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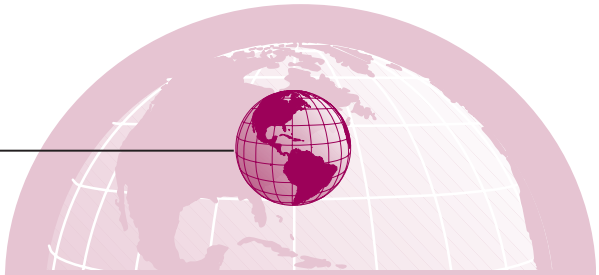
FEATURE ARTICLE



The Digital Divide and Urban Older Adults

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Computers and the Internet offer older adults opportunities and resources for independent living. However, many urban older adults do not use computers. This study examined the demographic, health, and social activities of urban older adults to determine variables that might predict the use and nonuse of computers in this population. A secondary data analysis was performed using the 2001 Detroit City-Wide Needs Assessment of Older Adults (n = 1410) data set. Logistic regression was used to explore potential differences in predictor variables between computer users and nonusers. Overall, computer users were younger (27%), had a higher level of education, were more likely to be employed, had an annual income greater than $20 000, and were healthier and more active than nonusers. They also were more likely to have memberships in community organizations and do volunteer work. Preferred computer activities included conducting Internet searches, playing games, writing, and communicating with family members and friends. The results suggest significant differences in demographic and health-related characteristics between computer users and nonusers among urban older adults. Although about a quarter of participants in this study used computers, the Digital Divide continues to exist in urban settings for scores of others.

KEY WORDS

African American • Aging • Computer use • Elderly • Gerontology • Healthcare • Inner city • Internet • Older adults • Social support • Urban

Computers and the Internet offer older adults an invaluable resource for maintaining independence and broadening their lives in the digital age. Information technology (IT) also has the potential to enhance the quality of life for older adults by helping them maintain and expand social support through communication with family and friends and by connecting them with services such as online shopping, banking, health status monitoring, and accessing current and reliable health information. Older adults may have the most to gain from accessing the information and services on the Internet compared with other age groups.[1] Unfortunately, many older adults are unable to become members of the cyberspace community at present.

This is remarkable because investigators have reported numerous findings from research conducted over the past two decades indicating that older adults can easily assimilate computers into their everyday lives. A recent review of the literature[2] outlines more than 30 studies that document the successful use of computers by older adults in a variety of environments, ranging from institutional settings for frail elders and nursing homes to assisted living facilities and adult day care centers. Furthermore, there are few data to suggest that older adults experience intractable problems when using electronic devices or IT in general. This includes applications on learning about memory training techniques,[3–9] software skills,[10,11] retirement issues, or health maintenance and promotion.[12,13] Moreover, although some modifications in the learning environment may be needed, many older adults are eager to learn about computers and the Internet when given the opportunity and training.[1,14] They may also become just as enthusiastic and active online as younger users.[15,16]

Findings from a recent survey on Internet use[17] indicate that about a third of persons older than 65 years are now using computers at least occasionally. This marks a 10% rise in usage by older adults since 2004, and usage is predicted to increase steadily over time as the baby boom generation, which is already composed of many Internet-literate individuals, grows older.[15,18] Older adults are

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also using the Internet for a variety of purposes similar to other age groups. Older adults use the Internet to send or read e-mail (94%), look for health information (66%), conduct product research (66%), visit government sites (60%), purchase goods (47%), make travel reservations (41%), look for spiritual information (26%), and bank online (20%). In fact, older adults now use e-mail more often than do young Internet users (96% compared with 91%, respectively).[19]

Therefore, it may not be uncommon to find that some older adults take the Internet for granted, while using the Internet is new territory for others.[20] For this reason, it is important to note that most online older adults are white and highly educated and with higher incomes and greater Internet access, although gains in other segments of the older adult racial-ethnic and socioeconomic cohort have been observed since 2000.[15] For example, 11% of African Americans and 21% of English-speaking Hispanics 65 years and older reported using the Internet in 2003, and these percentages are rapidly rising.[15,21]

