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Who goes to a library for cancer information in the e-health era? A secondary data analysis of the Health Information National Trends Survey (HINTS)

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ARTICLE INFO

Available online 5 May 2009

ABSTRACT

This study identifies characteristics of Americans who chose the library as their primary cancer information source over the Internet by examining demographic characteristics, online use experience, concerns of information quality, and perceptions of cancer information seeking. A secondary data analysis is conducted using the Health Information National Trends Survey (HINTS) of the National Cancer Institute (NCI). Findings reveal that people who are more likely to choose the library are, compared to their Internet counterparts, people who lack online experience, are distrustful of online cancer information, and are more aware of cancer sources. However, they are not necessarily more adept cancer information seekers and do not have a greater expectation of getting quality information from the library. These findings suggest how the library plays its role as an information source for cancer information consumers in the e-health environment. Implications of the findings are discussed in a way that libraries could invest their efforts to reduce the digital health divide and to advance consumer health information literacy.

Published by Elsevier Inc.

1. Background

There are more than 200 different types of cancer, a complicated disease that can be contracted at any age. Consequently, it is one of the most commonly searched topics among health information consumers (Stewart & Kleihues, 2003). Because of vast investments in clinical research, there has been an exponential increase in cancer information, as more than 400,000 new articles are added to the biomedical literature each year (Davis, Ciurea, Flanagan, & Perrier, 2004). Consumers can readily access cancer information in this e-health environment where the Internet has become the most popular health information source (Baker, Wagner, Singer, & Bundorf, 2003; Case, Johnson, Andrews, Allard, & Kelly, 2004; Cline & Haynes, 2001; Eng, 2001; Fox, 2006).

Easy access to cancer information, however, does not necessarily mean that consumers can obtain trustworthy information easily. As it has been increasingly challenging to locate reliable information from varied online and offline sources, the risk for laypeople of receiving inaccurate or misleading information has also become greater. It is not a simple task to comprehend and assess cancer information; therefore, it can easily overwhelm consumers who want to make informed decisions about their health (Chobot, 2004). Furthermore, some segments of society – often members of sociodemographically underprivileged populations – still lack access to online health information (Kreps, 2006). Public health experts claim that this

digital divide in e-health information access would further exacerbate the digital health disparity if proper measures are not taken (Chang et al., 2004; Chobot, 2004; Wood et al., 2000).

Recognizing these challenges, public health experts have claimed that the library¹ is a potentially effective institution that can make proper interventions in delivering health information services to the public (Linnan et al., 2004; Parker & Kreps, 2005). This view of the library is in keeping with its core role as a community information center that anyone can use for free.

Libraries have been viewed as community outreach centers that can meet the health information needs of underserved populations (Kreps, 2006). At the same time, the American public has regarded libraries a valuable consumer health information source (Baker & Manbeck, 2002; Deering & Harris, 1996; Molz & Dain, 1999). Hence, with the mounting concern about healthcare disparities in the United States, many experts suggest that libraries could reduce the gap by reaching out to vulnerable populations (Borman & McKenzie, 2005; Chobot, 2004; Dervin, 2005; Linnan et al., 2004; Nielsen-Bohlman, Panzer, & Kindig, 2004; Parker & Kreps, 2005; Smedley, Stith, & Nelson, 2002).

Another role of the library is as a credible, quality information source. Having access to accurate and trustworthy information is

¹ The term *library* or *libraries* in the present study is not restricted to any particular type but is rather a generic concept of libraries. The presupposition of this study is that the general public possesses a certain consistent image of the library as a whole regardless of library types. This notion is namely “library brand” and reflects information consumers’ perception of “the library’s purpose/mission and their trust of libraries and their resources” (Online Computer Library Center, 2005, pp. vii–viii).

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especially important in the environment where both online and offline health information could overwhelm serious consumers who seek dependable cancer information. Selecting relevant and trustworthy information has become a great challenge for them to make informed decisions. In this regard, libraries are expected to serve as filters that select, organize, and disseminate quality health information (Chobot, 2004).

Yet another attribute pertains to librarians' role as educators or information brokers. Cancer information is produced, often fragmented, by a variety of sources, and the obtained information can often be difficult to interpret. As intermediaries between information and its consumers, librarians can lower the barriers to cancer information by providing effectively organized information packages and by delivering health information literacy programs to the public (Borman & McKenzie, 2005; Chobot, 2004; Deering & Harris, 1996; Dervin, 2005; Plutchak, 2005; Mays, 2005). In sum, the aforementioned three roles of the library have positioned it to be more active as an easily accessible and effective consumer health information source for cancer information consumers.

2. Problem statement

To date there has been a dearth of research that informs how actual consumers of cancer use the library as an information source. Little is known about whether the aforementioned three roles of libraries are actually reflected in people's selection of the source. Who among the cancer information seekers choose the library as their primary source and why, and how are they different from people who choose the most popular source, namely the Internet? This study is the first empirical research to examine the characteristics of individuals who choose the library as their primary cancer information source and identifies predictors of the people whose primary cancer information source is the library.

The outcome of the study will help identify a profile of the general American public who depends on libraries primarily when looking for cancer information. Gaining an understanding of this specific population is critical in assisting their cancer information seeking and in helping libraries find their niche in a complex health information delivery system where various information sources coexist.

