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Health at High Speed

Broadband Internet Access, Health Communication, and the Digital Divide

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The study reported here explored the broadband digital divide in the context of Internet-based health communication. Inequities in the adoption of broadband technology were examined and the comprehensive model of health information seeking (CMIS) was used to make predictions about the implications of broadband Internet for personal health. Data from a population-based survey conducted by the National Cancer Institute in 2005 (N = 5,586) were analyzed. Results showed that those who were younger, more educated, and lived in an urban area were more likely to have a broadband Internet connection in their home. Furthermore, consistent with the CMIS, those with a broadband connection were more likely to use the Internet for health-related information seeking and communication than those with a dial-up connection.

Keywords: *information seeking; health; Internet; e-health; digital divide; broadband*

The Internet has been widely recognized as a potentially valuable tool for acquiring health information, care, and services. Technologies available online can be used to communicate with health care professionals, purchase medication and services, participate in support groups and behavioral change programs, acquire information about a plethora of medical issues, and perform a variety of other tasks relevant to one's health (Cline & Haynes, 2001; Gurak & Hudson, 2006; Mittman & Cain, 2001; Turner, 2003). Despite the potential of the Internet, the opportunities afforded by it may not be available to all Americans. Research conducted during the mid-1990s by the U.S. National Telecommunication and Information Administration (NTIA, 1998) showed a digital divide marked by gaps in access to computers and the Internet based on ethnicity, education, and household income.

Although studies completed by the NTIA in 1999, 2000, and 2002 indicate that inequities in access to the Internet are diminishing,[2] more recent research suggests the emergence of gaps based on the quality or speed of one's Internet connection (Horrigan, 2006; NTIA, 2000, 2002, 2004). Inequalities in the adoption of broadband technologies have been found based on age, education, geographic location (rural/urban), and income (Fox, 2005; Horrigan, 2006; NTIA, 2002, 2004). Given the unique characteristics that distinguish broadband from a traditional dial-up connection, the potential consequences of inequalities in access to broadband for health

communication may be substantial. Broadband, which primarily includes direct service lines (DSL) and cable modems, makes it possible to transmit information around 25 times faster than a dial-up connection (Boudreaux & Sloboda, 2000).[3] Additionally, broadband allows one to be continuously connected to the Internet and, thus, facilitates the integration of the Internet into one's daily life (Horrigan & Rainie, 2002). In order to develop effective health promotion campaigns and behavioral change programs delivered over the Internet, scholars of health communication must first understand any potential differences between those with dial-up and broadband connections.

The purpose of this study was to explore the implications of broadband for health communication. One objective was to test for inequalities in the adoption of broadband, in comparison with dial-up, based on adopter demographics. A second objective was to investigate the relationship between broadband access and health-related Internet use. Drawing from the comprehensive model of health information seeking (CMIS; Johnson & Meischke, 1993), it was hypothesized that those with access to broadband would use the Internet differently for health purposes than those with dial-up access. Data from the Health Information National Trends Survey (HINTS) collected during 2005 were analyzed in this research. In the following sections, research focusing on the implications of the broadband digital divide for health and background on the CMIS will be reviewed to develop study hypotheses.

The Broadband Divide and Health on the Internet

Interest in the digital divide was sparked by a 1995 NTIA report indicating demographic differences in access to telephone service. Such inequalities are antithetical to the U.S. government's telecommunication policy of universal service, which is rooted in the assumption that access to information is a fundamental right (Katz & Rice, 2002) and aimed at creating affordable access to information services for all Americans (NTIA, 1995, 1998). Computers and the Internet are a central avenue through which individuals may acquire information and participate in the public sphere (Mason & Hacker, 2003; Servon, 2002; van Dijk, 2005). These technologies are proposed to make it possible for individuals to overcome numerous longstanding cultural, geographic, political, and physical barriers (Katz & Rice, 2002). Gaps in access to computers and the Internet, then, broaden such inequalities and further disadvantage those in society who are traditionally considered have nots.

