

## **Cancer Information Scanning and Seeking Behavior is Associated with Knowledge, Lifestyle Choices, and Screening**

**MINSUN SHIM, BRIDGET KELLY, AND  
ROBERT HORNIK**

University of Pennsylvania, Philadelphia, Pennsylvania, USA

*Previous research on cancer information focused on active seeking, neglecting information gathered through routine media use or conversation (“scanning”). It is hypothesized that both scanning and active seeking influence knowledge, prevention, and screening decisions. This study uses Health Information National Trends Survey (HINTS, 2003) data to describe cancer-related scanning and seeking behavior (SSB) and assess its relationship with knowledge, lifestyle behavior, and screening. Scanning was operationalized as the amount of attention paid to health topics, and seeking was defined as looking for cancer information in the past year. The resulting typology included 41% low-scan/no-seekers; 30% high-scan/no-seekers; 10% low-scan/seekers, and 19% high-scan/seekers. Both scanning and seeking were significantly associated with knowledge about cancer ( $B = .36$ ;  $B = .34$ ) and lifestyle choices that may prevent cancer ( $B = .15$ ;  $B = .16$ ) in multivariate analyses. Both scanning and seeking were associated with colonoscopy ( $OR = 1.38$ , for scanning and  $OR = 1.44$ , for seeking) and with prostate cancer screening ( $OR = 4.53$ , scanning;  $OR = 10.01$ , seeking). Scanning was significantly associated with recent mammography ( $OR = 1.46$ ), but seeking was not. Individuals who scan or seek cancer information are those who acquire knowledge, adopt healthy lifestyle behaviors, and get screened for cancer. Causal claims about these associations await further research.*

In an age when pharmaceutical companies advertise directly to consumers, local news programs feature health minutes, and health-related websites are more abundant than ever before, it is becoming increasingly important for public health practitioners to understand how people get access to information to make medical decisions, including those related to cancer. One of the particular health concerns for which this issue is most prominent is cancer. As the second leading cause of death in the United States, cancer contributed to 553,768 deaths, or nearly 23% of all U.S. deaths in 2001 (American Cancer Society, 2004). Furthermore, the role of public information is particularly relevant to the topic of cancer as it is a disease for which new treatment options and new links to lifestyle behaviors frequently are emerging.

Address correspondence to Minsun Shim, 3620 Walnut Street, Annenberg School for Communication, University of Pennsylvania, Philadelphia, PA 19104, USA. E-mail: mshim@asc.upenn.edu

Most of the research in the field of cancer information has focused on active seeking, such as Internet searching or calling the Cancer Information Service (Czaja, Manfredi, & Price, 2003; Freimuth, Stein, & Kean, 1989). The majority of this research has investigated patients' information needs (Bennenbroek, Buunk, Van der Zee, & Grol, 2001; Boberg et al., 2003; Chalmers, Marles, Tataryn, Scott-Findlay, & Serfas, 2003; Lock & Willson, 2002; Rees, Sheard, & Echlin, 2003); the quality of information patients receive (Kunst, 2002; Mills & Davidson, 2002); or their preferences for different media (James, James, Davies, Harvey, & Tweddle, 1999; Johnson & Meischke, 1991; Mills & Davidson, 2002; Wallberg et al., 2000). Several studies have linked such information searching to decision making. In one phone survey of more than 3,000 Americans, 31% said they had searched for health information on-line, and 74% of them said that the information they found had been beneficial to their decision-making ability (Baker, Wagner, Singer, & Bundorf, 2003). According to a recent study based on the data from the Illinois Cancer Registry, information seeking was associated with discussing information with physicians and with finding obtained information useful during decision making (Czaja et al., 2003).

Because these studies focus on active information searching, however, it is likely that they miss much important information exposure. That is, they do not consider information that is gathered incidentally from sources in the environment, such as a television program that is on while someone is engaged in another activity or a newspaper article that one comes across casually through routine use of the media. We will define this complementary process as "scanning." It is our hypothesis that this type of information gathering, that which occurs as part of a person's normal flow of information, also may play a substantial role as people develop knowledge about cancer or decide to get screened for cancer.

