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Health media use among childhood and young adult cancer survivors who smoke

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Abstract

Purpose—Promoting healthy behaviors may reduce the risk of co-morbidities among childhood and young adult (CYA) cancer survivors. Although behavioral interventions are one way to encourage such activities, there is increasing evidence that health media use—particularly health information seeking—also may influence health knowledge, beliefs, and behaviors. The current study explores patterns of health media use among survivors of CYA cancer. Our focus is on survivors who smoke and thus are at even greater risk of co-morbidities.

Methods—We analyzed data from the Partnership for Health-2 study, a web-based smoking cessation intervention, to examine the prevalence of and factors associated with health media use ($N=329$).

Results—Nearly two thirds (65.3 %) of CYA survivors who smoke reported infrequent or no online health information seeking. Many reported never reading health sections of newspapers or general magazines (46.2 %) or watching health segments on local television news (32.3 %).

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Factors associated with health media use include education and employment, cancer-related distress, and smoking quit attempts.

Conclusions—Health information engagement is low among CYA survivors who smoke, particularly active seeking of health information online. Population subgroups differ in their media use patterns; some of these differences reflect communication inequalities, which have the potential to exacerbate health disparities. Clinicians have an opportunity to guide CYA survivors towards useful and reliable information sources. This guidance could help survivors fulfill their unmet information and support needs and may be particularly important for less educated survivors and other underserved populations.

Keywords

Childhood cancer survivors; Young adult cancer survivors; Information seeking; Media exposure; Smoking cessation

Introduction

For children and adolescents with cancer, the 5-year relative survival rate is now more than 80 % [1]. Advances in cancer treatment have improved survival, yet these treatments also have rendered survivors of childhood and young adult (CYA) cancer at greater risk of long-term morbidity and mortality. By 20 to 30 years post-diagnosis, nearly three quarters of survivors will develop a chronic health condition, and more than 40 % will develop a life-threatening condition [2, 3]. Fortunately, detecting late effects of treatment at an early stage can reduce morbidity and mortality, and the Institute of Medicine thus has recommended long-term follow-up of CYA survivors [4]. These recommendations—reinforced by the Children’s Oncology Group’s clinical practice guidelines [5]—include both risk-based surveillance and health promotion activities, thereby underscoring how avoiding tobacco use, consuming a healthy diet, and engaging in physical activity may reduce risk of co-morbidities.

Despite such recommendations, CYA survivors continue to engage in risky behaviors at rates similar to, and sometimes higher than, those of healthy individuals [6, 7]. Current smoking rates among CYA survivors range from 17 %–29 %, with recent estimates as high as 37 % [7–9]. Rates of healthy behaviors are disappointingly low among survivors— and, in some cases, are even lower than rates among healthy controls [10]. One recent study found that less than half of survivors met guidelines for diet and physical activity [11]. Given these discouraging patterns, there have been efforts to intervene with CYA survivors, some successfully producing higher smoking cessation rates [12, 13] and modestly increasing physical activity among participants [14].

Yet interventions are not the only way to encourage prevention behaviors and discourage risky behaviors. In recent years, health information in the media has proliferated [15], and there is growing evidence that active information seeking and routine exposure to health information may influence health knowledge, beliefs, and behaviors, both in general and clinical populations. General population-based studies have found that the use of media sources of health information is positively associated with cancer knowledge, prevention

behaviors (consuming fruits and vegetables, exercising), and screening behaviors (getting a mammogram, colonoscopy) [16, 17]. Research also has shown that adult cancer patients and survivors actively seek cancer-related information and come across health information in the media even when they are not looking for it [18, 19]. This health media use is associated with healthy behaviors among survivors [20]. That said, not everyone will benefit equally from increasing information exposure—a phenomenon that has been described as communication inequality [21]. Such inequalities have been documented in the general population, where those with less education often have lower levels of cancer knowledge [22] and seek less cancer-related information [16]. Similarly, less educated cancer patients have reported less seeking than their better educated counterparts [18], although patients of lower socioeconomic position have reported greater seeking for certain topics (information on financial assistance, employment issues) [23].