Although the digital divide is often talked about as a singular construct and studied as access to computers and the Internet, some argue that the notion of access is multifaceted and that there are multiple divides (Chen & Wellman, 2003; Servon, 2002; van Dijk & Hacker, 2003). van Dijk (1999, 2005, 2006) describes four distinct types of access, each reflecting a systematic segmentation of the population stemming from the possession (or lack thereof) of a tool or skill. The traditional notion

of a divide refers to what he calls material access, or the possession of a computer and an Internet connection. The other types of access include the motivation to use new communication technologies, the digital skills to be successful, and structural differences in usage behavior. Furthermore, van Dijk (2005) contends that digital divides are not simply absolute disparities in access but more likely represent relative inequalities—such as between broadband and dial-up Internet access.

Broadband adoption had steadily grown in recent years according to several reports from the Pew Internet and American Life Project (Horrigan, 2003, 2006; Horrigan & Rainie, 2002) and the NTIA (2002, 2004) as scores of dial-up users switched to broadband technology. In 2000, it was estimated that only 11% of Internet users in the United States had a broadband connection at home (NTIA, 2002). In early 2003, the number of broadband users rose to 31% of all home Internet users (Horrigan, 2003). Increases in broadband adoption have persisted with 40% growth from 2005 to 2006, resulting in an estimated 84 million Americans who currently have a broadband Internet connection at home (Horrigan, 2006). Despite this growth, inequalities in adoption exist (Fox, 2005; Horrigan, 2006; NTIA, 2002, 2004). Those who are older, have less education, less household income, and live in rural areas are less likely to have adopted broadband at home.

Inequalities in access to computers, the Internet, and broadband may have particularly important consequences in the context of health communication and public health. Health care organizations and public service agencies are increasingly relying on the Internet as a primary channel to relay information and provide health services (Cline & Haynes, 2001; Cotton, 2001; Mittman & Cain, 2001; Turner, 2003). Without such access, individuals are unable to capitalize on the opportunities afforded by the Internet. Cotton and Gupta (2004), for example, found that those individuals who used the Web to acquire health information during the year prior to their study reported significantly better general health and happiness than those who only sought information offline. Furthermore, those without access to the Internet may be among the same groups that would most benefit from it (Brodie et al., 2000; Cotton, 2001; Lorence, Park, & Fox, 2006; Shaw et al., 2006). Kreps (2005, p. 69) explains that,

> Many of the characteristics that identify those on the "have not" side of the digital divide also apply to those who suffer the negative effects of health disparities (e.g., people with less education, with low income and in ethnic minorities).

He goes on to note that, although access to the Internet does not guarantee health benefits, it does make them possible.

One specific objective of this study was to examine demographic differences between individuals with broadband access in their home and those using a traditional dial-up connection. Two population-based studies indicate that inequalities exist in broadband adoption based on age, income, education, and geographic location (Horrigan, 2006; NTIA, 2004). The following hypothesis is proposed to attempt to replicate previous research.

Hypothesis 1 (H1): Demographic differences exist based on age, income, education, and geographic location between those who have adopted broadband and those with a dial-up Internet connection at their home. Respondents who are younger, have more income and education, and live in an urban area are more likely to have adopted broadband.

The CMIS and Broadband

A second objective of this study was to examine the implications of broadband Internet access for health communication. As such, the CMIS (Johnson & Meischke, 1993) provides a useful framework to explore differences in Internet use between those with dial-up and broadband access. The CMIS was constructed to explain the selection and use of a particular communication medium to acquire health information. This model is grounded in the central assumption of uses and gratifications theory (Blumler & Katz, 1974; Rubin, 1986) that individuals actively select and use communication media to achieve goals.

The CMIS makes several predictions regarding individuals' perceptions and uses of media for health information seeking. First, four general health-related factors predict an individual's perception of a medium's utility and, in turn, information-seeking behavior. The four health-related factors are drawn from the health belief model (Rosenstock, 1974) and include demographics, experience with the health issue, salience or personal significance of the information, and one's sense of efficacy to manage the health issue. Second, perceptions of a medium's characteristics, which involve the editorial tone and communication potential of the medium (Johnson, 1983), directly predict information-seeking behavior and perceptions of a medium's utility. Individuals who have positive perceptions of a medium's characteristics will perceive it to have greater utility and increase the scope and depth of their usage behavior.