### ***Cancer Information Scanning***

This idea of scanning has appeared in the literature under various terms. For example, Zukin and Snyder (1984) describe a process of passive learning that takes place when exposure affects what people know without direct attention being paid. In the advertising literature, this form of exposure is sometimes called "incidental" or "mere" exposure (Janiszewski, 1993; Shapiro, MacInnis, & Heckler, 1997; Shapiro, 1999). Several studies suggest that this type of information exposure may influence later decision making (Janiszewski, 1993; Shapiro et al., 1997; Shapiro, 1999). Incidental exposure, however, is typically operationalized as that which occurs while attention is focused on some other task (Obermiller, 1985; Shapiro, 1999). It is our belief that scanning goes beyond incidental exposure, to include information a person encounters in the normal flow of information but decides to attend to. For example, one could be listening to the radio for music and hear a promotion for mammography. While the listener was not looking for the information, a decision was made to listen—and pay attention—to the advertisement.

It is also important to note that much of the literature on passive information exposure defines it as occurring only with specific information sources, including television, radio, and newspapers, while active seeking occurs with the Internet or books (Carlson, 2000; Dutta-Bergman, 2004). While we agree that some sources inherently may be more likely to be used for seeking than others, we believe both seeking and scanning can occur with all sources.

### **Purpose**

In this article we explore seeking and scanning for information. We expect that individuals may engage in both seeking and scanning behaviors, and both may be important for health outcomes. We develop a typology of SSB. We classify people according to how they engage in both behaviors. We then consider what individual background characteristics are associated with particular SSB, and examine whether SSB is associated with important health outcomes. Specifically, we aim to address the following research questions:

#### *1. Do Individuals Vary in Scanning and Seeking Behavior (SSB) for Cancer-Related Information?*

*Decision-Specific SSB and General SSB.* There are (at least) two ways to think about the construct of SSB. On the one hand, SSB may be specific to a particular context. For example, a man considering whether to get a prostate specific antigen (PSA) test may engage in a good deal of information seeking while receiving very little information through the routine flow of media exposure (scanning). When considering whether to ask a physician to arrange a colonoscopy, however, most of his relevant information might come from scanning and little from seeking. This decision-specific construct of SSB is supported by studies providing evidence that there is variation in SSB across decisions (e.g., Feltwell & Rees, 2004; Niederdeppe et al., in press). On the other hand, SSB may be thought of also as a personal style generally operating across contexts, the approach taken in this secondary analysis, by necessity.

This study involves secondary analysis of the HINTS 2003 data, which does not provide any measures of SSB that are specific to given decisions; therefore, decision-specific SSB is beyond the reach of the study. Rather, we take a complementary perspective. We assume that SSB, in addition to being specific to a particular decision, is also a reflection of an enduring personal style: Some people tend to be actively engaged with information across many areas of health, while others are more passive. Across contexts we would expect the active people to be high seekers and perhaps high scanners, while the passive group would do only scanning or even do neither seeking nor scanning, paying little attention to health information.

#### *2. Does Cancer Information SSB Differ, Depending on Individual Characteristics?*

This study aims to determine whether SSB is systematically associated with characteristics of individuals, particularly health status, prior cancer experience, education, and other sociodemographic variables. Health status and prior cancer experience are situation-specific characteristics, whereas education and other sociodemographics are more enduring. Both types of individual characteristics have been found to account for variation in information-seeking behavior in previous research. Freimuth and colleagues (1989), for example, found that callers to the Cancer Information Service wanted different types of information depending on their disease status. In addition, several studies suggest sociodemographics including education, gender, and race may predict variation in SSB. For example, those with higher levels of education are likely to be more active searchers for information than less-educated people (Muha, Smith, Baum, Ter Maat, & Ward, 1998; Rakowski et al., 1990), and women are more active than men (Marcus, Woodworth, & Strickland, 1993; Rakowski et al., 1990). White patients seem to use the Internet to gather information

about breast health more frequently than those of other races and ethnicities (Fogel, Albert, Schnabel, Ditkoff, & Neugut, 2002). We expect that age, marital status, cancer history, and family history of cancer also may account for some variation in SSB typology.

### *3. Do Individuals Who Vary in Their SSB also Vary on Their Knowledge About Cancer?*

Descriptions of cancer information SSB and the effort to account for variation in SSB become more meaningful when the variation in SSB itself may account for variation in health-related outcomes, such as knowledge about cancer. We offer two hypotheses about the association between cancer SSB and knowledge: the first hypothesis says that seekers will have better knowledge about cancer than nonseekers after controlling for sociodemographic factors, health status, and other relevant factors; the second hypothesis posits that more versus less extensive scanning will produce better knowledge about cancer, after other factors are controlled for. Additionally, we explore whether seeking and scanning interact in their joint effects on health outcomes: Are the effects of seeking and scanning independent, do they reinforce one another, or they are substitutes for one another?