Ultimately, little is known about the health media use patterns of CYA survivors—an important gap in the literature, given the pressing need to promote healthy behaviors among survivors and the role that health information exposure could play in encouraging such behaviors. Studies have shown that both CYA patients [24–26] and survivors [27–29] have unmet information needs. Although information resources [30] like pediatric cancer websites exist, their quality has been questioned [31]. Thus, researchers have begun to develop materials specifically for this population, including print materials and websites that provide social support or late effects information [29, 32, 33]. Yet, while studies have considered patients' and survivors' use of these materials, to our knowledge, only one explored survivors' health media use habits. Knijnenburg and colleagues found that about 50 % of childhood cancer survivors sought health information online, but the study's scope was limited, as it included less than 100 survivors drawn from two Amsterdam hospitals [29].

The goal of the current study was to explore the frequency and patterns of health media use among survivors of CYA cancer. Our analysis focused on smokers, who are at even greater risk for chronic disease and thus have been the target of behavioral interventions [12, 13, 34, 35]. We used data from the Partnership for Health-2 (PFH-2) study—a web-based smoking cessation intervention that recruited CYA survivors from multiple sites in the U.S. and Canada—to examine two study aims. First, we estimated the prevalence of both online health information seeking and routine exposure to health content in print and local television news. Second, we assessed factors associated with health media use, thereby enabling us to identify survivors who might benefit from additional health information or support during clinical encounters.

Methods

Study procedure

Study data come from the PFH-2 intervention. The original PFH study, which recruited participants from May 1999–July 2000, was a peer-delivered telephone counseling intervention for smoking cessation that produced a doubling of quit rates among CYA survivors at 8 and 12 months follow-up [12], an effect that was sustained over time [13]. Using a distinct sample, the PFH-2 intervention examined whether intervention efficacy

could be maintained when adapting the intensive, telephone-based PFH format to a scalable, self-guided, web-based format [34, 35]. Participants were recruited from December 2005–June 2008, completed a baseline survey, and were randomly assigned to a web-based or print materials version of the PFH intervention (regardless of prior self-reported Internet use behavior). A follow-up survey was administered 15 months post-randomization, from March 2007–October 2009. Results showed that web and print formats produced similar rates of cessation, which were equivalent to PFH’s quit rates [35].

The current study analyzes data from PFH-2’s 15-month follow-up survey, which focused primarily on smoking-related outcomes (cessation, quit attempts, pharmacotherapy use, household smoking restrictions). However, participants also were asked about their use of the PFH-2 website, general Internet use, and health media use; the latter is this study’s focus.

Study participants

PFH-2 recruitment was conducted in five U.S. and Canadian cancer centers: St. Jude Children’s Research Hospital, Memorial Sloan Kettering Cancer Center, Princess Margaret Hospital, The Hospital for Sick Children, and Dana-Farber Cancer Institute/Partners HealthCare. IRB approval was obtained at each site. To be eligible, survivors had to be diagnosed with cancer before age 35, off treatment for 2 years, between ages 18 and 55 years, able to provide informed consent, reachable by telephone, able to speak English, and a current smoker (defined as smoking in the past 30 days). A preliminary screen for eligibility was performed at each site via medical record review or telephone screening. Potential participants were told that the study was exploring different ways of delivering health information (including information on tobacco use) to CYA survivors. The study was not described as a smoking cessation study, and interest in cessation was not required for participation. The study team contacted consenting survivors, confirmed eligibility, and administered the baseline survey. Study information also was available on CYA survivorship websites; interested survivors contacted the study team and provided verbal consent.

We assessed eligibility among 4,399 survivors; 773 were deemed eligible. Of these, 374 enrolled in the study, and 88 % completed the 15-month follow-up ($N=329$). This is the sample included in the current study. The PFH-2 CONSORT flow diagram is provided elsewhere [35].

Measures

Sociodemographic and clinical characteristics—We collected self-reported sociodemographic (age, education, employment, gender, race/ethnicity, marital status) and clinical data (CYA cancer diagnosis; time since diagnosis; cancer treatment received; health status, as assessed by SF-36 [36]) (Table 1). Education and employment were combined into a single variable after initial analyses revealed a significant interaction, whereby associations between education and health media use were significant only among employed survivors.