Although the CMIS was developed and tested prior to widespread diffusion of personal computers and the Internet, it suggests that the nature of one's Internet access should have a systematic relationship with one's use of the Internet for health purposes. The role of Internet connection type should be important in determining an individual's perception of the Internet's characteristics. In particular, the nature of one's connection is likely a key determinant of the Internet's communication potential or "manner in which information is presented" (Johnson & Meischke, 1993, p. 349). The increased speed and always-connected capabilities are two reasons that broadband has a greater communication potential than dial-up (and, presumably, should be perceived as such by users). With dial-up access, would-be Internet users must establish a connection each time they desire to use the Internet and are subject to substantially longer wait-time for Web pages to properly load and files to be transmitted. For reference, a 10 megabyte file would take approximately 25 minutes and 50 seconds to transfer using a traditional 56K dial-up modem and only 50 seconds using cable broadband (Boudreaux & Sloboda, 2000). The increased communication

potential associated with broadband should lead those with this type of connection to be more likely than those with dial-up to use the Internet for health purposes such as information seeking and communicating (e.g., e-mailing one's doctor, participating in a support group).

There is some evidence that access to broadband is related to increased general Internet use (Fox, 2005; Horrigan, 2003; Horrigan & Rainie, 2002; Ishii, 2003; NTIA, 2004). Horrigan and Rainie (2002) reported that those with broadband access did seven things online during a typical day, in comparison with three things undertaken by those with dial-up. The most recent NTIA report issued in 2004 showed that those with access to broadband were more likely than those with dial-up to be daily Internet users and more likely to use the Internet for entertainment, purchasing products, banking, and acquiring information. These findings are commensurate with the outcomes of research conducted in Japan, indicating that those with broadband used the Internet more minutes during a week, perceived it to be more useful, and were more likely to shop, bank, and play videogames online than those with dial-up access (Ishii, 2003).

Drawing from the CMIS, it was hypothesized that the type of access one has to the Internet is associated with one's use of the Internet for health purposes. Those with broadband access were predicted to be more likely than those with dial-up access to perform health-related behaviors, such as searching for medical information or participating in a support group. In testing this hypothesis, it was important to control for other factors that may influence Internet use and, thus, isolate the impact of broadband access. Five factors that correspond to the health-related factors identified in the CMIS were used as control variables, including education level, age, gender, status of current health, and attention to health information in the media.[4] Education, age, and gender correspond to the demographic factors included in the CMIS, and current health status corresponds to the direct experience component. Furthermore, each of these four factors has been documented in previous research to predict use of the Internet to acquire health information (Rice, 2006). Attention to health information in the media corresponds to the salience factor in the CMIS in that it is a general indicator of the degree to which medical information is important to individuals. This variable also has been demonstrated to predict Internet use for health purposes (Dutta-Bergman, 2004, 2005). Controlling for the preceding variables makes it possible to account for the health-related factors that are predicted in the CMIS to influence information-seeking behavior and, as a result, determine the unique influence exerted by characteristics of the medium relating to its communication potential—specifically, broadband access—on use of the Internet for health-related purposes.

Hypothesis 2 (H2): Controlling health-related factors identified in the CMIS, respondents with a broadband connection are more likely to use the Internet for health-related purposes than respondents with a dial-up connection.

Method

Data

Data collected as part of the HINTS 2005 studies were analyzed to address the previous hypotheses. HINTS is a nationally representative survey of American adults conducted by the National Cancer Institute (2005). The HINTS survey was conducted to assess cancer-related knowledge, attitudes, and behaviors and included items addressing respondents' uses of the Internet for a variety of purposes related to health. Nelson et al. (2004) present a complete review of the questionnaire construction, survey design, and sampling procedures used in the HINTS survey.

A total of 5,586 respondents completed the questionnaire. Respondents were a mean of 52.17 (standard deviation [*SD*] = 17.88) years old and more likely to be female (65.5%). Almost one third of the sample (31.4%) had earned a bachelor's or more advanced degree. A majority of respondents self-identified as being White (76%), with the remainder of the sample self-identifying as Hispanic (9.1%), Black/African American (8.1%), Asian American (1.9%), American Indian/Alaskan Native (1.5%), Native Hawaiian or other Pacific Islander (0.2%), or multiple races (1.8%). The annual, pretax household income (for those who were willing to share this information) ranged from $0 to $1,150,000. With regard to Internet use, 58.1% of respondents reported using the Internet previously and a majority of users (88%) indicated using the Internet at home. Although women and White Americans were overrepresented in the sample (in comparison with the U.S. population) and younger adults (18-34 years) were underrepresented, researchers at the National Cancer Institute constructed sample weights to ensure the accuracy of population estimates derived from the data set. The weights account for nonrespondents and adjust for deviations in the demographic makeup of the sample from the demographic characteristics of the broader population of American adults. Nelson et al. (2004) discuss the weighting procedure in detail.