### *4. Do Those Who Vary in Their SSB Typology Also Vary on Lifestyle Choices Related to Cancer and Screening Behaviors?*

There is evidence that cancer knowledge will influence adoption or nonadoption of cancer-related behaviors (Becker, Kraft, Southwell, & Jorgensen, 2000; Eaker, Adami, & Sparen, 2001; Ward, Baum, Maat, Thomsen, & Maibach, 1998). On the basis of these previous studies, this study explores whether information gathering (i.e., SSB) is related to behaviors that may help to reduce incidence or mortality from cancer. Lifestyle behaviors, including low intake of fruits and vegetables, lack of exercise, smoking, and alcohol consumption all have been linked to increased cancer risk (Moyad & Carroll, 2004; Sanjoaquin, Appleby, Thorogood, Mann, & Key, 2004; Shike, 1999). Screening has been shown to significantly increase survival from some cancers, although the evidence for PSA screening remains uncertain (Gill, Farshid, Luke, & Roder, 2004; Labrie, 2000; Whynes, Frew, Manghan, Scholefield, & Hardcastle, 2003). We offer again two hypotheses: seeking will be related to lifestyle and screening behaviors; and so will scanning. Also, we explore whether scanning and seeking interact, and in what forms, in their effects on these behaviors.

## **Methods**

### *Data*

This study analyzed the data from the 2003 HINTS. The HINTS is designed to collect nationally representative data every 2 years about the American public's need for, access to, and use of cancer-related information. Since the HINTS 2003 data were not designed for analysis of scanning and seeking behavior, we used the measures of seeking and scanning that could be obtained from the dataset. This is also the reason for limiting the analysis to the second conceptualization of SSB—as a persistent style. The behaviors could not be measured across different topic areas because no data were collected about scanning for and seeking information related to other health issues or non-health-related topics.

### **Sample**

The survey respondents were a national probability sample of civilian, noninstitutionalized adults (18 and above) in the United States (National Cancer Institute, 2003). The sample was obtained through random-digit dialing (RDD) from all telephone exchanges in the United States, with oversampling of exchanges with high numbers of African Americans and Hispanics (Rizzo, 2003). During the household screener, one adult was sampled within each household and recruited for the extended interview ( $N = 6,369$ ; Rizzo, 2003).

Sixty percent of the sample was female. Twenty-six percent were ages 18–34, 21% were 35–44, 19% were 45–54, 24% were 55–74, and 9% were over age 75. About 71% of respondents were non-Hispanic White Americans, 13% were Hispanic, and 12% were non-Hispanic African Americans. Thirty-one percent of the sample had attended 4 or more years of college, 27% had 1–3 years of college, 30% had completed high school or obtained a GED, and 12% had some high school education or less. In addition, 53% were married. Weights were available to adjust results to population values. Since we were primarily interested in testing theoretical propositions, however we chose to maximize statistical power by ignoring those weights. Because essential multivariate analyses controlled for the primary characteristics on which the sample were over- or underweighted, these reported results are quite likely to represent the population results, in any case.

Thirteen percent of the sample assessed their own health status as excellent, 31% as very good, 34% as good, 18% as fair, and 5% as poor. Twelve percent reported having ever been diagnosed with cancer and 63% reported having ever had an immediate family member who had been diagnosed with cancer.

### **Measures**

#### *Information Scanning*

Cancer information scanning was measured indirectly using a set of questions: “How much attention do you pay to information about health or medical topics on/in [MEDIA SOURCE]?” and “Would you say a lot, some, a little, or not at all? (How about [MEDIA SOURCE])?” Respondents were asked to answer the questions regarding each media source, including television, radio, newspapers, and magazines on a 4-point scale, ranging from “not at all” (=1) to “a lot” (=4). The average score of these responses across media was calculated and recoded into a 4-point scale ( $M = 2.60$ ,  $SD = .78$ ). Finally, information scanning was dichotomized by the midpoint of the range (=2.5). That is, a person with an average score from 1 to 2.5 was defined as a “low scanner,” whereas a person getting above 2.5 was defined as a “high scanner.” Even though these questions did not specify focus on cancer-related information, we assume that those who pay more attention to health information across various media contexts are more likely to come across cancer-related information.