Risk perceptions—Participants were asked about their perceived vulnerability, or how likely it was that they would experience “any serious health problem” in the future,

irrespective of their current health conditions [34]. Responses were categorized as “no chance, very unlikely, or unlikely,” “moderate chance,” “likely,” and “very likely or certain to happen.”

Psychosocial factors—Cancer-related distress was assessed with the seven-item Intrusive Thoughts subscale of the Impact of Events Scale, which measures the frequency with which thoughts about cancer recurrence enter consciousness (Cronbach’s $\alpha=0.86$) [37]. To assess cancer-related worry, participants were asked, “Over the past seven days, how many days have you spent at least part of the day worried about getting cancer again? [34]” Participants were considered worried about cancer if they selected between 1 and 7 days; those who selected 0 were not considered worried. Depressive thoughts were measured using two items from the PRIME-MD scale: “During the past month, have you often been bothered by feeling down, depressed, or hopeless?” and “During the past month, have you often been bothered by little interest or pleasure in doing things? [38]” Participants who said no to both were considered to have had no depressive thoughts; those who responded affirmatively to one were considered to have had some depressive thoughts, and those who said yes to both were considered to have had many depressive thoughts.

Quit attempts—Participants were asked, “How many times in the last 15 months, since enrolling in Partnership for Health, have you tried to quit smoking cigarettes and stayed off for at least 24 hours? [34]” Responses were categorized as “none,” “one to three times,” and “four or more times.” Only respondents who reported smoking in the past 30 days (83.9 %, $n= 276$) provided data on quit attempts.

Health media use—All items were adapted from the National Cancer Institute’s 2005 Health Information National Trends Survey (HINTS) [39]. To assess online health information seeking, participants were asked, “How often did you use the Internet to look for health or medical information for yourself?” during the past 15 months. Participants also were asked how often they looked for such information for someone else; the two items were combined to create a single seeking variable. Response options for each included “at least once a week,” “at least once a month (but less than once a week),” “less than once a month, but at least six times a year,” “less than six times a year,” and “never.” For descriptive analyses, categories were collapsed into “at least once a week,” “at least once a month (but less than once a week),” “less than once a month,” and “did not use the Internet” (Table 2). For bivariate and multivariable analyses, online seeking was dichotomized (sought at least monthly versus sought less than monthly; Table 3).

Routine exposure to health content in print media was assessed using two items: “Some newspapers or magazines publish special sections on health. In the past 15 months, since you completed the initial Partnership for Health survey, have you read the health sections of newspapers or general magazines?” and “How often have you read such health sections in the past 15 months?” Those who said they did not read health sections were not asked the second question. The two items were combined, and response options included “never,” “less than once a week,” and “at least once a week” (Table 2). Similar items were used to assess routine exposure to health content in local television news: “Some local television news programs include special segments on their newscasts that focus on health issues. In

the past 15 months, have you watched health segments on the local news?” and “How often have you watched health segments on local news in the past 15 months?” The two items were combined; response options included “never,” “less than once a week,” and “at least once a week.”

Statistical analysis

We examined frequencies and distributions for all variables of interest. Bivariate logistic and polytomous logistic models were created for each outcome variable with *a priori* independent variables. All models controlled for recruitment site. Variables significant at $P \leq 0.20$ in bivariate models were tested for inclusion in a multivariable model. A parsimonious model including main effects was created. Mediation analysis was conducted to inspect any independent variable relations not captured in main effects models. All polytomous models used the proportional odds assumption, which was tested and satisfied for each model. Analyses were conducted in SAS version 9.3.

Results

Participant characteristics

The mean age of CYA survivors who completed the follow-up was 32.5 years at enrollment (SD=8.0). The sample was evenly split by gender (50.5 % male) and was predominantly white (86.3 %). Thirty-six percent had a high school diploma or less, and 29.8 % had at least a college degree. On average, participants were 20.1 years from diagnosis (SD=9.6). A majority (83.9 %) reported smoking in the past 30 days, and 55.0 % reported at least one quit attempt since baseline. Additional sample characteristics are provided in Table 1.

Online health information seeking

Overall, nearly two thirds (65.3 %) of CYA survivors who smoke reported infrequent or no online health information seeking, including 57 survivors (17.3 %) who reported not using the Internet since baseline (Table 2). Only 16.7 % reported looking for health or medical information online at least once a week.

