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Health Information-Seeking in the Digital Age

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Abstract

Objective: The authors examined the sources of health information among first-year university students and whether the predictors of information-seeking varied by information source. *Participants:* First-year students in a required course at a Midwestern public university were eligible to participate, and 82% (n = 1060) completed the study. *Methods:* Students completed a survey questionnaire regarding information-seeking behaviors and Internet uses in domains including health. The authors used regression analyses to examine predictors of source-specific health information-seeking. *Results:* Young women are much more likely than young men to seek health information. The characteristics associated with looking online for health information are different than those for using other information sources, and students who look online for health information also report greater use of other information for students, health professionals should be aware that not all students equally utilize this resource.

Keywords: information-seeking, Internet, Web

The significant growth of Internet use across the U.S. population has changed the landscape of health information available and has the potential to reduce health inequalities. Social inequalities in health are substantial and persistent, and information is a valuable resource mediating the relationship between social status and health.¹ The availability of health information online may reduce inequalities in information by providing access to information that was previously available only through medical professionals and therefore only to those with access to such professionals. Alternatively, the availability of health information on the Internet may perpetuate or increase inequalities if those with access to other sources of information are also the ones disproportionately using this new source of information. Previous research on health information-seeking online has been limited in scope, focusing primarily on differences by basic demographic characteristics, and few studies have focused on college students. We add to this literature by considering how a broad set of characteristics—including cognitive and Internet skills, and socioeconomic and psychosocial resources—are associated with health information-seeking behaviors among a diverse population of undergraduate students. We also consider whether the Internet is used more by students who do not use other sources of health information.

Research on where people look for health information and whether they look online has proliferated in recent years, but relatively few studies have focused on where college students or young adults look for health information. For many reasons, the dynamics in health seeking among younger Americans may be quite different than among older adults. Young adults have more experience with and access to digital media.² Although young adults and college students have fewer chronic health problems relative to the rest of the population, they have relatively

high rates of sexually transmitted diseases, drug use, and unplanned pregnancies,³ all of which are sensitive or stigmatized problems. Online information may be particularly important for these types of health issues. Additionally, young adults are more likely to be uninsured or underinsured,⁴ and thus may have more limited access to medical professionals. Indeed, previous research finds that the prevalence of health information-seeking online differs by age, as do the health topics that people look for online.⁵ Below, we review the literature on health informationseeking in general and then focus on the few studies that specifically consider college students.

Health-Information Seeking and the Internet

Recent research on health information-seeking among the total adult population finds that age, education, and gender are among the most important predictors of looking online for health information.^{6,7,8,9} However, few studies have examined additional predictors beyond these basic demographic characteristics. Differences by race/ethnicity, cognitive ability, Web skill, social support, or other characteristics associated with health disparities are rarely examined because of data limitations. Furthermore, little previous work has looked at whether online health information merely supplements other sources for people who already have many sources of information or if it is providing information to people who have access to few other sources.

Although this research area is still developing, a few findings from previous studies are notable. Regarding racial and ethnic differences, previous studies have found that Hispanics are less likely than non-Hispanic whites to have looked online for health information in the previous year,¹⁰ that black women are less likely than white women to use online health information sources,¹¹ and that white, non-Hispanics are more likely to look online for health information than other racial and ethnic groups.⁸ In a study of older adults, Flynn and colleagues¹² find differences in health information-seeking behaviors by cognitive skills, with those with higher

cognitive test scores more likely to search online for health information than their peers. Among Internet users, Hassani ⁸ finds that people who use computers more often and have more locations of access to the Internet are more likely to look up health information online. In summary, these studies find that differences in people's use of the Internet for health information are related to various user characteristics, including ones that previous research has found to be associated with disadvantage in health and health care access. The patterns, however, are far from clear, consistent or well-established.