Despite these gains, many older adults remain unfamiliar with the Internet, and very little is known about computer use, especially among urban older adults. It has been suggested that the Digital Divide (the social, economic, and demographic factors that exist between individuals who use computers and those who do not) is a fundamental barrier to going online for older adults living in low-income inner-city areas. In many instances, this group has no way to learn how to use computers because of the lack of access to hardware and training opportunities. Although these impediments are slowly dwindling as computer banks appear in senior centers, churches, libraries, senior residential facilities, low-income housing, and a number of other locations in urban settings, many older adults in this environment remain offline in the Internet age.[2]

Therefore, the purpose of this study was to examine the characteristics associated with computer use by urban older adults. A secondary data analysis was conducted using the 2001 Detroit City-Wide Needs Assessment of Older Adults data set.[22] This research examined the following research questions: (1) What is the prevalence of computer usage among urban older adults, and what are these users' demographics, characteristics, place of access, and preferred activities? and (2) what are the differences in demographic characteristics, health, and social activities between older adults in an urban setting who use computers and those who do not?

METHOD

Data used in this analysis were gathered as part of the 2001 Detroit City-Wide Needs Assessment of Older Adults conducted by the city of Detroit, MI.[22] The purpose of the original evaluation was to explore the environmental conditions and needs of older adults in the areas of housing, health, transportation, and services utilization in Detroit. The target population for the study consisted of all noninstitutionalized persons 60 years or older living in the city of Detroit, MI. A probability sample of 1410 residents (140 participants per sector) was selected using a stratified random sampling of a 10-neighborhood cluster (developed in 1997 as part of the Community Reinvestment Strategy to divide the city into 10 sectors for the purpose of city department planning; see Chapleski[22] for details on sampling methods and sample characteristics).

A computer-assisted telephone interviewing facility was used for data collection. The facility included 10 telephone interviewing stations and a staff of trained telephone and face-to-face interviewers. Telephone interviews were conducted using a random-digit dial telephone system. Interviewers reached participants by telephone, conducted the interview, and concurrently entered responses into a computer work station. Data were then transferred to the data-processing unit. Additional face-to-face interviews were conducted by randomly selecting older individuals from a block listing in a subset of neighborhoods. Interviews were conducted at a place convenient to participants, usually their own homes. Post–stratified-sampling weights were used in all analyses to guarantee that all areas of the city of Detroit were represented in proportion to the total population of eligible participants.

By using these methods, self-report data were collected from 1310 participants by telephone and 100 individuals by face-to-face interviews, for a total participant number of 1410 (82.5% African American, 12.5% white). The average age for the sample was 71.69 years (SD, 7.68 years). A majority of participants were retired (71.4%, n = 958) and female (70.6%, n = 995). More than half of the participants reported a high school education or greater (59.1%, n = 822), and almost two-thirds of the sample had an annual income of less than $20 000 (66%, n = 797). Detailed sample demographic characteristics are reported in Table 1. The study population was similar to the 2000 Detroit City census data on age and ethnicity. Female participants were overrepresented (70.6% compared with 59.6%), and male participants were underrepresented (29.4% compared with 40.3%).[22]

Measurement

The sample was divided into computer use and nonuse groups using a self-reported computer use item. The demographic data consisted of age, sex, education, employment, income, and race/ethnic group. Health measures considered were the following: frequency of seeking medical care, chronic health conditions, prescribed and

Table 1

Comparison of Demographic Characteristics Between Computer Users, Computer Nonusers, and the Total Sample

