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Internet Use, Browsing, and the Urban Poor: Implications for Cancer Control

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Background Despite the growing penetration of the Internet, little is known about the usage and browsing patterns of those in poverty. We report on a randomized controlled trial that sheds light on the Internet use and browsing patterns among the urban poor.

Methods The data come from 312 participants in Boston, Massachusetts, from Click to Connect, a study that examined the impact of an intervention that provided computers, Internet, and training to people from lower socioeconomic position (SEP). Data were gathered through pre- and posttest surveys and Internet use tracking software that generated approximately 13 million network activity files and more than 5.5 million records.

Results Internet use increased among Intervention participants, with most of their time spent on social and participatory media sites or Internet portals. Differential patterns of use by gender and race/ethnicity were observed. Purposive searching for health information was low among all participants. Most of the visits to health-related sites were to local hospitals' sites suggesting the influence of possible preexisting relationships and trust. Social networking sites were frequently visited, with three sites enjoying similar popularity among all groups.

Conclusions Our data show that the availability of Internet can lead to significant increase in its use among low SEP groups. Low SEP members used the Internet for participation and engagement, but the sites visited differed by group. Harnessing the power of social networking sites and shareware sites may be a way to increase access to health information.

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The revolutionary developments in information and communication technologies (ICTs) and their rapid deployment are leading to a profound impact on people, institutions, and communities. The spread of the Internet has succeeded in weaving together people and organizations, facilitating diffusion of information across geographic, temporal, and disciplinary boundaries (1), although the highest use continues to be among those with high levels of income and education (2). Searching for health information online now ranks third among online activities, with 59% of all adults looking for health information (3). The emergence of platforms such as social media that allow user contributions, engagement, and participation has generated excitement and optimism in using the Internet to transform the way we live, work, and play (1,4,5).

The marriage of consumer informatics with health informatics has engendered an unusual degree of optimism on how ICTs could be used to advance preventive health and improve quality of care leading to enhanced health outcomes (6,7). This enthusiasm, however, warrants qualification in light of the profound inequalities among social groups on various indicators across the cancer continuum (8–11). There are a number of social determinants that contribute to these inequalities (12) and critical among them is socioeconomic position (SEP). By virtually all measures, those in lower SEP groups fare worse on most disease outcomes than their more affluent counterparts (13–18).

Inequalities in health find their parallel in communications. Not all groups are able to take advantage of the ICTs, in part due to a lack of access to computers and Internet—or the "digital divide." Even if the issue of access is resolved, groups from lower SEP may not have skills to use the Internet and navigate the information environment. These "digital inequalities" (19,20) are a part of a larger problem of communication inequalities (21), which goes beyond access to focus attention on how people from diverse social groups are able to navigate the complex and abundant information environment in a variety of platforms and media. In an increasingly digital age, those who are unable to access or navigate the online information environment may be at a disadvantage for engaging fully with important cancer information. The evidence for cancer communication inequalities across the dimensions of access to and use of communication media, attention to health, processing health information, and the effect on health behaviors is overwhelming (22–26).

Despite the differential distribution of ICTs by SEP, access to the Internet is steadily increasing, especially with the emergence of the mobile revolution with the potential to provide health information

to large numbers of people. But access alone is not enough. The design of information—how information is organized, packaged, and disseminated—is even more important, and a usable and useful architecture is likely only when we have a close understanding of how people use ICTs. Indeed, Web 2.0 technologies hold the potential to engage lower SEP groups in their own care, link them to others with similar conditions, and connect them with evidence-based interventions, but questions on their detailed usage, and how to best optimize these resources for the underserved, remain (7).

In the context of health, data for those living in poverty are often omitted through data collection methods used by vital statistics and disease registries, with few health departments collecting information on income (27). This failure to add income data to surveillance systems has impeded efforts to monitor and address contemporary social disparities, masking both the distribution and etiology of disease within these groups (28,29). The same concerns apply to national surveys on health communication, including the Health Information National Trends Survey and Pew Internet and American Life Project survey among others. Internet usage and browsing patterns of middle and higher SEP groups are well documented, whereas such data for low SEP groups are limited. As a result, once access is achieved, Internet users face an overwhelming and often contradictory world that is often not tailored for nor accommodating to all users (1).