Several factors were significantly associated with online seeking in a multivariable model (Table 3). Among employed survivors, those with a high school degree or less (OR=0.27, 95 % CI=0.12–0.58) and those with some college/vocational school (OR=0.50, 95 % CI=0.26–0.99) reported less seeking than those with at least a college education. Survivors who were further from diagnosis also reported significantly less seeking (OR=0.97, 95 % CI=0.94–1.00). Those who had made 4+ attempts to quit smoking since baseline reported looking for significantly more health information online than those who made no quit attempts (OR=2.39, 95 % CI=1.18–4.82).

Routine exposure to health media content in print and on television

Compared with online health information seeking, more survivors reported reading health sections of newspapers or general magazines and watching health segments on local television news (Table 2). Just over 50 % reported reading health sections in the past 15 months, with 20.1 % reading at least once a week. Approximately two thirds reported

watching health segments during the past 15 months; 34.2 % reported watching at least once a week.

In a multivariable model predicting print exposure to health content (Table 3), a different pattern of results was observed for education and employment: Employed survivors with a high school diploma or less reported significantly more exposure to health sections in newspapers and magazines than those with a college degree or higher (OR=2.49, 95 % CI=1.30–4.75). Additionally, those who received radiation for their cancer reported more reading of health sections (OR= 1.94, 95 % CI=1.24–3.04), while survivors who reported greater cancer-related distress reported less reading (OR= 0.94, 95 % CI=0.90–0.98). In a bivariate analysis, survivors who made 4+ quit attempts since baseline reported lower levels of reading than those who made no quit attempts (OR=0.50, 95 % CI=0.28–0.91), but this result was not significant in adjusted analyses.

Several factors also were associated with television exposure to health content (Table 3). Adjusting for covariates, older survivors reported watching significantly fewer health segments on local news (OR=0.97, 95 % CI=0.94–1.00), as did those who reported greater cancer-related distress (OR= 0.95, 95 % CI=0.91–0.99). Survivors who reported making 1–3 quit attempts since baseline reported less exposure to health segments than those who made no quit attempts (OR=0.47, 95 % CI=0.28–0.80).

Discussion

PFH-2 data reveal that CYA cancer survivors who smoke engage in low levels of online health information seeking, with only about one third seeking at least once a month. Routine exposure to health content in print and television news media was more common, but even here a substantial number of survivors reported never reading health sections of newspapers or magazines or watching health segments on local television news.

The rates of health media use observed in PFH-2 are considerably lower than those reported among adult cancer patients and survivors, although the latter rates typically pertain to cancer-related media use, specifically, rather than general health media use as in PFH-2 [18, 19]. Unfortunately, comparisons to other CYA survivor samples are limited because there are little available data on health media use. Knijnenburg et al. reported that 49 % of childhood cancer survivors in their sample searched for health information online, though they did not gauge search frequency nor did they specify the search timeframe [29]. The 2005 HINTS data allow researchers to explore health media use by age and prior cancer diagnosis, but the type of diagnosis is not specified, and the number of younger survivors is too small to draw meaningful conclusions. Interestingly, an analysis of HINTS data suggests that PFH-2 participants engage in similar levels of online health information seeking as general population smokers and nonsmokers of comparable age (Table 2). However, the HINTS online seeking items were dichotomous; the categorical PFH-2 items allow us to see that, although a majority reported online seeking, much of this seeking was sporadic (i.e., less than once a month). Even if PFH-2 levels of health media use are roughly on par with HINTS, they nonetheless raise concern because PFH-2 is a high-risk CYA survivor population that could benefit from health information engagement. Given the dearth of

health media use data for CYA survivors—coupled with growing research on the unmet information and support needs of this population [24, 25, 27, 26, 28, 29]—adding online seeking and media exposure items to large-scale survivor surveys may be well-advised.