3. Literature review

3.1. Factors associated with health information source selection

Studies have reported that health information consumers tend to use a variety of different sources, including medical and nonmedical, interpersonal and mass media, traditional print and online sources, and that they typically consult three to four different sources when looking for a certain topic. The source selection is known to be associated with the individual's demographic background, such as age, gender, and education (Ankem, 2006; Cotton & Gupta, 2004; Mathes, Dooley, & While, 2005; Muha, Smith, Baum, Ter Maat, & Ward, 1998). Others claim that the extents to which the source is accessible and close to the individual are determinants of source selection (Johnson, 1997). Accessibility and proximity are claimed to be influenced by culture as well as the context in which the individuals are situated (Chatman, 1991; Johnson, 1997).

In relation to cancer information seeking in particular, Case and his colleagues (2004) examined source preferences of information for inherited cancers in a telephone survey with 882 Kentucky residents. Among a total of 15 sources identified, a library (14.1%) was ranked as one of the three most preferred sources following the Internet (46.5%) and a physician (18.4%). In a subsequent analysis of the Kentucky study, Johnson, Case, Andrews, Allard, and Johnson (2006) reported that information contexts in which consumers are situated affect their

awareness and knowledge of sources, which in turn influence their source selections. Johnson et al. also argued that source selection takes place within a network of sources and that a different individual selects a different combination of sources by taking his or her own distinctive path.

Based on their findings about source selection patterns, Johnson et al. (2006) profiled different types of cancer information seekers. Individuals who have a high dependence on the library were in the *authoritative* category, which comprised the highest fraction of the total respondents (32.9%). People in this category also sought the Internet, sometimes in combination with physicians. These individuals were characterized as more educated, more affluent, younger, and more likely to live in larger communities compared with members of the other types. While the study informed certain characteristics of people who primarily chose the library, those characteristics were not unique to them alone but were shared with others whose primary choice was either the Internet or physicians.

3.2. Libraries in the context of health information seeking

Traditionally, the American public has regarded libraries as valuable consumer health information sources (Baker & Manbeck, 2002; Molz & Dain, 1999; see special issues of the *Journal of the Medical Library Association*, Plutchak, 2005, and *Library Trends*, Mays, 2005). A serious illness or other health condition were among the top personal problems that Americans face in their everyday lives and that brought them to the library (Estabrook, Witt, & Rainie, 2007). Deering and Harris (1996) claimed that over 60% of the participants in their focus group interviews reported the library as their preferred source of health information. In a national random sample survey of library use commissioned by the American Library Association (2006), 12% of the total respondents reported that health-related topics were the first or second most popular reason for using their public library ($N = 1003$). Such a notable usage of libraries was partly explained by their strength as community information centers. Libraries are easily accessible to most citizens, provide free access to various types of information, and provide quality information service from trained reference librarians.

Entering the 21st century, the library's participation in the overall consumer healthcare information service industry has received more attention as evidenced by its many government-funded programs, including the Healthy People 2010 Library Initiative of the National Institutes of Health (Chobot, 2004). These programs emphasized three critical roles of the library in the e-health era: (a) a community health information center for underserved populations; (b) a quality information source; and (c) an intermediary that can help lower the barriers to health information seeking and promote health information literacy.

The first role, a service for the underserved, is a direct response to the concern about continuing healthcare disparities in the United States. Experts in both public health and librarianship suggest that libraries, as community information centers that anyone can use for free, could reduce the gap by reaching out to vulnerable populations who might not have adequate access to health information otherwise (Borman & McKenzie, 2005; Chobot, 2004; Dervin, 2005; Smedley et al., 2002).

The second critical role, as a quality information source, has to do with the myriad health information available to consumers. When confronted with too many choices, it can be challenging for consumers to select relevant and trustworthy information and to make informed decisions. This concern is particularly important when dealing with an overwhelming amount of information on critical health topics, such as cancer, on the Internet. Thus, libraries are expected to serve as filters that select, organize, and disseminate quality health information (Chobot, 2004).

Finally, the third role, as an intermediary between information and its consumers, relates to lowering barriers to health information

seeking. Health information is produced, often fragmented, by a variety of sources, and interpreting obtained information can be difficult. Such challenges could result in negative consequences, such as uncertainty, information overload, and frustrations, even for individuals who are highly literate (Nielsen-Bohlman et al., 2004; Parker & Kreps, 2005). Thus, libraries could lower the barriers and enhance accessibility to health information by providing more effectively organized information packages and by delivering consumer health information literacy programs (Borman & McKenzie, 2005; Chobot, 2004). In a nutshell, the three enduring and unique roles of the library make it a promising partner in the consumer health information system. The library should be a logical information source, especially for those cancer information seekers who are underserved, seek trustworthy information, or perceive great barriers when seeking information.

4. Research questions and hypotheses

Using the aforementioned three roles as a conceptual framework, the present study examines the characteristics of individuals whose primary cancer information source is the library as well as factors predicting the type of library seeker. The study investigates their characteristics in comparison with people whose primary source is the Internet, the most popular consumer health information source. The following research questions and hypotheses are examined for the purpose of this study:

RQ1 Are Americans who choose the library as their primary cancer information source different from those who choose the Internet?