#### *Information Seeking*

Respondents were asked two questions about their information seeking: “Have you looked for information about cancer from any source?” and “About how long ago was that?” A variable for cancer information seeking was created using these two items. “Information seekers” were defined as those who had looked for cancer

information within the last year. “Nonseekers” were those who had never looked for information or who had looked for information, but not within the past year.<sup>1</sup>

#### *Information Scanning and Seeking Behavior (SSB)*

These two variables were combined to create a typology of cancer information SSB. The categories of SSB are “low-scan/no seekers,” “low-scan/seekers,” “high-scan/no seekers,” and “high-scan/seekers.”

#### *Individual Characteristics*

Individual characteristics included situation-specific characteristics, for example, respondents’ health status (“In general would you say that your health is...?”) with answers ranging from poor (=1) to excellent (=5) and the cancer history of both respondents and their family members (“Have you ever been told by a doctor that you had cancer”: yes/no; “Have any of your brothers, sisters, parents, children, or other close family members ever had cancer?”: yes/no). Additionally, individual sociodemographic characteristics were measured, such as age, gender, race/ethnicity (Hispanic, White, African American, and other), education (lower than some high school, high school graduate, some college or technical school, and college graduate or higher), and marital status (later recoded into a dichotomous variable: married or member of an unmarried couple versus divorced, widowed, separated, or never married).

#### *Knowledge About Cancer*

An index of knowledge about cancer was formed using six relevant items. Items included measures of respondents’ awareness of the impact of several risk factors for cancer, as well as knowledge about recommended daily allowance for fruits and vegetables and awareness of specific screening tests (see Appendix A for a complete list of items used in this index). Knowledge items were eligible for inclusion if they had statistically significant relationships with educational level. We used the association with education as a criterion to judge item validity on the assumption that a valid measure of cancer knowledge would be expected to be related to education level as well. Additionally, to maximize statistical power, items that were asked of only a subsample were not eligible for inclusion. Excluded are questions either randomly assigned to a subsample or asked only of relevant subgroups (e.g., only females got a question about mammograms). Responses to each item were recoded into 1 (for an accurate answer) or 0 (for an inaccurate answer) and then, summed to form a 6-point index (0 to 6;  $M = 3.77$ ,  $SD = 1.53$ ).

#### *Lifestyle Choices*

An index of lifestyle choices was formed with regard to smoking, eating fruits, eating vegetables, and exercising. Each item was dichotomized as there was not enough variation in the answers to justify more than two categories for each: 1 for a healthier

<sup>1</sup>One reason for including recency in the seeking variable is that the current knowledge about cancer is not as likely to be as related to seeking that occurred many years ago, as it is to that which occurred within the last year. Likewise, the other outcome variables have an element of recency to them. Also, as explained before, we conceptualized seeking and scanning as a persistent style of individuals that is consistent across contexts. Thus, a person who had never looked for information about cancer within the past year may not be understood to have a persistent style of information seeking.

choice and 0 for a less healthy choice. For smoking, those who did “not” currently smoke “at all” were recoded as 1 and those who did “sometimes” or “everyday” were recoded as 0. Answers to both the fruit and vegetable questions (“During the past month, how often did you eat...?”) were recoded into 1 for eating at least 2 times per day and 0 for less than 2 times per day. The exercise question was coded as 1 for “yes” and 0 for “no” to the questions asking whether they engaged in regular activity long enough to work up a sweat at least once a week during the past month. Summing the values of these four items, we formed an index of lifestyle behavior varying from 0 to 4 ( $M = 1.84$ ,  $SD = 1.05$ ).

### *Screening Behaviors*

Screening behaviors included three items: whether respondents had ever had a colonoscopy, had ever had a PSA test, and had undergone a mammogram within the past 2 years, respectively. We limited the time period of getting mammograms to the past 2 years to be consistent with American Cancer Society guidelines. Because items about colonoscopy, PSA test, and mammogram were asked of different subsamples (based on age and gender), we looked separately at the relationships between SSB and getting each discrete screening test, instead of creating a scale of screening behavior. We limited our analyses to those aged 50 and over for colonoscopy, men aged 40 and over for PSA, and women aged 40 and above for mammogram.