Variable	Computer User (n = 386; 27%)	Computer Nonuser (n = 1024; 73%)	Total (n = 1410)
Age, mean (SD), y	68.259 (6.234)	72.740 (7.794)	71.609 (7.658)
Sex, no. (%)			
Female	275 (71.2)	720 (70.3)	995 (70.6)
Male	111 (28.8)	304 (29.7)	415 (29.4)
Education, no. (%)			
Less than high school	59 (15.6)	486 (49.9)	570 (40.9)
High school	69 (17.9)	255 (26.2)	331 (23.8)
Greater than high school	251 (66.2)	233 (23.9)	491 (35.3)
Employment, no. (%)			
Employed	133 (36.0)	96 (10.3)	231 (17.2)
Unemployed	22 (6.0)	129 (13.8)	153 (11.4)
Retired	214 (58.0)	711 (76.0)	958 (71.4)
Income, no. (%)			
<$20 000	136 (39.3)	661 (76.7)	797 (66.0)
>$20 000	210 (60.7)	201 (23.3)	411 (34.0)
Race/ethnic group, no. (%)			
American Indian/Aleut/Eskimo	3 (0.8)	6 (0.6)	9 (0.7)
Asian/Pacific Islander	3 (0.8)	0 (0.0)	3 (0.2)
Arab/Middle Eastern	0 (0.0)	1 (0.1)	1 (0.1)
Black/African American	303 (80.4)	823 (80.4)	1126 (82.5)
Hispanic/Latino	5 (1.3)	15 (1.5)	20 (1.3)
White	53 (14.1)	140 (13.8)	193 (12.5)
Other	10 (2.7)	29 (2.9)	39 (2.7)

over-the-counter medications, the 12-item Short-Form Physical Health and Mental Health Survey (SF-12), and senior optimism. Social activity was measured by active leisure activity, membership in organizations and neighborhood groups, and volunteer work.

Procedure

The interview included questions about computer use, access, and activities performed. Participants were asked if they had used a computer in the past year. If they answered yes, they were then asked where they used it (home, school or university, library, and senior or recreation centers) and what activities they performed (communicating via e-mail; conducting Internet searches; writing letters, journals, or notes; playing games; and purchasing goods and services online).

Interview questions about health included the SF-12: the Physical Component Summary (PCS) and the Mental Component Summary (MCS). In addition, other variables studied were senior optimism, recent visits to healthcare providers, use of prescribed and over-the-counter medications, and identification of chronic health conditions. The SF-12 was used to measure health status from the participant's point of view using a 4-week recall. The SF-12 is a subset of the SF-36 PCS and MCS, representing all eight dimensions (physical functioning, role functioning physical, bodily pain, general health, vitality, social functioning, role functioning emotional, and mental health) of the SF-36.[23] The instrument uses a Likert scale of 1 to 3 (1 = limited a lot, 2 = limited a little, 3 = not limited at all) for physical function items and 1 to 6 (1 = all of the time, 6 = none of the time) for vital and mental health items. Results are expressed in terms of two metascores: PCS and MCS. The test-retest correlation was reported as 0.89 for the PCS and 0.76 for MCS.[24] Higher scores on the PCS and MCS indicate better health. The SF-12 mean scores for PCS and MCS for persons aged 65 to 74 years were 43.65 and 52.10, respectively, and for those 75 years and older, mean scores for the PCS and MCS were 38.65 and 50.06, respectively, in this original study.[25]

The following question was used to evaluate senior optimism: "Some people say that being a senior citizen is the best time of your life. Do you (1) strongly disagree, (2) somewhat disagree, (3) neither agree nor disagree, (4) somewhat agree, or (5) strongly agree?" The response was recoded as follows: 0 = disagree, 1 = neutral, 2 = agree. A high score on this item indicated senior optimism.

Four questions were used to determine recent visits to healthcare providers. The stem of each question began with "During the past 12 months, how many" and ended with (1) times have you seen a medical doctor, (2) different times were you a patient in the emergency room, (3) days were you an inpatient in a hospital, and (4) days were you a patient in a nursing home or other

long-term care facility. Medication use was determined using two questions: (1) "How many prescription medicines are you currently taking?" and (2) "How many over-the-counter or nonprescription medicines are you currently taking?" Chronic health conditions were determined from the question, "Within the past year, has your doctor, nurse, or health provider treated you for or told you that you have" followed by a list of 16 common chronic conditions found in older adults.