It is in this context that we draw from a unique dataset based on a large randomized controlled trial on digital inequalities and health among the urban poor in New England to shed light on their Internet use and browsing patterns, and draw implications for health communication in general, and cancer communications in particular.

Methods

Study Overview

The data for this paper come from Click to Connect (C2C), a randomized controlled trial designed to examine the impact of provision of computers, Internet access, and training among urban, lower SEP groups. Participants were recruited from adult education centers in the greater Boston area. Eligibility criteria included: no home Internet access, enrollment in a General Educational Development or pre-General Educational Development class or a high-level English for Speakers of another Language class, between the ages of 25 and 60, had a working phone number, and had limited experience in using computers.

Participants were randomized to either the intervention or control groups. The intervention group received nine monthly computer-training sessions at community colleges in Boston, Massachusetts, including modules on basic computer operation, troubleshooting, and Internet navigation and searching. Participants also received a home computer, broadband Internet access, access to a Web portal designed for low-literacy populations that facilitates Internet navigation, and ongoing technical support. The control group received health information at the end of the project period.

Recruitment and Retention

Study procedures took place in three waves, which included 6 months for recruitment and pretest administration and 9 months (18 months for wave 1) for intervention and posttest administration. Data collection took place between May 2007 and March 2011.

Strategies to recruit and retain participants are described elsewhere (24). We used a "proactive approach" (30), an intense process of engagement involving direct and frequent contact with participants, community presence, key stakeholder engagement, reminders, and $5 gift cards. Of the 336 enrolled, 12 were deemed ineligible and 12 were lost postrandomization (24). In addition, computer and Internet tracking data for 23 intervention participants were lost due to a malfunction in the tracking software. The final sample consisted of 312 participants, spread over three waves, with a total of 155 participants in the intervention group and 157 participants in the control group (88% retention rate).

Data and Measures

The data for this paper come from the pre- and postintervention surveys conducted with intervention and control groups, and the Web browsing tracking data of the intervention group.

Pre- and postsurveys were conducted over the phone and included data on sociodemographics, health communication, health cognitions and beliefs, and health status and risk behaviors.

Web Browsing Tracking Data

Each computer was fitted with Spector 360, a software that is designed to track Web and computer activity, enabling us to capture multiple aspects of the participants' Web browsing, including the domain name of each site visited, time spent online, search engine activity, downloads, links accessed from selected home pages, and general computer use. Screen shots and key strokes were not captured to maintain user anonymity. Once installed in the homes, we used a virtual private network to connect participant computers to a dedicated study server so that all Web and computer activity was recorded and stored. All participants consented to data tracking. Per Institutional Review Board mandate, we tracked browsing activity by household rather than the individual. Individual level data were obtained from surveys. Human subjects approval for this project was granted by the Dana-Farber Cancer Institute Institutional Review Board.

Overall, there were more than 13 million network activity files and more than 5.5 million records collected of visits to Web sites over the course of the study. In all, there were 104 038 unique Web site domains accessed. There were a total of 854 559 hours of total time spent by participants connected to Web sites, with 52 776 hours of activity (scrolling, clicking, etc) occurring in Internet windows. Once all tracking data were collected, we submitted deidentified domain information to an online application program interface through the Webroot Content Classification Service, which categorized each domain into one of 82 predetermined categories.

Results

Sample Characteristics

A majority of the sample were women, minorities, and urban poor (Table 1). Almost 60% of the C2C participants were below the federal poverty level and 28% had been out of work for more than 6 months. We compared C2C socioeconomic characteristics with the Pew Tracking Survey (2011), data from the 2010 US Census, and

Table 1. Demographic composition of Click to Connect (C2C) sample and comparisons with national surveys*