### *Control Variables*

All of the individual characteristic variables described above were used as control variables in multivariate analyses. In addition, whether respondents had any form of health insurance was used as a control variable. We were concerned that an association between SSB and knowledge or other health outcomes might be an artifact of the effects of the control variables on both.

### *Analysis Procedures*

We cross tabulated the scanning and seeking variables to determine the percentages of respondents that fell into each category and to check the association of these two variables. We used chi-square tests to determine which demographic and personal variables were associated separately with scanning and seeking behavior. Subsequently, we conducted logistic regression using either scanning or seeking as a dependent variable with all individual characteristics as independent variables, in order to see the multivariate relationships between the set of background characteristics and SSB. In order to determine whether SSB was associated with health outcomes including knowledge, lifestyle choices, and screening behaviors, we used Ordinary Least Squares (OLS) multiple regression for continuous dependent variables (knowledge and lifestyle indices) and logistic regression for the dichotomous screening behaviors (e.g., “Have you ever been screened for prostate cancer? Yes or no?”). For each of the regression analyses, the demographic and personal characteristics controlled for included health insurance, health status, personal cancer history, family cancer history, age, gender, race, education level, and marital status. The independent variables were information scanning and seeking. An interaction term for these two behaviors also was entered.

**Table 1.** Cancer information scanning and seeking behavior typology

		Information scanning	
		Low scan	High scan
Information seeking	No seek	40.8% ( <i>N</i> = 2,567)	30.2% ( <i>N</i> = 1,902)
	Seek	9.9% ( <i>N</i> = 619)	19.1% ( <i>N</i> = 1,205)

Note: Gamma = .45,  $p < .001$ .

## Results

### *The Distribution of Cancer Information SSB*

According to the scanning measure before being dichotomized, about 80% of respondents said they paid attention to health information in the media, including television, radio, newspapers, and magazines, at least a little on average. When dichotomized by a midpoint (referring to a midpoint between a little and some attention paid to health information), 50.7% of the sample were categorized as low scanners, whereas 49.3% were high scanners (see Table 1).

Of the respondents, 47.4% said they had ever looked for information about cancer from any source. Among these people, 27.9% had sought cancer information within the last month, 18.0% within the last 6 months, 16.0% within the past year, and 38.1% in the past, but not within a year. In this study, only those who looked for information within the past year are categorized as seekers (29.0% of the sample).

The resulting typology included approximately 41% low-scan/no-seekers; 30% high-scan/no-seekers; 10% low-scan/seekers and 19% high-scan/seekers. Unsurprisingly, there was a strong association between seeking and scanning. Those who reported high seeking were much more likely to report high scanning than did low seekers. Nonetheless, there were individuals assigned to all four quadrants of the seeking and scanning typology. The largest cell included low-scan/no-seekers, while the smallest cell included those who were low-scan/high seekers.

### *Individual Characteristics Associated With Cancer Information SSB*

Several of the individual background characteristics were found to be associated with placement within a particular cell of the cancer information SSB typology (see Table 2).<sup>2</sup>

Scanning had significant associations with health status, family cancer history, gender, education, marital status, and race/ethnicity. For example, those who had a family member with cancer were more likely to pay attention to health information

<sup>2</sup>We report only the multivariate associations of the background characteristics with scanning or seeking separately. In addition, we tested whether the associations of the background variables with seeking were contingent on the effects of scanning or vice versa (by regressing seeking and scanning and their interaction on the background variables). We found no interactions, and thus proceeded to examine the effects of the background variables on seeking and scanning as separate outcomes. The lack of interactions also can be seen in the pattern of means in Table 2.



**Table 2.** Associations of cancer information SSB with background characteristics

Background variables	Means or % across SSB cells					Multivariate logistic regression with scanning or seeking as outcomes	
	Overall	Low scanners		High scanners		Scanning	Seeking
		No seek	Seek	No seek	Seek		
Health status (mean)	3.30	3.25	3.27	3.36	3.34	OR = 1.06*	.98
Had cancer (%)	12.0	10.3	16.0	9.6	17.1	1.07	1.80*
Family cancer (%)	62.8	56.5	73.0	61.0	73.7	1.20*	1.81*
Age (mean)	47.6	47.8	46.3	48.1	46.9	1.00	.99*
Female (%)	60.3	50.1	64.1	64.2	73.5	1.97*	1.79*
College educated (%)	31.3	24.9	32.1	32.5	42.6	1.56*	1.60*
Married (%)	56.3	52.6	54.9	60.1	58.9	1.39*	1.08
Race/ethnicity (%)							
White	70.3	68.6	74.9	70.4	71.4	1.17	.81
African/American	11.8	10.0	8.4	13.3	15.0	1.98*	.93
Hispanic	12.7	15.7	10.8	12.3	7.9	1.03	.60*
Nagelkerke <i>r</i> square ( <i>N</i> )						.07 (5,927)	.08 (5,872)