Three aspects of social activity were examined: (1) active leisure time activities, (2) membership in community organizations or neighborhood groups, and (3) doing volunteer work. Active leisure time activities were one of three factors identified from a principal components factor analysis with varimax rotation using a list of 13 social activities (going to museums, art exhibits, or cultural activities; watching TV; participating in sports/exercise; attending sports events; listening to music; playing bingo; traveling; vacations; reading books, magazines, or newspapers; going to casinos; social outings, and gatherings; engaging in creative activities such as arts, crafts, handiwork, taking classes, or learning something new; and going to church). The active social activities were those that required individuals to leave their homes to participate (bingo, travel, social outings, church), whereas passive activities could be done within the place of residence (reading, crafts, handiwork). Only active leisure activities were used in this analysis. (The third factor identified was gambling activity, not included in our active leisure time category.) The stem for each of the 13 questions was: "Thinking about how you spend your time, could you tell me how much you enjoy" followed by an activity. The response selection included (1) a lot, (2) a little, (3) not at all, or (4) unable to participate.

Membership in community organizations was determined with a yes or no response to the following question: "Are you a member of any community organizations or neighborhood groups?" Doing volunteer work was also determined with a yes or no response to the following question: "Do you do any volunteer work? By that I mean both formal and informal work at an agency, hospital, or church or caring for a family member, friend, or neighbor."

Data Analysis

Descriptive statistics were used to obtain the summary measures for all data including a description of the sample characteristics. Descriptive statistics included means and SDs for continuous variables. Categorical variables were represented in frequencies and percentages. Because of departures from normality assumption, the Mann-Whitney *U* test was used to find differences in continuous variables between computer users and nonusers on demographic, health, and social activity variables. For the categorical data, analysis of frequency (χ^2 test) was used to test the homogeneity of the categorical response variables with respect to the two groups. Logistic regression was used to examine the possible differences between computer users and nonusers with respect to individual demographic characteristics, health, and social activity.

RESULTS

Of 1410 respondents, 386 (27%) had used a computer and 1024 (73%) had not used a computer, as shown in Table 1. Bivariate analyses revealed a number of differences between computer users and nonusers. Findings indicated that computer users (mean [SD] age, 68.53 [6.23] years) were younger than nonusers (72.74 [7.79] years). A statistically significant difference was found in mean rank age between computer users and nonusers ($Z = -9.145$, $P = .001$). Education was coded into three categories (less than a high school education, a high school education, and greater than high school education). Overall, 35.3% of the sample had greater than a high school education, with computer users (66.2%) more likely to have greater than a high school education than did nonusers (23.9%). Employment was coded into three categories (employed, unemployed, and retired). Computer users (36%) were more likely to be employed than nonusers (10.3%), with the overall employment rate for the sample at 17.2%. Income was coded into two categories: less than $20 000 per year and greater than $20 000 per year. Overall, 34% of the (total) sample had an income greater than $20 000, and more computer users (60.7%) had an income greater than $20 000 than did nonusers (23.3%). Using the χ^2 test, statistically significant differences were found between computer users and nonusers on education ($\chi^2 = 230.202$, $P = .0001$), employment ($\chi^2 = 130.828$, $P = .0001$), and income ($\chi^2 = 153.649$, $P = .0001$) (Table 2).

Findings indicate that most users had access to computers in their homes. Some respondents (43.8%) reported that they used computers at other locations such as a relative's or friend's home, office, church, workplace, volunteer workplace, WebTV, and even the bowling alley. Similar to findings from other studies, the most common computer activity was conducting Internet searches (63.2%), followed by playing games (55.1%), writing (54.8%), and communicating via e-mail (52.8%).