Several patterns emerged when we considered factors associated with health media use. First, less educated survivors engaged in less online seeking than their better-educated counterparts, although these results were only significant among employed survivors. These findings are consistent with prior research: Among general and clinical populations, less education is associated with less information seeking [16] and use of fewer sources [18]. Additionally, among CYA survivors, less education is associated with lower levels of online health information seeking [29] and general Internet use, even among survivors with Internet access [40]. We also found that employed survivors with a high school degree or less read *more* health sections than those with a college degree or higher; it is possible that less educated survivors turn to print media like general magazines for health information, rather than to the Internet. Taken together, these results underscore the extent to which population subgroups differ in their use of media sources—and such communication inequalities have the potential to exacerbate health disparities [21].

Cancer-related distress also was associated with health media use. Survivors who reported greater distress reported reading health sections and watching health segments less frequently, perhaps reflecting a pattern of information avoidance among those concerned about late effects or recurrence. Moreover, while quit attempts were associated with greater online seeking, they also were associated with less print health media exposure (in bivariate analyses) and less television health media exposure. This suggests that survivors who are looking to quit smoking may be turning to certain types of media (online rather than print or television sources) for information or support. Clinicians have an opportunity to guide survivors towards reliable online and offline information sources that, in turn, could help survivors fulfill their unmet needs. During the clinical encounter, it is important for clinicians to identify survivors' information and source preferences.

Several study limitations should be noted. First, current levels of online seeking may be higher than those presented here, although we might expect similar patterns of differential use by level of education given persistent differences in Internet use across population subgroups [41]. Second, due to space constraints, only three types of health media use were considered. Future research should consider digital media (social networking sites), interpersonal (other survivors), and medical (oncologists) sources. So, too, should future studies consider families' information seeking habits, as survivors' families have unmet needs [42] and proxy seeking has been shown to be important among adult survivors [43]. Third, this study relied on follow-up data, and thus all participants were previously exposed to an intervention. Because the intervention addressed smoking cessation rather than health communication outcomes, this exposure should not have influenced responses to media use variables. However, survivors interested in participating in a health intervention may be more willing to improve their health and thus more apt to engage with health information in the media. Thus, the low levels of health media use reported here could be an overestimate; CYA survivors who smoke and did not participate in PFH-2 could be in even greater need of high-quality health information. Fourth, data on socioeconomic indicators such as income

(which could be associated with health media use) were not collected. Fifth, the sample was predominantly White and well-educated, which limits generalizability to other racial/ethnic groups or groups with lower education levels; that said, the distribution reflects the populations of participating cancer centers. Lastly, our focus on survivors who smoke enabled us to explore health media use among a particularly high-risk population, but caution should be used in generalizing to nonsmoking survivors.

Given CYA survivors' risk of developing treatment-related late effects, researchers have argued that clinicians should discuss healthy behavior recommendations as part of survivors' follow-up care [10]. In addition, evidence-based programs that have been developed to promote healthy behaviors and reduce risky behaviors [10, 35] should be integrated into survivorship care delivery [44], thereby enabling clinicians to reinforce health promotion. Our study suggests that health information engagement is low among CYA survivors who smoke, particularly active seeking of health information online. The clinical encounter therefore provides a critical opportunity to both encourage healthy behaviors and guide survivors towards useful and reliable information sources. This guidance may be particularly important for less educated survivors and other underserved populations. Not only may these populations be less engaged with the broader health information environment, but there is also evidence that they may be less engaged in follow-up care [45]. By understanding survivors' current health media use practices and directing them towards high-quality information sources, clinicians may be able to address unmet needs and minimize potential communication inequalities.

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Table 1Participant characteristics and smoking behavior ($N=329$)^a

	<i>n^b</i>	<i>%^c</i>
Sociodemographic characteristics		
Age (range=19–56), M (SD)	32.5	(8.0)
Education and employment		
College and employed	84	25.5
Some college/vocational school and employed	92	28.0
High school and employed	81	24.6
College and unemployed	14	4.3
Some college/vocational school and unemployed	21	6.4
High school and unemployed	37	11.3
Gender		
Male	166	50.5
Female	163	49.5
Race/ethnicity		
White	284	86.3
Non-white	45	13.7
Marital status		
Married or partnered	165	50.2
Unmarried or not partnered	164	49.9
Clinical characteristics		
CYA cancer diagnosis		
Leukemia	79	24.0
Hodgkin's disease	61	18.5
CNS malignancy	32	9.7
Non-Hodgkin's lymphoma	20	6.1
Bone cancer	25	7.6
Other ^d	112	34.0
Time since diagnosis, in years (range=1–49), M (SD)	20.1	(9.6)
Cancer treatment received: surgery		
Yes	234	72.9
No	87	27.1
Cancer treatment received: radiation		
Yes	203	62.5
No	122	37.5
Cancer treatment received: chemotherapy		
Yes	249	76.9
No	75	23.2
Self-reported health status		
Excellent or very good	114	34.8
Good	128	39.0