*Note.* The first five data columns present either the means or percentages of all respondents and 4 SSB group members, respectively.

Association columns present results of logistic regression (OR) predicting either scanning or seeking from background variables after controlling for health insurance.

\* $p < .05$ .

in the media. Healthier people, females, college graduates, married people and African Americans (compared with Whites) were also more likely to be scanners.

Seeking was accounted for both by family cancer history and personal cancer history, as well as age, gender, education, and race/ethnicity. Those with previous cancer experience were more likely to seek cancer-related information, as were younger people, females, and college graduates. Hispanics were less likely to seek than Whites.

### *The Association Between Cancer Information SSB and Cancer Knowledge*

The associations between SSB and knowledge about cancer are presented in Table 3.

Both information scanning and seeking were positively associated with knowledge about cancer, after controlling for the sociodemographic factors, as well as cancer history, health status, and health insurance coverage. Individuals who paid a lot of attention to health information in the media (high scanners) were more likely to know about cancer than lowscanners. In addition, those who sought cancer-relevant information for themselves within the past year demonstrated better knowledge about cancer than nonseekers. Interestingly, those who were either seekers or scanners, but were low on the other behavior had almost identical knowledge

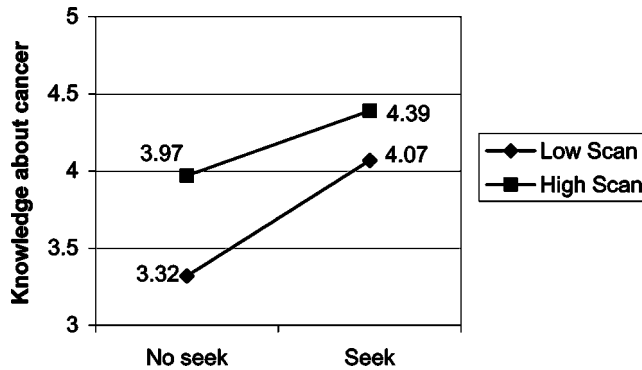
**Table 3.** Associations of cancer information SSB with health outcomes

Health outcomes	Predicted means or %				Multivariate coefficients for SSB variables regressed on health outcomes along with background variables (not shown)				
	Low scanners		High scanners		Scanning	Seeking	Scanning*	Seeking	R square
	No seek	Seek	No seek	Seek					
Knowledge (mean)	3.81	3.32	4.07	4.39	B = .36*	B = .34*	B = -.21*	.30	
Lifestyle choices (M)	1.84	1.64	1.88	2.10	B = .15*	B = .16*	n.s.	.13	
Not smoking (%)	80.1	77.1	78.4	82.6	OR = 1.17*	OR = .99	n.s.	.13	
Exercising (%)	53.3	44.7	54.3	65.3	OR = 1.59*	OR = 1.42*	n.s.	.18	
Eating fruit (%)	21.0	17.4	21.9	26.3	OR = 1.17*	OR = 1.22*	n.s.	.06	
Eating vegetables (%)	27.3	22.5	30.7	35.3	OR = 1.09	OR = 1.31*	n.s.	.07	
Screening behaviors									
Colonoscopy (%)	37.3	31.0	42.1	37.8	OR = 1.38*	OR = 1.44*	n.s.	.10	
Mammogram (%)	77.6	71.6	76.5	83.4	OR = 1.46*	OR = 1.25	n.s.	.08	
PSA (%)	46.3	36.5	67.2	57.7	OR = 4.53*	OR = 10.01*	OR = .36*	.31	

*Note:* The first five data columns present either the means or percentages of all respondents and 4 SSB group members, respectively. Mean predicted values were acquired from OLS multiple regression after controlling for other relevant variables. Percentage predicted values were acquired from logistic regression after controlling for other variables.