- **H1:** People who are socioeconomically and demographically underserved tend to select the library over the Internet.
- **H2:** People who have less online experience tend to select the library over the Internet.
- **H3:** People who are concerned more about information quality tend to select the library over the Internet.
- **H4:** People who perceive greater degrees of challenges in seeking cancer information tend to select the library over the Internet.

RQ2 What are good predictors of the people who select the library as their primary cancer information source over the Internet?

- **H5:** Socioeconomic and demographic characteristics predict the people who select the library as the primary cancer information source over the Internet.
- **H6:** Online use experience predicts the people who select the library as the primary cancer information source over the Internet.
- **H7:** Perceptions of information quality predict the people who select the library as the primary cancer information source over the Internet.
- **H8:** Perceptions of cancer information seeking predict the people who select the library as the primary cancer information source over the Internet.

All hypotheses are tested for a statistical significance at a level of $p < 0.05$.

5. Procedures

5.1. HINTS instrument and sampling

The Health Information National Trends Survey (HINTS) of the National Cancer Institute (NCI) (2003a) is the first cross-sectional national survey that assessed general Americans' comprehensive health information behavior. Based on a national probability sampling of the adult population, this biannual survey provides in-depth data

on how cancer information consumers utilize both traditional and new media to meet their cancer information needs (National Cancer Institute, 2003a). Data from the 2002–2003 administration of HINTS were used for this study (National Cancer Institute, 2003b). The survey instrument consists of 148 questions that were either created or selected from existing surveys, followed by extensive expert reviews and pretests of the instrument.

The study sample pool was constructed through a random-digit dial telephone survey using a computer-assisted telephone interview (CATI) format. A probability sample of residential telephone numbers was selected throughout the 50 states in the United States. After screening calls of these selected households, one adult was recruited per household by identifying a person who was aged 18 years or older and had the most recent birthday. HINTS over-sampled Hispanics and African Americans in an effort to achieve high precision for those two important minority groups. A trained interviewer administered an approximately 30-minute in-depth telephone survey to the recruited individuals using the CATI system that runs automated processes of call scheduling, interviewing, and data collection for quality control purposes.

As a result, the response rates were 55% for the initial household screener and 62.8% for the main telephone survey ($N = 6369$). The collected data were later adjusted to account for the multistage sampling design and nonresponse bias. To produce nationally representative estimates for the adult population in the United States, sampling weights and replicate sample weights were assigned to each adult who had completed the survey. All standard errors for these estimates were produced by employing the jackknife variance estimation technique.²

The profile of the total HINTS study population distribution calculated through the above estimation technique is as follows. First, age distribution was 18–34 years old (31.2%), 35–49 years old (31.0%), 50–64 years old (21.5%), and ≥ 65 years old (16.3%). Gender distribution consisted of female (51.9%) and male (48.1%). The education distribution was: up to high school graduates (48.9%), some college graduates (26.8%), and college graduates (24.3%). Annual household income was $< \$25,000$ (29.1%), $\$25,000$ – $\$49,999$ (30.7%), $\$50,000$ – $\$75,000$ (17.4%), and $\geq \$75,000$ or above (22.7%). People who used the Internet from home were 53.6% of the total respondents. The sampling and telephone interview processes are further detailed in the HINTS final report (National Cancer Institute, 2003b).

5.2. HINTS measures

5.2.1. Source selection for cancer information

HINTS developers devised two questions to examine source selection behavior: (a) "The most recent time you looked for information on cancer, where did you look first?" and (b) "Imagine that you had a strong need to get information about cancer. Where would you go first?" The former asks about the actual source used in the past, whereas the latter relates to a future intention to choose a particular source. Because there is a considerable gap between actual behavior and intention to perform the behavior (Fishbein & Ajzen, 1975), the former item was selected to identify the characteristics of people who actually used a library as their primary cancer information source.

² The jackknife variance estimation technique is the standard operating procedure for variance estimation for the HINTS survey in order to generate statistically sound, nationally representative estimators from the collected data. It takes selected subsets of the data for each "replicate" and determines a sampling weight for each respondent in the replicate subset as if the replicate subsets were the sample. The resulting weights are called replicate weights. This procedure is necessary to adjust the risk of committing Type I errors because of underestimation of standard errors caused by the multistage sampling design. Consequently, this procedure helps to produce statistically valid standard errors for sampling estimators (Davis & Moser, 2005).

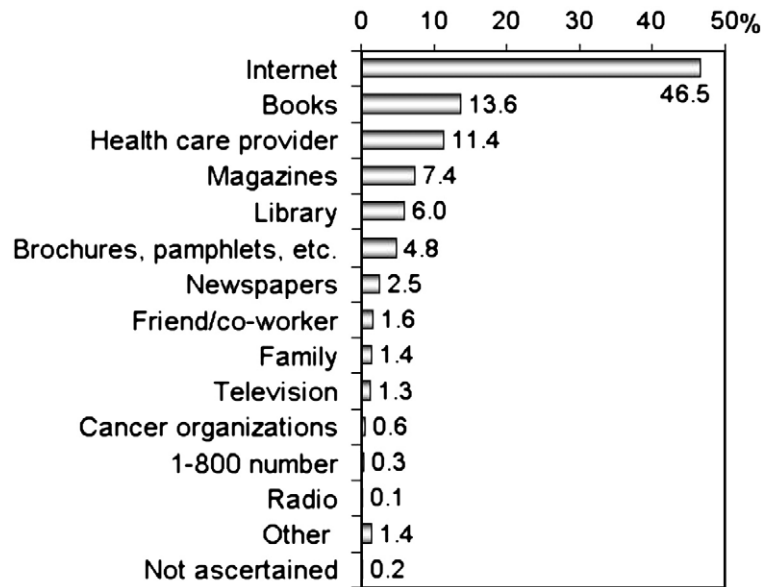


Fig. 1. "The most recent time you looked for information on cancer, where did you look first?" ($n = 3011$).