	<i>n^b</i>	<i>%^c</i>
Fair or poor	86	26.2
Risk perceptions		
Likelihood of developing serious health problems		
No chance/very unlikely/unlikely	54	16.7
Moderate chance	119	36.8
Likely	82	25.4
Very likely/certain to happen	68	21.1
Psychosocial characteristics		
Cancer-related worry at least 1 day a week		
No	260	80.8
Yes	62	19.3
Cancer-related distress (range=0–21), M (SD)	3.7 (4.8)	
Depressive thoughts (feeling down, depressed, or hopeless; little interest or pleasure in doing things)		
None	166	50.6
Some	44	13.4
Many	118	36.0
Quit attempts (since baseline assessment)		
None	95	28.9
1–3 times	106	32.2
4 or more times	75	22.8
Did not smoke in past 30 days	53	16.1

^aThere were no sociodemographic differences between follow-up survey completers and dropouts except employment status; dropouts were more likely to be employed

^bSample sizes may differ slightly due to missing data

^cPercentages may not sum to 100 due to rounding

^dThe most common “other” cancer diagnoses reported were testicular cancer, Wilms and other kidney tumors, cervical cancer, and sarcomas

Table 2

Prevalence of health media use among PFH-2 participants, HINTS 2005 smokers (ages 18–49 years), and HINTS 2005 nonsmokers (ages 18–49 years)

	PFH-2 participants		PFH-2 participants		HINTS 2005 smokers, ages 18–49 years		HINTS 2005 nonsmokers, ages 18–49 years	
	<i>n</i> ^a	% ^a	<i>n</i>	% ^a	<i>n</i>	% ^a	<i>n</i>	% ^a
Frequency of online health information seeking ^b								
At least once a week	55	16.7	230	84.6	302	78.9	271	79.0
At least once a month ^c	59	17.9	42	15.4	81	21.1	72	21.0
Less than once a month	158	48.0	(<i>n</i> =272) ^d		(<i>n</i> =383)		(<i>n</i> =343)	
Did not use Internet	57	17.3						
	(<i>n</i> =329)							
Frequency of reading print health media content								
At least once a week	66	20.1	191	37.5	155	38.0		
Less than once a week	111	33.7	137	26.9	147	36.0		
Never	152	46.2	182	35.7	106	26.0		
	(<i>n</i> =329)		(<i>n</i> =510)		(<i>n</i> =408)			
Frequency of watching television health media content								
At least once a week	112	34.2	268	45.0	205	46.1		
Less than once a week	110	33.5	153	25.7	129	29.0		
Never	106	32.3	175	29.4	111	24.9		
	(<i>n</i> =328)		(<i>n</i> =596)		(<i>n</i> =445)			

^aSample sizes may differ slightly due to missing data. Percentages may not sum to 100 due to rounding^bPFH-2 online health information seeking items were categorical and asked about seeking in the past 15 months (since baseline data collection), HINTS online health information seeking items were dichotomous and asked about seeking in the past year^cBut less than once a week^dSince only HINTS Internet users were asked online seeking items, the 57 PFH-2 Internet nonusers were excluded from this analysis for comparability

Table 3

Bivariate and multivariable models predicting online health information seeking, print health media exposure, and television health media exposure ($N=329$)