Among the many recent studies on health information-seeking, we identified just three that focused on college students. Among a convenience sample of community college students (n=125), Hanauer and colleagues¹³ found no gender difference in the percentage reporting online health information-seeking, but some differences by race/ethnicity. They also found that among those who looked for health information online, diet/nutrition and fitness/exercise were the most popular topics, but approximately one-quarter looked for information on medicines and mental health. In a sample of students recruited from large lecture classes at a Midwestern public university in spring 2005 (n=374), Ogan and colleagues found that approximately three-quarters of study participants had ever looked online for health information and one-quarter looked often or very often.¹⁴ In contrast to the Hanauer findings, the Ogan study found that women were more likely than men to look online for health information. In the third study, Escoffery and colleagues found that among a non-representative sample of 743 students approximately threequarters of students had ever looked for health information online and that 40% did so at least once a month.¹⁵ They also found that women were more likely to look online for health information than men and that students who rated themselves as more experienced with the Internet were also more likely to look online for health information. Thus, all three studies find

that most students have looked for health information online and that many do so frequently, but the previous research is not in consensus about which students are more likely to look online for health information.

Finally, the question of whether the Web is a substitute or a complement to other information sources—described as the complementarity hypothesis by Dutta-Bergman¹⁶—in the realm of health information remains unanswered. Several recent studies have examined this question, but all of these studies have notable limitations. In simple bivariate analyses, two studies ^{17,18} find evidence for the complementarity hypothesis among adult samples with a wide range of ages. A small-sample study of British and American adolescents' health informationseeking finds that teens describe their use of the Web for health information in ways that suggest it is a complement to other information sources.¹⁹ A study of adults²⁰ finds that using the Internet for health information at the baseline timepoint is associated with *more* contact with health professionals at the follow-up interview, but the response rate for this study was very low (approximately 16%). Finally, in perhaps the best analysis on this topic to date, Dutta-Bergman²¹ finds that greater Internet usage is associated with greater "autonomous" health information seeking, defined as seeking information from information sources other than the respondents' doctor.

In summary, although previous research has identified some demographic predictors of online health information-seeking for the total adult population, we know little about whether there are gender differences in health information-seeking among college students or how other factors—including Web skills, cognitive skills, or psychological and social resources—are associated with health information-seeking. Examinations of racial and ethnic differences in health information-seeking are also lacking because most previous studies had samples which

included few minorities. Lastly, we do not know whether people use the Web instead of, or in addition to, other information sources.

METHODS

Data collection

We collected data from students at an urban public research university in the Midwest in early 2007. The school's student body is exceptionally ethnically and racially diverse – ranked as in the top 10 in ethnic and racial diversity by U.S. News and World Report²² – and this allows us to examine racial and ethnic differences in much greater depth than any previous studies of online health information-seeking. Working with the First-Year Writing Program at the university, we conducted the study through the single course on campus that is required of all students, allowing us to reach a representative sample of students at the school and secure a high response rate. The final response rate was 82% of all students enrolled in the First-Year Writing Program, and the demographic characteristics of our sample are very similar to those for all firstyear students who entered in 2006. This analysis is limited to the 1,060 first-years who participated in the study. The institutional review board at the authors' university approved this research.

We administered the survey in class using paper and pencil, avoiding biasing against people who feel less comfortable filling out Web forms or who spend less time online. The average survey completion time was approximately 30 minutes. The survey included detailed questions about respondents' Internet uses (e.g., experience, context of use, types of sites visited, and online activities), sources of information for a variety of topical areas, recreational activities and social support, and demographic and family background. However, the survey did not

include items about students' health status. The response rate for most items was very high, with lower response rates for ACT (a college admission test) scores. For this and other missing data, we used multiple imputation techniques (specifically, the MICE command in Stata) with five iterations, using all variables in the analysis plus an additional fifty variables related to Internet use, college courses, and other characteristics.

Measures

Social and demographic characteristics

Table 1 presents descriptive statistics for our sample. The majority of respondents are 18 or 19 years old (97%). Less than half of the group is non-Hispanic White (41.7%), and just under a fifth are of Hispanic origin (19.1%). The biggest minority group in the sample is Asian/Asian-Americans (30.0%), including diverse origins within that category. Seven percent of survey respondents immigrated to the United States at age 11 or later, and for one in four students (24.9%), English is not the only or primary language spoken at home. Just under half of the survey sample comes from families where neither parent has a college degree. Just over half (53.1%) of participants live with their parents, whereas the other half live with others or alone.