Using the Mann-Whitney *U* test, statistically significant differences were found between computer users and nonusers on all health variables: senior optimism ($Z = -3.57$, $P = .0001$), number of healthcare provider visits ($Z = -4.05$, $P = .0001$), hospital days ($Z = -4.6$, $P = .0001$), number of prescription drugs ($Z = -3.46$, $P = .0001$), index of illness/disease ($Z = -4.24$, $P = .0001$), SF-12 PCS

Table 2

Results of the χ^2 Test Between Computer Users and Computer Nonusers for Sex, Education, Employment, Income, and Racial/Ethnic Group

Variable	Computer User, no. (%)	Computer Nonuser, no. (%)	Total	χ^2	*P*
Sex				0.117	.744
Female	275 (27.6)	720 (72.4)	995		
Male	111 (26.7)	304 (73.39)	415		
Education				230.202	.0001
Less than high school	59 (10.4)	511 (89.6)	570		
High school	69 (20.8)	262 (79.2)	331		
Greater than high school	251 (51.1)	240 (48.9)	491		
Employment				130.828	.0001
Employed	133 (57.6)	98 (42.4)	231		
Unemployed	22 (14.4)	131 (85.6)	153		
Retired	214 (22.3)	744 (77.7)	958		
Income, $				153.649	.0001
<20 000	136 (17.1)	661 (82.1)	797		
>20 000	210 (51.1)	201 (48.9)	411		
Race/ethnic group				8.738	.189
American Indian/Aleut/Eskimo	3 (33.3)	6 (66.7)	9		
Asian/Pacific Islander	3 (100)	0 (0.0)	3		
Arab/Middle Eastern	0 (0.0)	1 (100)	1		
Black/African American	303 (26.9)	823 (73.1)	1154		
Hispanic/Latino	5 (25.0)	15 (75.0)	18		
White	53 (27.5)	140 (72.5)	176		
Other	10 (25.6)	29 (74.4)	38		

($Z = -6.09$, $P = .0001$), and SF-12 MCS ($Z = -3.93$, $P = .0001$). Computer users were significantly healthier when compared with computer nonusers. Computer nonusers reported a higher number of healthcare provider visits, hospital days, number of prescription medications, and number of diseases than did computer users.

Using the Mann-Whitney *U* test, a statistically significant difference was found between computer users and nonusers on active leisure activity score ($Z = -9.900$, $P = .0001$). Computer users were found to have more active leisure activity than did nonusers. Using the χ^2 test, a statistically significant difference was found between computer users and nonusers regarding membership in community organizations ($\chi^2 = 67.48$, $P = .0001$) and volunteer work ($\chi^2 = 71.13$, $P = .0001$). Computer users participated more frequently in community organizations (44.3%) and volunteer work (47%) than did nonusers (22.36% and 23.73%, respectively).

Binary logistic regression models, permitting the use of both continuous and categorical variables, were constructed to determine whether differences existed between computer users and nonusers in terms of demographic characteristics, health, and social activity variables. Variables that were significantly different between the two groups using the Mann-Whitney *U* and the χ^2 tests were included in the logistic regression model. The results of logistic regression indicated that the following variables were significantly discriminated between computer users and nonusers: age, SF-12, hospital visit, education, employment, income, organization membership, and volunteering. In addition, the computer users were 2.280 times more likely to be employed, 1.581 times more likely to have membership in community organizations, and 1.807 times more likely to do volunteer work (Table 3).

DISCUSSION

The purpose of this study was to explore the Digital Divide in urban older adults and to determine the prevalence of computer usage and its correlates. To the best of our knowledge, computer usage among urban older adults has not been previously reported; therefore, our findings are an important contribution to the knowledge base in this area.