	C2C	US Census 2010	HINTS 2007	Pew Internet Tracking Survey 2011
Total n	312	308 745 538 (population estimate)	7674	7235
Sex				
Male	34%	49%	39%	49%
Female	66%	51%	61%	51%
Age				
≤34	35%	48%	12%	23% (<30)
35–49	44%	21%	23%	34% (30–49)
≥50	21%	31%	65%	41%
Race				
American Indian/Alaska Native	1%	2%	1%	2%
Asian	4%	5%	2%	3%
African American	54%	13%	7%	13%
White	8%	78%	79%	75%
Other	33%	2%	11%	2%
Hispanic				
Yes	25%	16%	9%	14%
No	75%	84%	91%	86%
Born in the United States				
Yes	42%	87%	89%	—
No	58%	13%	11%	—
Income				
Less than 10 000	36%	8%	31% (<$35K)	9%
$10 000–14 999	12%	6%		40% ($10–49K)
$15 000–24 999	29%	12%		
$25 000–34 999	9%	11%		
$35 000–49 999	4%	14%	13%	
$50 000–74 999	3%	18%	17%	11%
$75 000+	1%	32%	29%	15%
Education				
Less than high school	71%	8%	9%	13%
High school graduate	21%	50%	25%	32%
Some college	7%	21%	30%	24%
Bachelor's degree or higher		28%	36%	28%
Employment				
Employed	50%	57%	51%	54%
Unemployed	38%	7%	4%	19%
Retired	1%	26%	26%	19%
Disabled	9%	10%	5%	3%

* Some percentages may not sum to 100 due to rounding or omitted data categories. HINTS = Health Information National Trends Survey.

the National Cancer Institute's 2007 Health Information National Trends Survey. About 36% of the C2C sample reported an income of less than $10 000 per year compared with 9% of the Pew sample (Table 1). Similarly, the C2C sample had a higher proportion of people in lower income segments and a lower proportion from the highest income group compared with the national samples. Similar differences may be seen in education and employment. By design, about 71% of the C2C sample had less than high school education in sharp contrast to 13% of the Pew sample, 9% of Health Information National Trends Survey, and 8% of US Census. About 38% of C2C sample was unemployed compared with 7% of US Census, 4% of Health Information National Trends Survey, and about 20% of Pew (Table 1).

Internet Use

The C2C intervention had a significant effect on the Internet use of the intervention group compared with the members of the control group. Internet use increased in the intervention group compared with the control group both on weekdays (1.81 vs 0.57 hours, $P < .0001$) and weekends (2.73 vs 0.69 hours, $P < .0001$) (Figure 1).

Browsing Behavior

The C2C intervention group spent considerable time on social media sites that promote user contributions and participation, pointing out the importance of user engagement (Supplementary Figure 1, available online). Almost two-thirds of the hits, or separate visits to a Web page, were to sites that encourage user engagement and contributions: social networking sites (SNS) such as Facebook (25%) or Myspace (27%) or sites with user-contributed content such as YouTube (7%). Internet portal or search sites such as Yahoo (14%) or Google (8%) or utilitarian sites (eg, sites that offer a service or serve a function) such as Craigslist constitute the rest. Furthermore, the Web site category that participants spent the *most time* on across both gender and racial/ethnic groups was internet portals, defined as sites that aggregate a broader set of content