To those respondents who had looked for cancer information ($n = 3011$), the question item asked them to choose their primary source from 13 different cancer information sources. Fig. 1 presents the rank of responses, with the Internet selected by most people (46.5%), followed by books (13.6%), healthcare providers (11.4%), magazines (7.4%), and libraries³ (6.0%). The current study focused on two specific sources among 13. That is, the respondents whose primary choice of source was the library (hereinafter the Library group, $n = 181$; coded as 1) were selected for the main interest of this study; and the respondents whose primary answer choice was the Internet (hereinafter the Internet group, $n = 1399$; coded as 0) were selected as a reference group to compare with the Library group.

The decision to choose the Internet group as the only reference group was based on several considerations. First of all, this study was initially motivated to characterize the cross-section of the American public whose primary cancer information source is the library in this e-health era where the Internet is the most trendy and widely used health information source. The characteristics of the Library group are anticipated to be revealed most effectively by comparing it with the Internet group.

This study did not attempt to make comparisons beyond the Internet group. While it is worthwhile, making comparisons with three or more groups can diffuse the patterns in the research findings rather than revealing distinctive characteristics of the Library group. Furthermore, the number of people who chose certain sources (e.g., friends, family, or cancer organizations) was too small to undertake proper statistical tests.

A noteworthy attribute of the selected HINTS measure is that it examines the first choice only. Health information consumers tend to consult multiple sources in combination. The first choice would not necessarily be the only source people used or the most important

source. In addition, the measure does not take into account the fact that the library is a comprehensive information center that provides various information sources, including the Internet. Asking respondents to select one source may lead to a certain level of imprecision in measurement because a person who used the Internet in the library could answer either "library" or "Internet." Similarly, a person who used the Internet at home to access library resources could also answer in either way. The measure may leave some ambiguity in the findings although it is a validated measure in a standardized survey instrument and is often used in the source selection literature.⁴

Nonetheless, it is important to understand the reasons certain groups of people chose a particular source first over other sources. Some people access a certain source first because of its accessibility, while others choose one because of its ease of use, or quality. While certain groups of people choose libraries due to one of the above reasons, others choose libraries due to a lack of other options. Because of these reasons, research about the first source is important in identifying the unique profile of citizens whose primary cancer information source is the library regardless of the kinds of resources they use in the library. The unique attributes of the HINTS source selection measure discussed above should be taken into consideration when interpreting the findings of this study.

5.2.2. Demographic, socioeconomic background (H1, H2, H5, and H6)

Demographic, socioeconomic background was examined by selecting two sets of measures:

Demographic characteristics. Demographic characteristics were measured as follows: age (18–34, 35–49, 50–64, ≥ 65); gender (female, male); education (up to high school graduate, some college, college graduate); annual household income (<\$25,000, \$25,000–\$49,999, \$50,000–\$74,999, $\geq 75,000$); race (African American or non-Hispanic black, Hispanic, non-Hispanic white, non-Hispanic other or multiple); health insurance coverage (yes, no); employment status (employed, homemaker or student, retired, unemployed); community setting (metropolitan area,

³ The HINTS item measuring the source selection behavior did not specify the type of library the respondents had in mind when answering the question. The types and extent of consumer health information services are expected to be different across different types of libraries (e.g., public library vs. hospital library vs. academic library). The survey responses would vary according to the respondents' own experience of using a particular library type. The findings of this study would provide general suggestions for the overall library community rather than offering suggestions for a specific type of library. Researchers or the developers of the HINTS could consider an inclusion of a question asking the library type in the instrument in future research.

⁴ Future research could resolve the ambiguity by exploring a more precise meaning of "selecting the library." Researchers could either devise a measure that uses a more precise question statement or add a question item asking about the specific resources used in the library (e.g., traditional library resource, networked resources, reference librarians, the Internet, etc.).

nonmetropolitan area); personal cancer history (have ever been diagnosed with cancer, no); and family cancer history (have a close family member diagnosed with cancer, no).

Online use experience. Online use experience was measured by asking four questions: (a) Do you ever go online to use the Internet from home?; (b) In the past 12 months, did you use the Internet, whether from home or somewhere else, to look for health or medical information for yourself?; (c) In the past 12 months, did you use the Internet, whether from home or somewhere else, to look for health or medical information for someone else?; and (d) Have you ever visited an Internet web site to learn specifically about cancer? Each of these four items was answered in a dichotomous measure (yes = 1, no = 0).