Measures

All measures in this study were constructed from items in the HINTS questionnaire. Greater values indicate more of a particular variable.

Broadband. Access to broadband was measured with a single, dichotomous item. Respondents were asked to report their primary method of accessing the Internet from home. Those who indicated using dial-up ($n = 1,147$) were coded 0, and those who reported using a cable modem ($n = 728$), DSL ($n = 649$), or a wireless device such as a personal digital assistant ($n = 42$) were coded as 1. Mean access to broadband was the following: $M = 0.55$; $SD = 0.50$.

Table 1
Factor Loadings for the Items Addressing Internet-Use Behavior

Item	Factor 1	Factor 2
Sought information for self	.81	.09
Sought information for other	.82	.04
Purchased medication	.31	.31
Participated in a support group	.04	.59
E-mailed health provider	.03	.71
Discussed information found online	.15	.62

Note: Items were subject to a principal components analysis with varimax rotation.

Internet use. Included among the items in the HINTS data set are a series of six items that focus on health-related uses of the Internet. Because these items address a range of different uses of the Internet for health purposes, they were deemed appropriate for the study. It is noteworthy that the six items were not constrained to use of the Internet for cancer (as are a majority of the items in the HINTS questionnaire), but represented the respondents' general uses of the Internet for medical purposes. The six Internet-use behaviors include information seeking for self, information seeking on behalf of someone else, purchasing medication, participating in a support group, e-mailing one's health care provider, and talking to one's health provider during a visit about information found online. Each item was rated on a dichotomous scale with 1 indicating that respondents had performed the behavior during the previous 12 months and 0 indicating that they had not.

The six items were subjected to a principal components analysis with varimax rotation. Factors with eigenvalues greater than 1 were retained (Tabachnick & Fidell, 2001). The .60-.40 criterion, in which items must have a loading on a primary factor of .60 or greater and a loading no greater than .40 on any other factor, was used to identify the items comprising each factor (McCroskey & Young, 1979). The analysis produced two distinct factors corresponding to information seeking and communication behaviors. Factor loadings for each of the six items are displayed in Table 1.

Factor 1 consisted of the two items that address general information-seeking behavior. Information seeking for self and information seeking for others were combined to form an index of information seeking (α = .55; M = .61, SD= .40); this factor explained 24.02% of the item variance. Three items loaded on the second factor, including communication with one's health provider via e-mail, during visits with one's doctor, and with support groups.[5] Each of these items are conceptually similar in that they represent uses of the Internet for health-related communication. The communication factor explained 22.31% of the item variance. The reliability of these three items, however, was low (α = .32). To address this issue, the item with the highest factor loading was used to assess the communication factor. As illustrated

in Table 1, the loading for the item assessing whether or not respondents had e-mailed their health care provider was greater than the other two items and thus used in the analysis ($M = .10$; $SD = .30$). Although the use of a single item introduces measurement error, the item assessing respondents' use of e-mail to communicate with their health care provider has face validity as a measure of Internet use for communication purposes. This approach to handling measures with low reliability has been used in other secondary analyses of data sets addressing health-related Internet use (Rice, 2006). Finally, the item addressing the purchase of medication on the Internet loaded equally on both factors and was thus excluded from either factor.

Demographic and control variables. Four demographic variables were examined to assess the status of the digital divide with regard to broadband. However, approximately 30% of the respondents refused to report or indicated not knowing their household income. Given the large number of missing responses for this item, income was not assessed as a demographic predictor of inequities in broadband adoption. With regard to the remaining three factors, respondents self-reported their age ($M = 52.17$; $SD = 17.88$). Respondents' level of education was assessed by having them indicate the highest grade in school that they completed. An index was constructed by segmenting responses into one of six options representing standard segments in contemporary U.S. education, such as elementary school, some high school, high school, some college. Of those who reported their education, almost one third of the respondents indicated earning a college degree or more. The education index was treated as an interval-level measure for the analyses; larger values for this measure indicated a greater amount of schooling completed. Geographic location was determined using the U.S. Department of Agriculture Economic Research Service's (2003) rural-urban continuum codes for counties. Urban areas consist of metropolitan areas, which are defined as (a) counties including areas of greater than 50,000 residents or (b) counties adjacent to a metropolitan area and having at least 2% of its labor force commuting to a metro area. Rural counties were not in, or adjacent to, a metropolitan area. A majority of the respondents (91.7%) lived in an urban area.