	Online health information seeking			Print health media exposure			Television health media exposure		
	Bivariate model, OR (95 % CI) ^a	Multivariable model, OR (95 % CI) ^a		Bivariate model, OR (95 % CI) ^b	Multivariable model, OR (95 % CI) ^b		Bivariate model, OR (95 % CI) ^c	Multivariable model, OR (95 % CI) ^c	
Sociodemographic factors									
Age (continuous)	$P=0.61$ 0.99(0.96–1.02)			$P=0.19$ 0.98 (0.96–1.01)			$P=0.02$ 0.97 (0.95–1.00)	$P=0.02$ 0.97 (0.94–1.00)	
Education and employment	$P=0.005$	$P=0.004$		$P=0.06$	$P=0.03$		$P=0.46$		
College and employed	1.00	1.00		1.00	1.00		1.00		
Some college/vocational school and employed	0.50 (0.26–0.96)	0.50 (0.26–0.99)		1.36(0.76–2.44)	1.48 (0.81–2.68)		0.96(0.54–1.71)		
High school and employed	0.25 (0.12–0.52)	0.27 (0.12–0.58)		1.96 (1.06–3.60)	2.49 (1.30–1.75)		1.26 (0.70–2.27)		
College and unemployed	0.88 (0.28–2.80)	1.28 (0.37–1.43)		0.54(0.19–1.54)	0.61 (0.20–1.82)		0.40 (0.13–1.19)		
Some college/vocational school and unemployed	0.94 (0.35–2.55)	1.27 (0.45–3.58)		0.62 (0.25–1.53)	0.72(0.29–1.84)		1.25 (0.50–3.09)		
High school and unemployed	0.86(0.38–1.95)	1.11 (0.48–2.61)		1.24(0.59–2.63)	1.23 (0.56–2.68)		0.94 (0.45–1.96)		
Gender	$P=0.15$			$P=0.34$			$P=0.78$		
Male	0.71 (0.45–1.13)			1.22(0.81–1.84)			1.06(0.71–1.58)		
Female	1.00			1.00			1.00		
Race/ethnicity	$P=0.71$			$P=0.82$			$P=0.88$		
White	0.88(0.46–1.70)			1.07(0.59–1.94)			0.96(0.53–1.71)		
Non-white	1.00			1.00			1.00		
Married or partnered	$P=0.42$			$P=0.81$			$P=0.39$		
Yes	0.83(0.52–1.31)			1.05(0.70–1.58)			1.19(0.80–1.78)		
No	1.00			1.00			1.00		
Clinical factors									
CYA cancer diagnosis	$P=0.89$			$P=0.62$			$P=0.64$		
Leukemia	0.79(0.41–1.52)			1.66(0.93–2.95)			1.34 (0.77–2.35)		
Hodgkin's disease	0.85(0.43–1.67)			1.13 (0.62–2.05)			0.97 (0.54–1.75)		
CNS malignancy	1.29 (0.55–3.01)			0.94 (0.44–1.99)			0.75(0.35–1.61)		
Non-Hodgkin's Lymphoma	0.71 (0.25–2.04)			1.17(0.47–2.95)			1.31 (0.53–3.22)		