5.2.3. Perceptions of information quality (H3 and H7)

Perceptions of information quality were examined in two different aspects:

Trust in online cancer information. Respondents were asked to assess the extent to which they would trust information about cancer from the Internet on a 4-point scale of not at all (= 1) to a lot (= 4).

Concerns about cancer information quality. Based on their overall experience with searching for information on cancer, respondents were asked to answer how much they agreed with the statement, "You were concerned about the quality of the information [about cancer]," on a 4-point scale of strongly disagree (= 1) to strongly agree (= 4).

5.2.4. Perceptions of cancer information seeking (H4 and H8)

The consumer perception of cancer information seeking was examined in six different aspects as listed below:

Perceived efforts in searching cancer information. To measure perceived efforts in searching cancer information, respondents were asked to answer how much they agreed with the statement, "It took a lot of effort to get the information you needed," on a 4-point scale of strongly agree (= 1) to strongly disagree (= 4).

Perceived difficulty in finding cancer information. Respondents were asked to answer how much they agreed with the statement, "You wanted more information, but did not know where to find it," on a 4-point scale of strongly agree (= 1) to strongly disagree (= 4).

Perceived difficulty in comprehending cancer information. Respondents were asked to answer how much they agreed with the statement, "The information found was too hard to understand," on a 4-point scale of strongly agree (= 1) to strongly disagree (= 4).

Frustrations during cancer information search process. Respondents were asked to rate their agreement with the statement, "You felt frustrated during your search for the information," on a 4-point scale of strongly agree (= 1) to strongly disagree (= 4).

Self-confidence in seeking cancer information. Respondents were asked to answer how confident they were that they could get advice or information about cancer if they needed it on a 4-point scale of not at all (= 1) to very confident (= 4).

Cancer resource awareness. Five items assessed awareness of the following five national cancer resources: (a) National Institutes of Health (NIH); (b) American Cancer Society (ACS); (c) Cancer Information Service (CIS); (d) NCI; and (e) 1-800-4-CANCER hotline (yes = 1, no = 0). By combining the values from the five items, the scores ranged from no awareness (= 0) to awareness of all five sources (= 5).

5.3. Statistical analyses

A series of statistical analyses were conducted to examine differences between the Library group and the Internet group and to identify the factors that can predict the people who would belong to the Library group. For inferential statistical testing using the HINTS data, it is important to calculate population estimates properly to take into account the multistage sample design of the HINTS study. Otherwise, the standard errors are likely to be underestimated, which increases the risk of committing a Type I error. This problem was adjusted by using the jackknife replicate sample weights included in the HINTS data set, as noted in Section 5.1 (Davis & Moser, 2005). The statistical analyses conducted for this study were bivariate chi-square tests, *t*-test, and multivariate logistic regression using the statistical program STATA version 9.0 (StataCorp LP, 2005).

6. Findings

6.1. Bivariate analyses

RQ1 and the first four hypotheses (H1–H4) examine the profile of the Library group by comparing with the Internet group (RQ1: Are the Americans who choose the library as their primary cancer information source different from those who choose the Internet?). Table 1 presents the results of hypothesis tests by reporting bivariate analysis findings ($p < 0.05$).

First, H1 tests for the difference in various socioeconomic and demographic characteristics between the two groups. A series of chi-square tests revealed that the two groups are statistically significantly different in their age ($\chi^2 = 22.7$), education ($\chi^2 = 9.9$), annual household income ($\chi^2 = 43.8$), employment ($\chi^2 = 12.0$), health insurance coverage ($\chi^2 = 27.9$), and personal cancer history ($\chi^2 = 5.2$). Compared to their Internet counterparts, the people in the Library group tend to be older, have fewer years of education, be less affluent, be retired or unemployed, have less health insurance coverage, and have been diagnosed with cancer. No statistically significant difference was found in their gender, race, community type, and family cancer history. Thus, H1 was partially supported.

H2 tests for the difference in various online use experiences between the two groups. It was found that online use experiences among the Library group were statistically significantly less than the Internet group across all areas: Internet use at home ($\chi^2 = 24.8$); Internet use for health or medical information for self ($\chi^2 = 30.5$) and for others ($\chi^2 = 35.6$); and Internet use for cancer information ($\chi^2 = 89.7$). Thus, H2 was supported.

H3 tests for the difference in perceptions of information quality between the two groups. The chi-square tests revealed mixed results: the Library group showed statistically significantly lower levels of trust in online information ($\chi^2 = 167.1$); but the two groups were not statistically significantly different in their concerns about cancer information quality. Thus, H3 was partially supported.

Finally, H4 tests for the differences in perceptions of cancer information seeking. The two groups showed statistically significant differences in three areas: perceived efforts in getting information they desired ($\chi^2 = 26.1$); perceived difficulty in understanding information ($\chi^2 = 13.1$); and the level of cancer resource awareness ($t = 3.2$). However, the two groups were not statistically significantly different in the other three perceptions: difficulty in finding cancer information; frustrations during cancer information search process; and self-confidence in seeking cancer information. Hence, H4 was partially supported.

6.2. Multivariate analysis

The variables that showed significant bivariate differences were further examined by entering them into a logistic regression model

Table 1

Comparative characteristics of the Library group and the Internet group for demographic characteristics, online use experience, concerns about information quality, and perceptions of cancer information seeking.