Three additional variables were included (along with age and education) as control variables in testing Hypothesis 2: gender, current health, and attention to health information in the media. Respondents self-reported their gender on a single-item measure. Males were coded as 1 and females coded as 0 ($M = .35$; $SD = .48$).Current health was assessed by having respondents self-report their current health status on single-item, 5-point measure with the anchors *poor* and *excellent* ($M = 3.28$; $SD = 1.05$). Finally, attention to health information in the media was assessed with three items. Participants rated whether or not they had read the health section of a newspaper or magazine, watched a health segment in the local television news, or happened across (i.e., not intentional seeking) health information on the Internet in the previous 12 months. Affirmative responses were coded 1 and each of these three items were combined to form a health information awareness index ($\alpha = .30$; $M = .72$, $SD = .33$).

Procedure for Data Analysis

Linear and logistic regressions were conducted to test the study hypotheses using STATA 9 (StataCorp, 2005). The sample weights generated for the data set by the National Cancer Institute (2005) were applied during each analysis using a jackknife estimation procedure to compute the standard errors for the regression coefficients and 95% confidence intervals (CIs). The use of sample weights in the analyses was necessary to ensure the accuracy of population estimates (Nelson et al., 2004).

Results

Hypothesis 1 predicted demographic differences between those who adopted broadband and those with a dial-up connection. Given the dichotomous outcome variable, logistic regression was used to test this hypothesis. Age, education, and geographic location (with rural coded as 0 and urban coded 1) were entered into the model as criterion variables, and access to broadband was the outcome variable (with 0 indicating dial-up access and 1 indicating broadband). The results of the analyses are displayed in Table 2. The odds of having adopted broadband were greater for those living in an urban area, with more education, and who were younger. Hypothesis 1 was supported.

Hypothesis 2 posited that, controlling for the health-related factors identified in the CMIS, differences existed in use of the Internet for health purposes between respondents with broadband and dial-up access. Given the significant difference in access to broadband based on geographic location, this factor was included as a sixth control variable along with gender, age, education, current health, and attention to health information in the media. Separate linear regression models were tested for the communication and information seeking variables. The six control variables were entered in the first step of both models. Broadband, with broadband access coded as 1 and dial-up access coded 0, served as the criterion variable and was entered in the second step.

Results of the analyses showed that, after accounting for the variance explained by each of the control variables, access to broadband technology was associated with use of the Internet for communication, $b = .05$, $SE = .02$, $p < .01$, and information-seeking purposes, $b = .10$, $SE = .02$, $p < .01$. Broadband users were more likely to report using the Internet for health-related communication ($M = .14$; $SD = .35$) than dial-up users ($M = .08$; $SD = .27$). Those with broadband were also more like to engage in information seeking online ($M = .68$, $SD = .38$) than dial-up users ($M = .56$; $SD = .41$). Hypothesis 2 was supported.

Discussion

The purpose of this study was to examine the implications of broadband technology for health communication. The results demonstrate inequities in access to broadband

Table 2
Demographic Differences in Broadband Adoption

Variable	Dial-Up Weighted %	Broadband Weighted %	OR	Jackknife *SE*	95% CI
Geographic location			1.96*	.44	1.24-3.08
Urban (1)	41.4	58.6			
Rural (0)	60.0	40.0			
Education completed			1.44*	.08	1.30-1.61
Never attended	100	0.0			
Grades 1-8	23.7	76.3			
Some high school	46.2	53.8			
High school graduate	54.5	45.5			
Some college	43.1	56.9			
College graduate	33.0	67.0			
Age			.98*	.004	0.97-0.99
18-34	35.8	64.2			
35-49	44.1	55.9			
50-64	45.4	54.6			
65-74	61.2	38.8			
75+	69.2	30.8			

Note: OR = odds ratio; SE = standard error; CI = confidence interval. Percentages of broadband and dial-up represent the weighted percentage of those in the population who have adopted a broadband/dial-up connection among all individuals with a home Internet connection. An odds ratio greater than 1 indicates that respondents were more likely to have adopted broadband than dial-up. In the logistic regression analyses, each respondent's exact age was used and education was treated as a continuous variable.
*$p \leq .01$.

and differences in respondents' health-related Internet uses based on the nature of their Internet connection. In the following paragraphs, these findings will be discussed and the implications of this study for the development of Internet-based health communication campaigns will be considered.