Our survey instrument included measures of skills and resources in several domains previously found to be associated with information-seeking or Internet use. These include two measures of cognitive ability: a word association measure that is used in the General Social Survey²³ and self-reported ACT scores. Our measure of social support and psychological wellbeing is based on a subset of items from the Interpersonal Support Evaluation List, a well-established scale of social support and self-esteem.²⁴ These cognitive and social support measures are standardized (mean = 0, standard deviation = 1) to make interpretation easier.

Because of our special focus on use of online health information, we include an extensive set of measures related to Internet use. On average, students in the sample had been using the Internet for six years by the time of our study and spent 16 hours surfing the Web each week, excluding time spent on email, chat and online phone conversations (VoIP). On average, students have access to the Internet at six locations and use the medium at three places regularly with the majority using it at home the most. Because the distributions of years of use, weekly hours of use, and number of access locations are right-skewed, we use the logged version of these in our analyses. The Web skill index is a summary of 27 Internet-related terms with a possible range of 27-135, a standard deviation of 22.6, an inter-item covariance of .67, and a mean of 81.3. It has been shown to be a good proxy for actual online abilities ^{25, 26}.

[INSERT TABLE 1 HERE]

Health information-seeking

To ask about health information-seeking, we used a slightly modified version of the item asked on the General Social Survey's (GSS) Information Society Module in 2000. This question asks respondents how often, in the past year, they had consulted the following sources for health information: (a) daily newspaper (paper version); (b) general-interest magazine (paper version); (c) special health or medical newsletter or magazine (paper version); (d) a doctor, nurse or other medical professional; (e) friends; (f) family; (g) radio or television programs; (h) health Web site; (i) other Web site. For each of these, the options were "not at all", "one or two times" or "three or more times." Our question differs from the one on the GSS in that the GSS item grouped friends and family together into one category and did not distinguish between health Web sites and other sites. In the main analyses, we group the various sources into four categories: (1) family and friends (social networks); (2) health care professionals; (3) online resources; and (4) traditional media (newspapers, magazines, radio and television). An additional item asks respondents about the frequency with which they use the Web for various purposes including "looking up health and fitness info." The eight response categories for this item ranged from "several times a day" to "never." In our analysis, we aggregate these responses into two categories: weekly or more frequently and less than weekly.

Analysis

To investigate our research questions of what characteristics are associated with using particular sources of health information and whether the Web provides a source of information for students who have less access to other information sources, we present descriptive statistics and results from several regression models. First, we use logistic regression models with a rich set of covariates to predict who uses each of the four common sources of health information described above. Second, we present selected results from logistic regressions which predict looking for health information online, controlling for use of the other three sources of health information information. Lastly, we examine whether students use the Internet to look for health and fitness information weekly or more often through logit models.

RESULTS

Over 95% of our respondents report looking for health information in the previous year. The most popular source of health information for students is family and friends with 89.5% of respondents reporting that they consulted family or friends for health information in the previous year (see Table 2). Web sites, medical professionals, and traditional media were also common sources of information with 78% reporting having looked online for health information and similar percentages reporting having consulted a health professional such as a nurse or physician (75.5%) or consulted other media such as newspapers, magazines, television or radio (74.6%).

The average survey respondent consulted 3.2 of these four sources of information in the previous year, with more than half consulting all four sources. There is variation in how frequently students consulted particular sources as shown in Table 2. Health Web sites and family members are the sources with the highest share of participants who report using these sources three or more times in the previous year. In a battery of items asking about the frequency of several online activities, 25% of students report using the Web weekly or more often for health or fitness information, and 57% of students report having looked up information on medications online in the previous year. Thus, while traditional sources of information such as family, friends, and health professionals remain popular sources of information, the Web has joined their ranks as a frequently used source of health information among this undergraduate student population.

[INSERT TABLE 3 HERE]

Table 3 shows the results from logistic regression models, which predict whether a student used each of four sources of health information (Web, medical professionals, family and friends, and traditional media) in the previous year. For each source, we use a rich set of covariates that reflect students' demographic characteristics (gender, age, race/ethnicity, immigration experience), primary language, place of residence (with parents or not), and cognitive, social, material, and Internet-specific resources.