Research variables	Library Percent (%) (n = 181)	Internet Percent (%) (n = 1399)	χ^2
Demographics			
Gender			
Female	63.1	57.8	1.9
Male	36.9	42.2	
Age			
18–34	38.6	39.6	22.7**
35–49	31.9	35.2	
50–64	17.8	21.4	
≥65	11.7	3.8	
Education			
Up to high school	40.1	28.8	9.9*
Some college	29.5	32.5	
College graduate	30.4	38.7	
Annual household income			
<\$25,000	32.3	14.7	43.8***
\$25,000–\$49,999	28.3	25.9	
\$50,000–\$74,999	21.7	22.4	
≥\$75,000	17.7	37.0	
Race			
African American	11.6	8.6	2.4
Hispanic	6.3	5.1	
White	75.8	79.6	
Other	6.3	6.7	
Employment			
Employed	59.9	66.6	12.0*
Home maker/Student	17.2	20.0	
Retired	12.0	6.2	
Unemployed	10.9	7.2	
Health insurance covered			
Yes	77.7	90.8	27.9**
No	22.3	9.2	
Community type			
Metro area	81.6	84.1	0.8
Nonmetro area	18.4	15.9	
Cancer history – self			
Yes	17.7	11.8	5.2*
No	82.3	88.2	
Cancer history – family			
Yes	72.3	72.7	0.1
No	27.7	27.3	
Online use experience			
I use the Internet from home. (yes)	78.9	92.4	24.8***
I used the Internet to seek health information for myself. (yes)	55.5	78.0	30.5***
I used the Internet to seek health information for someone else. (yes)	45.1	71.6	35.6***
I have visited an Internet site to learn specifically about cancer. (yes)	33.6	76.8	89.7***
Perceptions of information quality			
Do you trust cancer information from the Internet?			
Not at all	19.1	1.9	167.1***
A little	18.4	6.3	
Some	35.2	55.4	
A lot	27.3	36.4	
I was concerned about the quality of the information.			
Strongly agree	21.0	26.0	3.3
Somewhat agree	37.4	36.7	
Somewhat disagree	23.3	21.7	
Strongly disagree	18.3	19.6	
Perceptions of cancer information seeking			
It took me a lot of effort to get the information I needed.			
Strongly agree	25.4	11.8	26.1**
Somewhat agree	27.7	32.4	
Somewhat disagree	27.3	33.1	
Strongly disagree	19.6	22.7	
I wanted more information but did not know where to find it.			
Strongly agree	14.0	10.1	5.2
Somewhat agree	34.2	36.3	
Somewhat disagree	27.0	32.4	
Strongly disagree	24.8	21.2	

Table 1 (continued)

Research variables	Library Percent (%) (n = 181)	Internet Percent (%) (n = 1399)	χ^2
The information found was too hard to understand.			
Strongly agree	12.6	6.9	13.1*
Somewhat agree	29.5	25.0	
Somewhat disagree	27.1	37.2	
Strongly disagree	30.7	30.8	
I felt frustrated during the information search.			
Strongly agree	15.5	13.6	0.7
Somewhat agree	27.4	27.0	
Somewhat disagree	23.3	25.4	
Strongly disagree	33.8	34.0	
How confident are you that you'd find cancer information?			
Not at all	1.6	1.5	1.3
Slightly	6.2	4.9	
Somewhat	23.6	26.9	
Very	70.0	67.9	
Cancer resource awareness			
Mean (standard deviation)	3.1 (0.10)	2.8 (0.03)	$t = 3.2**$

* $p < 0.05$.
 ** $p < 0.01$.
 *** $p < 0.001$.

and applying the jackknife variance estimation technique. This multivariate test investigates RQ2 and the remaining four hypotheses (H5–H8). The test reveals the predictors of people whose primary cancer information source is the library rather than the Internet. Table 2 presents the test results ($p < 0.05$).

The respondents who were more likely to choose the library as their primary cancer information source instead of the Internet were the people who had personal cancer history (odds ratio, OR = 2.57), people who perceived less difficulty in understanding the cancer information they found (OR = 26.86), and people who knew more cancer resources (OR = 1.62).

In contrast, the respondents who were less likely to choose the library were the unemployed (OR = 0.30), people with home Internet access (OR = 0.15), people who had used the Internet for health information for themselves (OR = 0.40), people who had previously visited an Internet site for cancer information (OR = 0.17), people who had some or a lot of trust in online cancer information (OR = 0.07 and OR = 0.08, respectively), and people who did not perceive that obtaining cancer information takes a lot of effort (OR = 0.29; OR = 0.13). Table 3 summarizes the multivariate analysis findings by reporting the result of hypothesis tests (H5–H8) and the predictors of the Library group.

7. Discussion

7.1. Service for the underserved

The initial bivariate data analysis showed differences between the Library group and the Internet group in some socioeconomic and demographic characteristics. Compared to their counterparts, people who belong to the Library group were older, had fewer years of education, were less affluent, were retired or unemployed, held less health insurance coverage, and had a personal cancer history. In the subsequent multivariate analysis that applied a rigorous variance estimation procedure, most of those demographic variables did not remain as the determining factors that can predict the people whose primary cancer information source is the library. Library seeking was most consistently and strongly predicted by online use experience as well as personal cancer history. That is, libraries were most likely to be sought by people who did not access the Internet at home, who had no experience of using the Internet for health or cancer information, and who had cancer history.