	Online health information seeking			Print health media exposure			Television health media exposure		
	Bivariate model, OR (95 % CI) ^a	Multivariable model, OR (95 % CI) ^a		Bivariate model, OR (95 % CI) ^b	Multivariable model, OR (95 % CI) ^b		Bivariate model, OR (95 % CI) ^c	Multivariable model, OR (95 % CI) ^c	
Bone cancer	1.08 (0.43–2.67)			1.23 (0.54–2.80)			1.49 (0.66–3.36)		
Other	1.00			1.00			1.00		
Time since diagnosis (continuous)	<i>P</i> =0.15	<i>P</i> =0.05		<i>P</i> =0.85			<i>P</i> =0.28		
Cancer treatment received: Surgery	0.98(0.95–1.01)	0.97 (0.94–1.00)		1.00(0.98–1.02)			0.99(0.96–1.01)		
Yes	<i>P</i> =0.78			<i>P</i> =0.24			<i>P</i> =0.92		
No	0.93(0.55–1.57)			0.75 (0.47–1.21)			0.98 (0.62–1.55)		
Cancer treatment received: Radiation	1.00			1.00			1.00		
Yes	<i>P</i> =0.93			<i>P</i> =0.03	<i>P</i> =0.004		<i>P</i> =0.88		
No	1.02(0.64–1.64)			1.59 (1.05–2.43)	1.94 (1.24–3.04)		0.97 (0.64–1.47)		
Cancer treatment received: Chemotherapy	1.00			1.00	1.00		1.00		
Yes	<i>P</i> =0.85			<i>P</i> =0.30			<i>P</i> =0.51		
No	0.95(0.55–1.63)			1.29(0.80–2.08)			0.85 (0.53–1.37)		
Self-reported health status	1.00			1.00			1.00		
Excellent or very good	<i>P</i> =0.20			<i>P</i> =0.88			<i>P</i> =0.12		
Good	1.01 (0.56–1.81)			1.04(0.61–1.77)			1.65 (0.97–2.79)		
Fair or poor	0.65(0.36–1.16)			0.92 (0.55–1.55)			1.11 (0.67–1.84)		
Risk perceptions	1.00			1.00			1.00		
Likelihood of developing serious health problems	<i>P</i> =0.58			<i>P</i> =0.99			<i>P</i> =0.25		
No chance/very unlikely/unlikely	1.22 (0.57–2.62)			1.10(0.56–2.17)			2.00 (1.02–3.92)		
Moderate chance	0.96(0.50–1.86)			1.05(0.59–1.86)			1.31(0.74–2.31)		
Likely	1.44 (0.72–2.86)			1.06(0.57–1.95)			1.27 (0.69–2.32)		
Very likely/certain to happen	1.00			1.00			1.00		
Psychosocial factors									
Cancer-related worry at least 1 day a week	<i>P</i> =0.38			<i>P</i> =0.14			<i>P</i> =0.69		
No	1.31 (0.72–2.41)			1.49(0.88–2.51)			1.11 (0.66–1.87)		
Yes	1.00			1.00			1.00		
Cancer-related distress (continuous)	<i>P</i> =0.87			<i>P</i> =0.02	<i>P</i> =0.006		<i>P</i> =0.02	<i>P</i> =0.02	
	1.00(0.95–1.05)			0.95 (0.91–0.99)	0.94 (0.90–0.98)		0.95 (0.91–0.99)	0.95 (0.91–0.99)	

	Online health information seeking		Print health media exposure		Television health media exposure	
	Bivariate model, OR (95 % CI) ^a	Multivariable model, OR (95 % CI) ^a	Bivariate model, OR (95 % CI) ^b	Multivariable model, OR (95 % CI) ^b	Bivariate model, OR (95 % CI) ^c	Multivariable model, OR (95 % CI) ^c
Depressive thoughts (feeling down, depressed, or hopeless; little interest or pleasure in doing things)		<i>P</i> =0.13		<i>P</i> =0.22		<i>P</i> =0.24
None	0.72(0.44–1.18)		1.45(0.93–2.26)		1.27 (0.82–1.97)	
Some	0.47(0.21–1.03)		1.52(0.78–2.94)		1.72 (0.90–3.30)	
Many	1.00		1.00		1.00	
Quit attempts (since baseline assessment)		<i>P</i> =0.009		<i>P</i> =0.09		<i>P</i> =0.02
None	1.00		1.00		1.00	
1–3 times	1.05(0.56–1.96)		0.94(0.49–1.82)		0.48 (0.29–0.81)	0.47 (0.28–0.80)
4 or more times	2.66 (1.36–5.18)		0.50 (0.28–0.91)		0.71 (0.40–1.27)	0.65(0.36–1.16)
Did not smoke in past 30 days	1.96 (0.95–4.07)		0.99 (0.52–1.90)		1.11 (0.59–2.10)	1.02(0.54–1.95)

Bold emphasis indicates statistically significant association. Factors found to be significant at the 0.20 level in bivariate analyses were included in multivariable modeling

^aDerived using binary logistic regression where the outcome variable was coded as 0 seeking less than once a month and 1 seeking at least once a month. Bivariate and multivariable models adjust for recruitment site

^bDerived using ordinal logistic regression where the outcome variable was coded as 1 reading never, 2 reading less than once a week, and 3 reading once a week or more often. Bivariate and multivariable models adjust for recruitment site

^cDerived using ordinal logistic regression where the outcome variable was coded as 1 watching never, 2 watching less than once a week, and 3 watching once a week or more often. Bivariate and multivariable models adjust for recruitment site