We first consider who uses online sources for health information. Model 1 shows that female students are more likely to use the Web for health information than male students (odds ratio of 2.43) and that students living with their parents are less likely to do so (odds ratio of .71). Perhaps surprisingly, parental education is not correlated with using the Web for health information. However, we find that non-native English speakers and students with greater Web skills are more likely to use the Web as a source of information. We speculate that those who speak English as a second language may prefer information in their native tongue, which is more likely to be available online than through traditional media or local health professionals. Students with higher-level Internet user skills will be more capable of finding relevant information, which would make the Web a more desirable source of information for them.

Turning to models which predict seeking health information from medical professionals (Model 2), family and friends (Model 3), and traditional media (Model 4), we find that women are more likely to use all sources of information than similar men. Beyond this finding, we identify a few other significant patterns in health information sources (discussed below), but notably, use of these other sources seems to be more fragmented by demographic characteristics and resources than use of the Web for health information.

Although there is no association between parental education and Web use for health information in our data, we find that parental education is associated with use of other information sources. Students whose parents have higher education have greater odds of seeking health information from medical professionals and from family and friends than those with less educated parents. The relationship between parental education and use of medical professionals is not surprising; students with highly educated parents are more likely to have had health insurance during childhood and to have had regular checkups ²⁷, perhaps setting a pattern of consulting medical professionals. In general, more educated people also have a greater understanding of health and medicine, perhaps explaining why respondents with more educated parents consult family members for health information more often than those from families with less educated parents.

Perhaps surprisingly, we find few differences in use of information sources by race/ethnicity or immigration status. The exception is that, controlling for other factors,

Asian/Asian-American students are more likely to turn to family and friends (odds ratio of 1.93) and traditional media (odds ratio of 1.69). Although we find no differences between recent immigrants and other students, as previously noted, we find that students for whom English is not the primary language—a category comprised mostly of immigrants or children of immigrants—are more likely to use the Web for information; we also find that they are more likely to use traditional media.

Other findings include that social support is strongly and positively associated with use of medical professionals and family and friends, but not of traditional media or the Web and that students who live with their parents are less likely to use all sources of information except for family and friends. We also find that students with higher ACT scores have lower odds of consulting medical professionals and using traditional media as sources of health information than their peers with lower scores, but they are no more likely to use the Web or family and friends. Finally, our models also show that students with greater Internet access have greater odds of consulting medical professionals compared with students with less access; the reason for the association of internet access with use of medical professionals is not clear. More Internet access locations may be related to greater material resources or larger family and friend networks, but testing whether this explains the association is beyond the scope of our data. Notably, number of Internet access locations is not related to use of the Web for health information.

[INSERT TABLE 3 HERE]

In additional analyses, we predict use of the Internet for health information-seeking controlling for students' uses of other information sources. We find that, all else equal, students who use traditional media for health information have much higher odds (4.25) of using the Web

for medical content. Those who consult medical professionals or family and friends are also more likely to use the Web, but less dramatically so. We performed similar analyses for other sources of information (medical professionals, family and friends, and traditional media), and found that use of any one of these sources is positively associated with use of the other sources. Thus, there is no evidence of substitution effects with information sources, and our findings confirm the complimentarity hypothesis.

Next, we consider how frequently students use the Web for health information. Almost 80% of our survey respondents had used the Web for health information at least once in the previous year. However, we suspect that regular and frequent use of the Web for health information may be more stratified by resources and demographic characteristics. Thus, we examine which students use the Web weekly or more often for health information (see Table 4). We find that students with more access locations and greater psycho-social resources have greater odds of using the Internet weekly or more for health or fitness information.