The finding that people without Internet access at home chose libraries suggests that certain segments of people in America must go

Table 2
Logistic regression predicting the selection of libraries as the primary cancer information source.

Research variables	Odds ratio (OR)	95% Confidence interval (CI)
Demographics		
Age	0.98	0.95–1.01
Education		
Up to high school	1.00	–
Some college	1.78	0.77–4.12
College graduate	1.73	0.77–3.86
Annual household income		
<\$25,000	1.00	–
\$25,000–\$49,999	0.88	0.35–2.18
\$50,000–\$74,999	1.73	0.67–4.47
≥\$75,000	0.75	0.26–2.22
Employment		
Employed	1.00	–
Home maker/student	1.14	0.43–3.04
Retired	0.43	0.11–1.66
Unemployed	0.30*	0.10–0.91
Health insurance covered	0.51	0.22–1.18
Cancer history – self	2.57*	1.01–6.57
Cancer history – family	0.77	0.40–1.46
Online use experience		
I use the Internet from home. (yes)	0.15*	0.07–0.33
I used the Internet to seek health information for myself. (yes)	0.40*	0.20–0.80
I used the Internet to seek health information for someone else. (yes)	0.70	0.37–1.33
I have visited an Internet site to learn specifically about cancer. (yes)	0.17*	0.10–0.33
Perception of information quality		
Trust in online cancer information		
Not at all	1.00	–
A little	0.51	0.122–1.7
Some	0.07*	0.02–0.25
A lot	0.08*	0.02–0.30
Perception of cancer information seeking		
It took me a lot of effort to get the information I needed.		
Strongly agree	1.00	–
Somewhat agree	0.47	0.20–1.08
Somewhat disagree	0.29*	0.12–0.72
Strongly disagree	0.13*	0.05–0.36
The information found was too hard to understand.		
Strongly agree	1.00	–
Somewhat agree	26.86*	4.33–166.76
Somewhat disagree	12.90*	2.03–81.91
Strongly disagree	38.92*	5.89–257.02
Cancer resource awareness	1.62*	1.07–2.44

* $p < 0.05$.

to the library while the majority of their fellow citizens go online from home. This suggests that libraries are assisting the underserved as the most accessible cancer information source in the e-health era. This finding not only suggests that libraries indeed play their anticipated role (i.e., serving the underprivileged who are at the lower end of the digital divide) but also reveals a clear digital divide among cancer information consumers.

Table 3
Predictors of the Library group (H5–H8).

Variable groups	Hypothesis test results	Predictors of the Library group
Demographics (H5)	Partially supported	Cancer history – self Employment
Online use experience (H6)	Partially supported	Internet access from home Internet use for health information for self Internet use for cancer information
Perceptions of information quality (H7)	Partially supported	Trust in online cancer information
Perceptions of cancer information seeking (H8)	Partially supported	Difficulty in comprehending cancer information Efforts in obtaining cancer information Awareness of cancer resources

Considering the fact that the Internet is an important communication channel, this finding is reminiscent of the contention that the digital health divide is a consequence of the limited accessibility to the Internet (Kreps, 2006, p.766). With the increase of online health information, people with limited Internet connectivity will experience a greater health information disparity. This situation, in turn, will exacerbate healthcare disparities, which could result in much higher rates of morbidity and mortality among that population (Kreps, 2006). The results of this study urge libraries to make continued commitments to serving the underprivileged to further bridge the digital health divide.

Regarding the finding that the most consistent predictor of library seeking was the lack of online health or cancer information use experience, it is uncertain whether this lack of experience is reflective of their voluntary and conscious choice based on disbelief in the information on the Internet, or indicates lack of access to Internet health information. The next section further explores this issue by examining people's concerns about health information quality and the barriers they perceive while seeking for cancer information.

7.2. Service with quality information

Although libraries are contended to be a source that can provide quality health information resources (Chobot, 2004), this notion was not fully supported in this study. People who chose the library as their primary cancer information source were not particularly concerned about information quality nor did they have high expectations for getting quality health information. This finding is consistent with an earlier report that 69% of the American general public felt that libraries and search engines provide the same level of trustworthiness (Online Computer Library Center, 2005). The fact that libraries have little appeal as a quality information source even to the Library group urges libraries to further strengthen its image as a quality source while keeping its role as an easily accessible, free health information source.

When it comes to trust, the Library group showed a considerably lower level of trust in online cancer information sources than the Internet group, as predicted. This distrustful attitude may suggest that people in the Library group are critical consumers of online information. However, the fact that they had little experience using online health information could mean that their distrust was not based on much experience with properly appraising information quality. This is because trust with information builds with experience using sources (Kelton, Fleischmann, & Wallace, 2008).

Perhaps their distrust is partly attributed to the lack of exposure to good Internet resources. Considering that there are many valuable online cancer resources from authoritative sources, such as the National Library of Medicine, libraries could invest more effort in providing information consumers with useful online resources. For small public libraries that do not have sufficient resources, library communities at large could further their collaborative efforts in building networks of consumer health information services. For example, the National Network of Libraries of Medicine's (NN/LM's) directory of consumer health information is a national database that

lists consumer health information services provided by all types of libraries, including public, academic, and hospital libraries (*National Network of Libraries of Medicine, 2008*). Small public libraries without many cancer resources could make effective referral services utilizing this online directory. These efforts will help libraries develop a reputation as a quality information source among cancer information consumers.