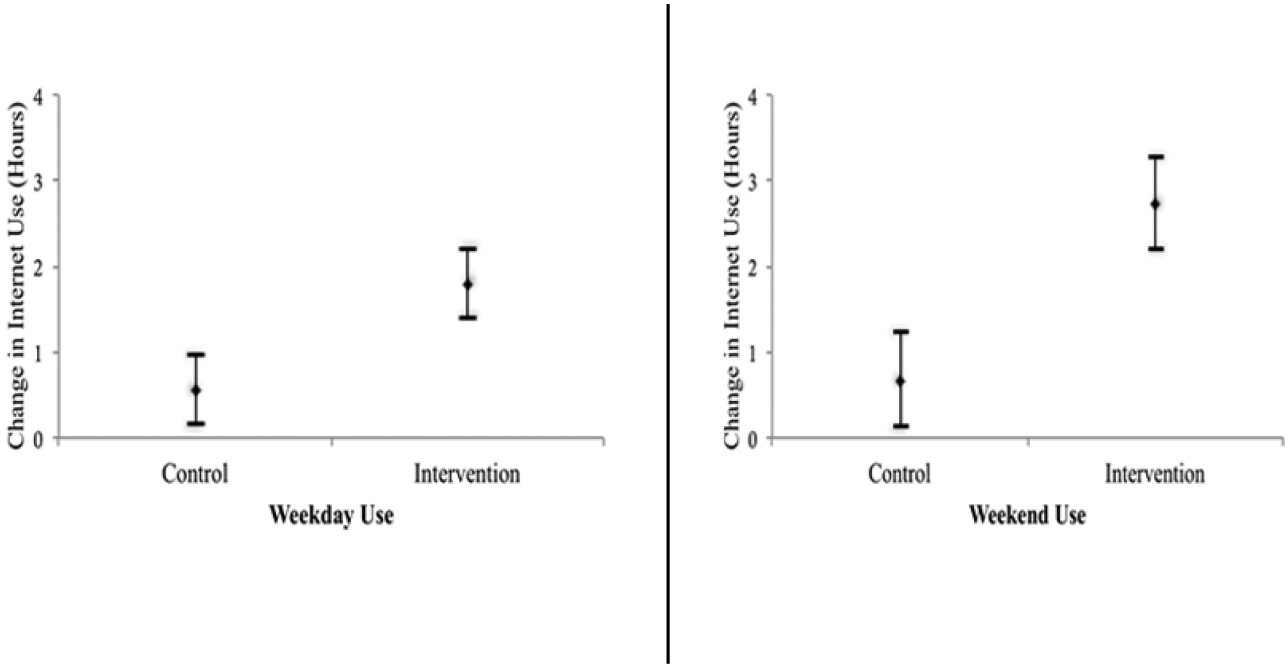

Figure 1. Change in Internet use between treatment and control groups. Increases in use of the Internet (in hours) after the intervention. Changes in Internet use for both weekdays and weekends are pictured.

and topics, with the top hours logged on AOL, Yahoo, and MSN (not shown here).

There were differences in browsing patterns between genders and among race and ethnic groups (Supplementary Figure 2, available online). When comparing number of Web site hits across the top six most popular Web site categories, women were more likely than men to visit SNS (57% of Web site hits for women vs 45% of hits for men) and shopping sites (9% vs 7%). Men were more likely than women to visit Internet portals (22% vs 15%) and streaming media (9% vs 6%) sites.

There were also differences in the browsing patterns by race/ethnicity. *Although SNS were the most visited for each group*, white (69%) and Hispanic (63%) participants had the highest percentage of hits to SNS compared with black (51%) and participants of other race (35%). Blacks were more likely to visit shopping (10%) and streaming media (8%) than white and Hispanic groups. Participants of other race had the highest percentage of hits for Internet portals (22%), search engines (14%), and gaming (13%).

Health-Related Browsing

We examined the browsing of health-oriented Web sites, relative to other types of sites. Among the categories of sites visited, health ranked low in number of hits: 31st for Hispanics, 32nd for African Americans/blacks, and 19th for whites. Health also ranked low for men (33rd) and women (31st).

Three categories appear to stand out when the top 30 health sites categories were examined: local hospitals, women's health, and general health (Table 2). Among specific diseases, mental health and addictions ranked among the top 10, followed by cancer, which was ranked 15th. Psychological distress is a major issue among the poor, which may explain the high number of visits to these sites (31). Additionally, there were clear differences in the top health sites visited by race/ethnicity (Table 3).

Social Network Behavior

SNS accounted for more than 2 million hits during the study. Myspace and Facebook, followed by hi5.com, emerged as the most visited SNS, both in total and across gender and racial/ethnic groups (Table 4). Notably, there was some variation in the remainder of the top 10 SNS by racial/ethnic group, indicating that there may be some patterning to the social network sites that are visited.