Association columns present results of OLS regression (unstandardized coefficient B) or logistic regression (OR) predicting each health outcome from seeking, scanning, and their interaction term after controlling for the relevant factors. *N* = 5,510 (for knowledge); *N* = 5,340, (lifestyle choice); *N* = 2,326 (colonoscopy); *N* = 2,109 (mammogram); *N* = 1,260 (PSA).

\**p* < .05.



**Figure 1.** Knowledge about cancer in each SSB group.

*Note.* Values are the predicted values, which were acquired from OLS multiple regression using knowledge as a dependent variable and SSB as predictors after controlling for relevant variables.

scores. We can speculate then that both types of SSB have similar influences on knowledge acquisition.

Moreover, scanning and seeking had a negative interaction in their effects on knowledge about cancer as shown in Figure 1. It appeared that seeking and scanning substituted for each other, in part. The association of either SSB variable with knowledge was greater in the absence of the other.

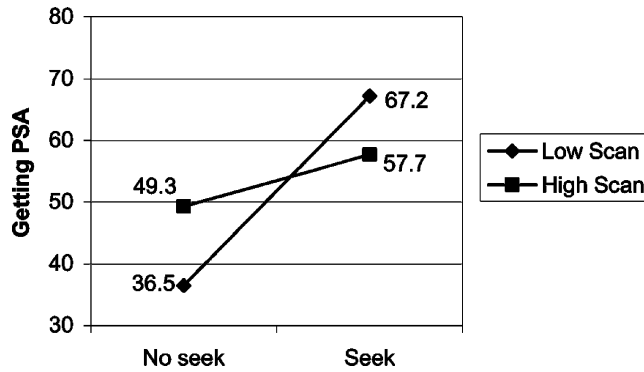
#### ***The Association Between Cancer Information SSB and Lifestyle Behavior***

The scale of lifestyle behaviors including smoking, exercise, and fruit and vegetable consumption was positively associated with both seeking and scanning, even after controlling for respondents' sociodemographics, cancer history, and other relevant variables (see Table 3). There was no significant interaction effect, however, of scanning and seeking on lifestyle behaviors.

The examination of SSB associations with a specific lifestyle choice generally parallels those for the summed scale. High scanners were more likely to exercise regularly and to eat fruit at least two times per day, and were less likely to smoke. Information seeking was associated with exercise and both fruit and vegetable consumption, but not with smoking. There were no significant interactions of seeking and scanning on these specific lifestyle choices.

#### ***The Association Between Cancer Information SSB and Screening Behavior***

Both information scanning and seeking were positively associated with getting a colonoscopy after controlling for other demographic characteristics and control variables among those 50 and older kept in the sample (see Table 3). There was no significant interaction effect of scanning and seeking on getting colonoscopies. Women who paid more attention to health information in the media (scanners) were more likely to have had a mammogram within the past 2 years. Their seeking behavior was not associated with the screening test, nor was there an interaction between seeking and scanning.



**Figure 2.** Percentage of getting PSA tests in each SSB group.

*Note:* Values are predicted values, which were acquired from logistic regression using getting PSA as a dependent variable and SSB as predictors after controlling for relevant variables.

Both seeking and scanning were associated with PSA screening. Men who were high scanners or information seekers were more likely to get PSAs. Strikingly, a negative interaction between seeking and scanning was found. For low scanners, information seeking was associated with getting a PSA, whereas seeking had no additional association among high scanners (see Figure 2). That is, scanning only mattered for nonseekers; among seekers, high scanners actually reported fewer PSAs than low scanners.

## Discussion

The results reveal that scanning and seeking are clearly separate behaviors, often having different associations with sociodemographics or outcome behaviors. The two-by-two typology shows that while the largest percentage of respondents (41%) neither scan nor seek, scanning is clearly more common than seeking.

It is not surprising that those with a family history of cancer are more likely to scan and seek and that those with a personal cancer history are more likely to seek; however, it is not clear why those respondents with a personal cancer history are not also more likely to be scanners.

As expected, women were more likely to seek information about cancer than men. While there was no difference by marital status for seeking, married people were more likely to scan. Perhaps married respondents are more attentive to a greater range of health information; this may be especially true if that health information is more relevant to the opposite sex, since unmarried people might be likely to ignore those stories.