The results of this study revealed inequities in access to broadband technology based on age, educational level, and geographic location. Those who were younger, more educated, and lived in an urban area were more likely to have a broadband connection than a dial-up connection to the Internet. These findings are important for several reasons. First, these inequities in access to broadband technology are consistent with those reported in previous research (Horrigan, 2006; NTIA, 2004) and mirror broader gaps in access to computers and the Internet. Second, the gaps in broadband access found in this study exist despite a dramatic surge in broadband adoption during the past 5 years (Horrigan, 2003, 2006). As such, the substantial growth in broadband access appears to be occurring primarily within demographic groups as opposed to between them.

The results of this study also offer insights into the relationship between broadband access and health-related Internet use. When controlling for three of the four

health-related factors identified in the CMIS, broadband users were more likely than those with dial-up to perform health-related communication and information-seeking behaviors online. This finding is consistent with the CMIS. The greater communication potential of broadband, which is manifested in faster download speeds and the potential to be continuously connected to the Internet, was associated with increased health-related Internet use. This finding is important because it suggests that the time it takes to connect to the Internet and transmit information are two key barriers explaining why people do not use the Internet for health purposes.

The outcomes of this research inform the CMIS, the broader body of scholarship exploring health information seeking, and research on new communication technologies and health disparities. First, the results of this study have several implications for the CMIS. Although this study cannot be considered a formal test of the CMIS, the results are consistent with a key finding from Johnson and Meischke's (1993) original test of the model. That is, above and beyond demographic and health-related variables, factors related to the medium were associated with media use for health purposes. Even when the variables corresponding to the health-related factors in the CMIS and geographic location were controlled, the nature of respondents' Internet connection significantly predicted their health-related Internet use. Additionally, because the CMIS was originally tested with magazines and relatively few attempts have been made to further assess the theory (for exceptions, see Johnson, 1997; Johnson, Donahue, Atkin, & Johnson, 1995), this research offers at least tentative evidence of the utility of applying the CMIS to study the Internet. Finally, the results of this study inform the CMIS by demonstrating that the communication potential of any one medium may vary based on features ancillary to the medium itself—such as the nature of one's Internet connection. Although it was not possible to directly measure respondents' perceptions of the Internet's communication potential, it seems plausible that those with dial-up likely viewed the Internet (in general) less positively than those with broadband. Such differences could extend to other media, such as between high definition and standard definition television. Researchers applying the CMIS should keep in mind that the communication potential of any one medium may not be fixed. As opposed to being uniform, the communication potential may greatly vary depending on specific features secondary to the medium itself.

Second, the results of this research have important implications for other theories of information acquisition such as Brashers's (2001) uncertainty management theory. Uncertainty management theory posits that one approach individuals take to manage their uncertainty about health issues is to seek out information to increase or decrease their level of uncertainty. The Internet and World Wide Web are resources to acquire such information (Brashers, Goldsmith, & Hsieh, 2002). Yet the nature of one's access may serve as a scope condition that determines the relative likelihood that one will use the Internet to acquire information to decrease or increase one's uncertainty. Those with broadband access may be more inclined to use the Internet,

whereas those with dial-up may seek out health-related information from interpersonal sources such as their family or health care provider.

Finally, the results of this study inform research on health disparities and new communication technologies. The Internet has been offered as a means to reduce health disparities by providing medical information and services to those without insurance or who live in rural areas without close proximity to a health care practitioner (Kreps, 2005; Lorence et al., 2006). Although Internet access is a precondition for such outcomes to occur, the findings from this study suggest that access, alone, may not be enough. The quality of one's access also matters. As opposed to simple dichotomy of haves and have nots, the results from this study underscore the notion that the disparities in Internet access may be better described as a range from the have-nots to the haves-with-unmitigated-access. Although those with dial-up may be better-off than those without any access, the differences in uses of the Internet found in this study suggest that there may be disparities between those with dial-up and broadband capabilities.