7.3. Service as an intermediary lowering information barriers

Consumers seeking cancer information often get confused when dealing with an overwhelming amount of sometimes-conflicting information from various sources. This study examined how people who seek libraries would feel the challenge, and if their perceptions of the challenge would affect them to seek libraries more to get help.

According to the findings of this study, the people in the Library group tended to perceive cancer information seeking as requiring greater effort compared to their Internet counterparts. They were, however, aware of more cancer resources and felt less challenge in understanding the information they found. These findings, along with the finding that the Library group had more people with cancer history than their counterparts, may suggest that the Library group represents more serious cancer information seekers possibly because of their health condition. Or, the people in the Library group may invest more effort in looking for information than their counterparts because their search for the needed information is not just a click away.

This cross-sectional study could not determine whether the greater perceived efforts among the Library group were due to their past experience with libraries or were because people who feel greater difficulties in seeking information tend to select the library more to get help. The perception of greater efforts in seeking information in the library is perhaps related to inadequate consumer health information services in libraries. According to *Wood et al. (2000)*, most public libraries did not set health information services as their primary focus. Some librarians appeared apprehensive about providing health information to their patrons because such a service deals with sensitive issues and risks of intrusion in patron privacy, not to mention responsibility for error with grave health-related consequences for patrons. In a more recent study conducted immediately after the severe acute respiratory syndrome (SARS) outbreak in Toronto in 2003, *Harris, Wathen, and Chan (2005)* reported problems in the readiness of public libraries in providing adequate reference services to health-related inquiries in the midst of the crisis.

The inadequacy of health information services in libraries is also implied in the responses to another HINTS item: "Imagine that you had a strong need to get information about cancer. Where would you go first?" Comparing the answers between the two groups, the finding is striking. While 61.3% of the Internet group kept their loyalty by choosing the Internet again, only 27.6% of the Library group chose the library. If approximately three in four people in the Library group would not want to make the same choice again, the cancer information services the respondents experienced at the library may not have met their expectations. While there are libraries striving to provide quality consumer health information services (*Ruffin, Cogdill, Kutty, & Hudson-Ochillo, 2005; Zeisel, 2005*) and information service quality varies across different library types (i.e., public vs. academic vs. hospital library), this study generally supports an earlier report that most libraries are not fully ready to deliver consumer health information services (*Chobot, 2004*).

The findings of this study address a pressing need that librarians, as effective intermediaries, should help patrons have a more straightforward and effortless health information seeking experience in the library. By taking a more proactive intermediary role, librarians could design more easy-to-use services and educate cancer information consumers so that they can become more health literate. Such efforts

include preparation of well-packaged online resources and tutorials, database use workshops and training, materials that the general public can easily understand, more audiovisual materials that can accommodate the needs of special populations (e.g., people with low vision), and referral services that can effectively connect cancer information seekers to the pertinent resources in the maze of online and offline cancer information.

8. Conclusion

Johnson et al. (2006) noted, "the relative role of libraries is often ignored in research in health information seeking" (p. 579). The present study responded to this lament by examining the use of the library as an information source in a much broader consumer health information seeking context, by analyzing the NCI's HINTS data collected from a representative sample of the general U.S. population. This approach distinguishes the present study from previous library research that is largely restricted to the behaviors of either library patrons or people in a geographically limited location.

The results of the study show a snapshot of how libraries play their anticipated roles as consumer health information sources in the e-health environment. These results suggest that libraries carry out their first aspired role (i.e., serving the underserved population) by providing access to cancer information for people who do not use the Internet. However, the other two roles were not associated with library seeking. There was little evidence that people select the library as a quality information source or as a helpful intermediary lowering barriers to their cancer information seeking. To be perceived as a source that actually performs all three anticipated roles claimed in the literature, libraries should invest in further developing their image as a well-packaged, trustworthy consumer health information source and in advancing health information literacy. Librarians should also provide the underserved with more opportunities to encounter trustworthy e-health resources and to get benefits from those emerging resources, with a goal of eliminating the digital health information disparity. Such efforts will help libraries to better shape their niche in the overall consumer health information system.

This study is one of the first empirical efforts that explore the library's role in assisting health information consumers in the e-health environment. The findings should be further validated through future research. A new source selection measure could be employed to overcome the limitations of the measure used in this study. In order to have a complete understanding of the role of the library, it is also necessary to answer some questions raised from this study. What factors are responsible for the library's weak image as a quality information source and intermediary among cancer information consumers using the library? What organizational barriers does the library encounter in serving the role as a quality health information source or as an effective intermediary? Answering these questions will enhance our understanding of the optimal roles of the library and help the library community to serve as an effective information source for cancer information consumers in the e-health environment.

Acknowledgments

The authors would like to acknowledge the help of Dr. Lila J. Finney Ruten of the National Institutes of Health/National Cancer Institute for the advice on statistical analyses for weighted data in the Health Information National Trends Survey (HINTS) data set.

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