The results also clearly show some associations between SSB and some health-relevant outcomes. Both information scanning and seeking were positively associated with cancer knowledge. Here there was also an interaction, in which the effects of scanning or of seeking were a little reduced in the presence of the other. Most strikingly, the level of cancer knowledge was about the same among seekers and scanners who did not engage in the other behavior.

Lifestyle behaviors also are associated with SSB. Both those who scanned and sought were more likely to engage in behaviors such as eating fruits and vegetables,

and exercising weekly, even after controlling for demographic variables. Furthermore, both scanning and seeking were associated with cancer screening behavior. For breast, prostate, and colon cancers, those who did more scanning were also more likely to have been screened. And for the PSA test and colonoscopy, those who did some seeking were also more likely to have been screened. It is unclear why seeking was not related to getting a mammogram, though it may be that this test has such a high prevalence (about 70% of respondents received it in the previous 2 years) that there is little current information seeking related to this behavior. Another possible explanation is that breast cancer receives so much attention in the media that active information seeking does not provide much additional information beyond that which can be obtained through the normal flow of information.

Another interesting finding was the interaction between scanning and seeking in relation to the PSA test. For men who reported little information seeking, their amount of scanning was a very important correlate. Contrarily, among men who were high seekers, scanning had no additional association with the test. Although the lack of information in the survey about seeking or scanning particular to prostate cancer renders difficult specific interpretation of these results, it may be that for some types of information, seeking and scanning are substitutes for each other. If a little searching brings up all of the material information with regard to a decision, and there is so much detailed information easily accessible through routine exposure to mass media, then one might expect just this pattern of results. Those who do some seeking may not gain more from scanning the ordinary media environment.

## Limitations

The observed (and intriguing) associations of SSB with the outcomes do not justify causal claims. There may be other unmeasured confounders that account for the association. There is a possibility that the association reflects some reverse causal influence—that individuals who know more about cancer, who engage in healthier behaviors, and who have done screening tests, are more likely to engage in and report both scanning and seeking.

Additional limitations of this study are worth noting. For one, the measures included in the HINTS data were not originally intended for the examination of scanning and seeking behavior. As a result, the scanning measure, which, in its wording, confounds attention to each medium with exposure to that medium, may not represent the actual scanning construct well. Future studies will need to find valid ways of measuring this construct to determine whether these relationships persist. Second, we are only able to investigate one framework for understanding SSB—that is, as a persistent style—when, in fact, we think it actually may be quite specific to the particular decision. Measures of seeking and scanning about a particular cancer might have shown stronger effects.

Finally, the outcomes measured here were limited to knowledge and just a few types of health-related behaviors. In the long run, what really matters is whether scanning and seeking behavior affects health behavior—specifically lifestyle choices that may help to prevent cancer. The measure of lifestyle variables was very limited in this dataset, including only questions about how many fruits and vegetables a person ate and whether a person had done any exercise in the past month or had done enough exercise to sweat in the past week. Future studies might assess frequency of

exercise more specifically, and measure other lifestyle choices, such as alcohol use or consumption of red meat, trans fats, or high-fat foods.

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## Appendix A. Cancer Knowledge Index

Knowledge scale questions	Answer coding
Can exercise help to lower the chances of getting some types of cancer or does exercise not make much of a difference?	Doesn't make a difference=0 Lowers chance of cancer=1
Tell me how much you agree or disagree with the following statements or if you have no opinion: There's not much people can do to lower their chances of getting cancer.	Strongly agree, somewhat agree, no opinion=0 Somewhat disagree, strongly disagree=1
Would you say the average smoker has about the same lung cancer risk as a nonsmoker, twice the nonsmoker's risk, 5 times the nonsmoker's risk, or about 10 or more times the nonsmoker's risk?	About the same, a little higher, twice as high=0 Five times as high, 10 times as high=1
How many servings of fruits and vegetables do you think a person should eat each day for good health?	0-4=0 5-16=1
Can you think of any tests that detect colon cancer? Anything else?	Barium enema, biopsy, stool blood test/fecal occult blood test, colonoscopy, digital rectal exam, proctoscopy, sigmoidoscopy, lower GI, MRI/Scans/Cat, blood tests, or other (specified)=1 Nothing=0
Have you ever heard of a sigmoidoscopy or a colonoscopy?	No=0 Yes=1



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