[INSERT TABLE 4 HERE]

COMMENT

Discussion

In summary, we find that female students are more likely than male students to use all sources of health information. Family and friends are the most popular source of health information, but online sources, medical professionals, and traditional media are each used by approximately three-quarters of the young adults in our study. Beyond the differences by gender, other differences in health information-seeking were source-specific. Students with more highlyeducated parents are more likely to seek advice or information from medical professionals and their family and friends, whereas students who lived with their parents are less likely to turn to

medical professionals or the Web for health information. Asian/Asian-American students, compared to students of other ethnic and racial backgrounds, are more likely to use their network of family and friends and traditional media, controlling for other factors.

We find that among this diverse sample of students, all of whom have Internet access, the Web serves as an additional source of information and not as a substitute for other sources such as medical professionals, family and friends, or traditional media. The predictors of who uses the Internet for health information are different than those of who uses medical professionals or family and friends, with non-native English speakers and those with more Internet skills more likely to do so. That non-native English speakers are more likely to use the Web (and traditional media) for health information suggests that the Internet may be particularly important as a source of information for students who may face barriers to obtaining information from other sources. However, our findings that use of the Web for health information is higher among students with greater Internet skills suggests that the Internet will not necessarily equalize information access and may enhance or perpetuate other inequalities in information access and use.

Perhaps most interesting is that we found so few differences in use of digital media for health information by parental education and race/ethnicity. Differences in health status and health care access by social class and race/ethnicity are large, even among young adults.²⁸ Whereas use of medical professionals and family and friends is patterned by parental education and psycho-social resources, use of the Web and traditional media does not differ by these factors, suggesting that the Web may alleviate some types of information inequalities. However, we know little about differences in the content and quality of information students obtain from different sources. Homogeneity in types of sources consulted may mask considerable variations in information quality, a variable for which we have no measures in this data set.

Limitations

This study has several limitations. Most notably, we do not have information on students' health status. Another limitation is that we lack more nuanced data on the content of health information that students sought. For example, we do not know if students were looking for preventative information, such as how to prevent sexually-transmitted diseases, or treatment information, such as symptoms of the flu or what to do when one has a fever. We also do not know about the quality of the health information they received from any of the sources. Also, our survey does not include information about whether one information source directed their use of another source. For example, students may have seen a medical professional who advised them to read more about a diagnosed health condition, or students who found health information online may have been prompted by the information to visit a medical professional.

Conclusions

Our findings suggest that information sources complement, not replace, each other. Students who seek health information online also seek information from medical professionals, family and friends, and traditional media. The availability of online information does not seem to have crowded out other sources of health information, but neither is it disproportionately used by those without other sources of information. Thus, health information on the Web probably does not compensate for inequalities in access to other sources of health information, but neither does it compound disparities by parental education or race/ethnicity. Based on our findings, we suggest that college health professionals remain attentive to differences among students in health information access especially with respect to differences in parental education and race/ethnicity. Having information available on the internet and on the campus health center website is important, but is not likely to eliminate the health-information barriers experienced by firstgeneration college students and minority students.

Although we find relatively few differences in use of the Internet for health information by demographic characteristics, we do find that use varies by Web skill. As the Web becomes a more popular and important source of health information for college students, campus health providers should be attentive to differences in access to health information based on Internet skills. Thus, we recommend that college health professionals continue to provide information in multiple formats (e.g. both pamphlets available at the health center and information on the student health services website). Our findings suggest that health professionals should not assume that all students are equally capable and likely to access information online. Although the rise in digital media has the potential to reduce inequalities in information, a resource crucial to maintaining health, our research suggests that it may create health inequalities on an additional dimension: Internet skill.

NOTES: The authors of this article are not now nor have ever been affiliated with this university other than in the context of this study.

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Characteristics	%
Women	55.8
Age	
18	64.8
19	32.2
20-29	3.0
Race and ethnicity	
White, non-Hispanic	41.7
Hispanic	19.1
African-American	8.0
Asian or Asian-American	30.0
Native American	1.2
Parent's highest level of education	
Less than high school	7.6
High school or some college	38.7
College	34.6
Graduate degree	19.1
Recent immigrant	7.2
English is not only or primary language	24.9
Lives with parents (vs. in dorm, with friends, etc.)	53.1
	Mean (standard deviation)
Word association score (scale: 0-6)	2.5 (1.0)
ACT test score (scale: 1-36)	23.3 (3.9)
Social support index (scale: 6-30)	20.1 (3.1)
Number of Internet use years	6.3 (2.0)
Number of hours on the Web weekly	15.5 (10.0)
Number of Internet access locations	6.2 (2.1)
Web Skill Index	81.3 (22.6)