In addition to the implications for health information seeking theories and research on health disparities, the findings have practical import for the development of health communication campaigns. Practitioners must account for the demographic differences in access to broadband as well as those differences in Internet uses based on Internet connection type when conceptualizing and delivering health campaigns. For example, a Web-based campaign geared toward older adults or those in rural areas would need to accommodate a dial-up connection. Smaller file sizes including few images or videos would need to be incorporated in the campaign. For those groups that use broadband, such as younger adults and urbanites, it would be possible to construct a more dynamic and interactive campaign. Furthermore, it also seems possible to capitalize on some of the behaviors that those who have access to broadband are more likely to perform. Given that broadband users are more likely to engage in health-related communication behaviors online, a campaign directed at broadband users could integrate an element that works cooperatively with health care practitioners. A sexually transmitted infection (STI) campaign directed at young adults—a group that is more likely to be broadband users—could function as a springboard to promote discussion of STI-related issues with their health care provider.

As with any research, this study is not without limitations. One limitation is that the items assessing Internet use were all based on self-report data as opposed to objective measures of behavior. As such, this study assumes that respondents' reports are commensurate with their actual Internet use. A second limitation is that the measures of Internet use were somewhat limited. It was only possible to begin to examine the scope of Internet use for health (i.e., communicating or seeking information); it was not possible to evaluate the depth of respondents' Internet use. A final limitation is that controlling for various demographic and health-related factors to test the second hypothesis may have oversimplified the relationship between the nature of one's Internet connection and Internet usage. Some of the demographic variables such as

education and age may interact with broadband access to shape use of the Internet for health purposes. Yet controlling for these factors made it possible to isolate the relationship between broadband Internet access and health-related uses of the Internet.

Finally, the results of this study suggest several directions for future research. One such direction is to conduct a descriptive, in-depth analysis of differences in use of the Internet for health by those with broadband and dial-up. Such research could examine the amount of time spent online, the actual health Web sites visited, and the commensurate health outcomes. Additionally, future research should explore any potential relationships between the nature of one's Internet access and information-seeking acumen on information-seeking outcomes. It stands to reason that those who have limited skills or a reduced sense of efficacy in their ability to acquire information may be more successful in their information-acquisition efforts when they have broadband as opposed to dial-up. The reduced time it takes for pages to load when one has broadband access may motivate those who are easily discouraged by the Internet to persevere in their quest for medical information. Finally, it would be worthwhile to explore the effectiveness of health promotion campaigns delivered to those individuals with broadband and dial-up Internet access. The findings from this study suggest that there may be important differences based on one's connection type, with broadband users reaping greater benefits.

In closing, although the digital divide is a broad social problem, it is particularly relevant to scholars of health communication and public health. Through exploring inequities in broadband adoption, this study makes a contribution by identifying some of the consequences of the digital divide for consumer health on the Internet. Yet it is only through continued research that scholars will be able to fully understand the implications of the Internet for public health and health communication in the Information Age.

Notes

1. The author would like to thank the editor, Dr. Michael Roloff, and two anonymous reviewers for their insightful feedback regarding this manuscript.

2. It should be noted that a fair amount of debate exists about the status of the digital divide; arguments that the digital divide is shrinking have been made—and countered—by a number of researchers (see van Dijk, 2005).

3. *Broadband* is a general term that refers to a number of different types of Internet connections. Two of the most widely used are direct service lines (DSL) and cable, with typical download speeds of around 1 megabyte per second (Horrigan, 2006). The two features that distinguish broadband are the potential to be continuously connected to the Internet and faster download speeds.

4. It was not possible to control for the beliefs variable in the comprehensive model of health information seeking (CMIS), which consists of an individual's perception of the "efficacy of various medical procedures associated with the health topic" (Johnson & Meischke, 1993, p. 347). As such, this study cannot be considered a formal test of the CMIS.

5. It should be noted that the factor loading for the item addressing support group participation was slightly below the .60 criterion. However, the loading of this item for the first factor was approximately 0, indicating that the item loads predominately on Factor 2. Furthermore, this item is conceptually similar to the other two items that loaded on Factor 2.

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