Conclusions

In summary, our data show that the availability of the Internet could lead to significant increase in its use among low SEP groups. The browsing data show that low SEP members use the Internet with the intention of participation and engagement demonstrated by their high use of SNS and shareware sites. Internet portals, likely for additional information seeking or as a launching-off point to other Web sites, also rank high. What is interesting is the heterogeneity in usage among the low SEP groups. Race/ethnicity and gender influence which categories (SNS or portals or specific Web sites) are accessed. Without sufficient numbers of low SEP people, these differences would have been masked. Further work that evaluates the navigability and reading level of the sites most frequently visited may help to harness the power of these targeted messaging platforms for lower SEP groups (32).

The use of the Internet for health has been well documented, and public, private, and nonprofit sectors are increasingly investing in the Internet to connect with patients (eg, electronic health records), provide information (eg, WebMD, Medline), and engage patients through online support groups or social media (eg, Patients

Table 2. Top 30 health Web sites visited by Click to Connect tracking participants

Site	Hits	Subject of the site
Partners.org	2891	Health care, hospital, gateway to other resources
Qualityhealth.com	862	Health information resource; recipes, tools
Lifescript.com	674	Women's health information; food, relationships, articles
Webmd.com	673	Medical news and information, symptom tracking
Bmc.org	539	Health care, hospital
Pregnancy.org	513	Pregnancy information and resources
Kidshealth.org	364	Children's health information
Baycove.org	339	Medical center, mental illness and drug addiction
Medicinenet.com	327	Health and medical information
Brighamandwomens.org	322	Health care, hospital
Realage.com	309	Health assessments
Emedicinehealth.com	217	Information for first aid and medical emergencies
Everydayhealth.com	203	Health information, personalized health tools, calorie counter
Cancer.org	173	Cancer information
Unaids.org	170	HIV/AIDS
Ballyfitness.org	154	Fitness club
Mayoclinic.org	142	Health information, medical center
Massgeneral.org	132	Health care, hospital
Insureme.com	126	Insurance quotes
Redcross.org	119	Disaster relief, donations
Americanheart.org	119	Heart disease and stroke
Noah-health.org	115	Consumer health information, English and Spanish
Nursys.com	112	Nurse license verification
Healthinfotranslations.com	110	Plain language for health
Healthology.com	104	Health information
Gnc.com	103	Vitamins and supplements (commercial)
Bidmc.com	99	Health care, hospital
Melaleuca.com	99	Wellness products (commercial)
Healthychoice.com	99	Low calorie meals (commercial)
Chooseyourdiet.com	84	Diet information

Table 3. Top health sites by race/ethnicity

Black (hits)	Hispanic (hits)	White (hits)	Other (hits)
Partners.org (815)	Partners.org (899)	Qualityhealth.com (588)	Partners.org (733)
Lifescript.com (464)	Pregnancy.org (512)	Webmd.com (273)	Unaids.org (170)
Bmc.org (326)	Webmd.com (313)	Realage.com (206)	Bmc.org (152)
Baycove.org (301)	Melaleuca.com (95)	Lifescript.com (162)	Cancer.org (73)
Brighamandwomens.org (240)	Ballyfitness.com (93)	Emedicinehealth.com (125)	Americanheart.org (72)
Qualityhealth.com (232)	Herpes-coldsores.com (65)	Medicinenet.com (105)	Kidshealth.org (70)
Medicinenet.com (166)	Patientgateway.org (57)	Healthychoice.com (99)	Truecaredental.com (53)
Everydayhealth.com (149)	Medicinenet.com (53)	Myuhc.com (77)	Carnitinedeficiencies.com (50)
Kidshealth.org (144)	Kidshealth.org (46)	Chooseyourdiet.com (74)	Optimizerx.com (48)
Insureme.com (125)	Panicaway.com (44)	Mayoclinic.com (52)	Bidmc.org (42)

Like Me, Facebook). The Internet can be harnessed successfully in prevention as has been shown in the case of tobacco (25). Once diagnosed, the extraordinary complexity of cancer care remains a major challenge. ICTs can play a significant role in providing information to patients, promoting individualized treatments, and supporting informed decision making (33).

As Web sites are developed, much of this decision making is occurring without the input of those who are poor and from minority groups. The absence of data on how the lower SEP groups use the Internet may be leading to Web site design that is exclusionary, with potential to only widen the gaps. This paper is arguably one of the few to address this issue by reporting on Web browsing patterns of the urban poor.