Table 1. Sample characteristics (n=1,060)

<u></u>	<i>. </i>		
Sources	Not at all	1 or 2 times	3 or more times
Social Networks	10.5	49.9	39.6
Family	15.5	48.5	36.0
Friends	19.1	52.1	28.8
Medical Professional (doctor, nurse other)	24.5	47.0	28.5
Online	21.6	40.9	37.5
Health web site	23.9	39.6	36.5
Other web site	56.7	24.8	18.5
Traditional media	25.4	49.4	25.2
General-interest magazine (paper version)	44.6	38.4	17.1
Special health or medical magazine or newsletter	54.6	32.9	12.5
Radio or television programs	57.9	30.4	11.7
Daily newspaper (paper version)	58.9	33.5	7.6

Table 2. Sources of health information and frequency of use over the past year (*n*=1,060).

	Web	<u>Medical</u> Professional	Family and Friends	Traditional Media
_	Model 1	Model 2	Model 3	Model 4
	Odds Ratio	Odds Ratio	Odds Ratio	Odds Ratio
Age (centered on 18)	1.14	1.14	.97	.97
Female	2.43***	1.43*	2.39***	2.85***
Race/Ethnicity				
White, non-Hispanic (reference category)				
Hispanic	1.15	1.32	1.10	1.15
African-American	1.12	1.50	.78	.93
Asian / Asian-American	1.17	.96	1.93*	1.69**
Native American	.90	.86	.44	.95
Parental education				
High school (reference category)				
Less than high school	1.11	1.05	1.31	1.18
Bachelor's degree	1.12	.88	1.55#	1.07
Graduate degree	1.21	1.65	2.01	1.02
Recent immigrant	.78	.91	.72	.66
English is primary language	.65#	1.28	.75	.68#
Word association score (standardized)	1.15	1.11	1.15	1.01
ACT score (standardized)	.92	.83#	.84	.82*
Years of web use (logged)	1.56	1.53	1.31	.88
# of Internet access locations (logged)	1.24	1.78*	1.40	1.54#
Web use hours per week (logged)	.93	1.02	1.06	.90
Web skill (standardized)	1.49***	.88	.85	1.15
Social support index (standardized)	1.06	1.19*	1.50***	1.11
Lives with parents	.65*	.71*	.80	.73#
Constant	1.22	.33	1.66	1.76
Psuedo R ²	.057	.051	.084	.063
X^2 (df)	54.9(19)	54.1(19)	54.1(19)	69.0(19)
% using source	78.4	75.5	89.5	74.6

Table 3. Logistic regression	models predicting use of	of each source for	health information
(<i>n</i> =1,060).			

Notes: Significance levels are the following: # p<.10; * p<.05; ** p<.01; *** p<.001.

	Odds Ratios
Age	.98
Female	.93
Race/ethnicity	
White, non-Hispanic	ref. category
Hispanic	.87
African-American	.66
Asian/Asian-American	1.14
Native American	1.15
Parental education	
High school	ref. category
Less than high school	.70
Bachelor's degree	.75
Graduate degree	.95
Recent immigrant	.82
English is primary language	.79
Word association score	1.15#
ACT score	.89
Years of Web use	1.39
# of Internet access locations	2.69***
Web use hours/week	1.23#
Web skill	1.11
Social support index	1.20*
Lives with parents	1.04
Constant	.02
Psuedo R ²	.050
X^2 (df)	55.4 (19)
% using weekly or more	25.0

Table 4. Logistic regression models predicting weekly or
more frequent use of the Internet for health information

Notes: Significance levels are the following: # p<.10; * p<.05; ** p<.01; *** p<.001. Age is centered on 18. Vocabulary, ACT score, Web skill, and psycho-social resources are standardized variables. Years of Web use, number of access locations, and Web use hours per week are logged.