The results from this study offer some important implications for cancer control, particularly in designing internet-based outreach strategies for those from lower SEP groups. One, the findings reported in this paper point to the importance of using social media as a platform to engage low SEP groups and offer a critical opening to address communication inequalities including digital inequalities. Sites with user-contributed content are already being used by certain companies to promote unhealthy behaviors such as tobacco (34) or unhealthy foods (35). At the same time, there is general increase in the use of social media among the American public. For example, the latest Pew data showed that 67% of respondents who are Internet users reported using "any SNS." This is especially so among women and adults 18–29 years

Table 4. Top social networking sites by race/ethnicity

Black (hits)	Hispanic (hits)	White (hits)	Other (hits)
Facebook.com (389 844)	Myspace.com (470 036)	Facebook.com (220 443)	Myspace.com (98 425)
Myspace.com (314 737)	Facebook.com (135 821)	Myspace.com (23 044)	Facebook.com (96 086)
Hi5.com (130 580)	Hi5.com (29 898)	Hi5.com (359)	Hi5.com (41 866)
Tagged.com (52 232)	Tagged.com (17 700)	Twitter.com (155)	Blackplanet.com (6563)
Blackplanet.com (7008)	Migente.com (12 541)	Tagged.com (141)	Tagged.com (5799)
Bebo.com (2695)	Mycrib.net (3761)	Espin.com (72)	Myyearbook.com (5030)
Myyearbook.com (2201)	Imikimi.com (2540)	Classmates.com (41)	Ning.com (1502)
Espin.com (2084)	Quepasa.com (2056)	Sonico.com (39)	Imvu.com (797)
Imikimi.com (1291)	Slide.com (482)	Secondlife.com (31)	Migente.com (273)
Imvu.com (868)	Bebo.com (402)	Graduates.com (23)	Twitter.com (243)

old (36). Our findings parallel those of Pew, although measured at the household level.

From a strategic communication perspective, it is important to pay particular attention to SNS and those that generate user engagement and contributions. Research is beginning to emerge on how people, including patients, are engaging in social media for health (37); however, as evidence in this paper suggest, a detailed examination into how low SEP groups are engaging with different sources of social media, and how these sites may be used to convey health information, is warranted.

Two, although health Web sites did not rank high compared with other categories, there was a high number of visits to health Web sites, indicating that health information was relevant to most participants and purposefully sought at some point. It is also conceivable that the participants might have visited health sites or obtained health information from the Internet portals or from their visits to the news and entertainment portals. What is clear is that households within our randomized controlled trial did use the Internet to connect with local hospitals, due possibly to greater trust or affiliation as a patient. This observation points to another important avenue to reach low SEP groups with health information, engage them in health promotion, and create a tight networked environment between physicians and patients, enhancing cancer care and assisting in critical decision making. The combination of social media and outreach by health care institutions with which low SEP groups have a prior relationship could turn out to be particularly effective.

Some limitations of this study should be noted. First, although our sample includes an adequate representation of low SEP groups without Internet access, we do not know if this population is representative of other low SEP groups in Boston or the United States. Given our recruitment age range of 21–60, we cannot gauge the Internet browsing behaviors of older adults, who may have different usage patterns. We were only able to capture Internet usage at the household level; therefore, individual participant usage of SNS and health sites may be lower than the figures reported here. However, this initial work represents an important first step in identifying the Internet usage patterns of low SEP populations and highlights how Web sites visited differ across gender and racial/ethnic groups. Future studies may build upon this work to continue to explore the online experiences of the medically underserved.

The findings from this study demonstrate that the digital divide may in part be addressed by increased access to computers and Internet training and that these steps are able to increase the capacity of socioeconomically disadvantaged adults to seek and use health information. The data from our C2C randomized controlled trial provide a unique opening to designing future e-health interventions in a way to address communication inequalities, and in designing how cancer-related information could be delivered. This study represents an important step in addressing the dearth of data on how socioeconomically disadvantaged adults use the Internet to engage with health information.

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