In this study, 27% of the sample reported computer usage, which is slightly higher than the prevalence reported in previous studies for older adults in general (21% nationally).[26] Our findings suggest that the African American older adults surveyed in this study are about as likely to use a computer as older adults who are white. In addition, our research indicates that computer activities were similar to those of previous studies. The most frequently reported activities were using the Internet to conduct searches (63.2%), followed by playing games (55.1%), writing letters or other documents

Table 3

Logistic Regression Model for Predicting Computer Use in Urban Elders

Variable	β	SE	*P*	Odds Ratio	95% CI
Age	−0.0703	0.0136	<.0001	0.932	0.908–0.957
SF-12 PCS	0.0271	0.00941	.0039	1.027	1.009–1.047
Hospital visit	−.0813	0.0342	.0174	0.922	0.862–0.986
Educ[1]	−1.5589	0.2167	<.0001	0.210	0.138–0.322
Educ[2]	−1.0903	0.2138	<.0001	0.336	0.221–0.511
Emp[1]	0.8242	0.2047	<.0001	2.280	1.527–3.406
Emp[2]	−0.4465	0.3676	.2246	0.640	0.311–1.0315
Income	−0.7276	0.1770	<.0001	0.483	0.341–0.683
Member	0.4579	0.1879	.0148	1.581	1.094–2.285
Volunteer	0.5917	0.1802	.0010	1.807	1.269–2.573

Abbreviations: CI, confidence interval; PCS, physical component summary.
Educ[1] refers to using less than high school education and more than a high school education as the two categories.
Educ[2] refers to using high school education and more than a high school education as the two categories.
Emp[1] refers to using those employed and those retired as the two categories.
Emp[2] refers to using those unemployed and those retired as the two categories.

(54.8%), and communicating via e-mail (52.8%). These findings are similar to those of Fox,[26] who reported that older adults who go online value the Internet as a useful tool to stay in touch with family members and friends and also for mental activity. Although trends continue to demonstrate increasing computer usage by the elderly,[27] the current data suggest that only about a quarter of urban older adults are using computers, demonstrating that the Digital Divide affects this population. Furthermore, although there are several limitations to this study (secondary data analysis, cross-sectional design, and a specific sample population), which make it difficult to generalize the findings to all urban older adults, an interest in the use of IT within this population has been confirmed. Urban older adults, like other older adults, are interested in using the Internet.

Computer use among urban older adults was associated with several demographic and health variables. Overall, computer users in the sample were younger, had a higher level of education, were more likely to have an income greater than $20 000, were more likely to be employed, and were healthier and more active than nonusers. They also were more likely than nonusers to have memberships in community organizations and do volunteer work. Thus, the discriminating factors between computer users and nonusers in the sample included not only age, education, employment, and income but also health status (SF-12), hospital visits, organization membership, and volunteering.

The implication of these findings is that older adults who are most vulnerable in terms of poor health and low economic status are least likely to be using computers. Thus, intervention research is needed to determine the interest in, access to, and best ways to assist these older individuals in using computers. An example of a program that increases access and promotes usage can be found in an apartment community of urban older adults in the city of Detroit. Using the Housing and Urban Development Neighborhood Network model of community partnership, one of the authors currently provides computer training to interested residents in a new technology center (10 computer workstations with broadband Internet access). The program has been met with overwhelming enthusiasm by residents, demonstrating how access to and training in using computers improves interest in use among urban older adults. Continued investigation is needed to identify how access to and training in computers and the Internet can affect quality of life for urban older adults. While this study focused on urban seniors living independently in the community, similar research is needed to investigate potential interest in, access to, and use of computers among urban frail elders in adult day care centers, assisted living, and nursing home facilities.

Although at first glance computer use might be thought of as a simple personal preference, it can be argued that the use of computers on issues related to health and social support should be strongly encouraged. The Internet is a promising tool for providing urban older adults with health information as well as tailored interventions that can address health disparities, outcomes, and cost. Even though the current study investigated health-related issues among the participants, no questions were asked related to the use of the Internet for seeking health information or using available health management tools. Thus, further study is needed to determine the interest in using the Internet as an information source to manage health. Even though online tools for self-managing health are available on the Internet, most tools are not particularly user-friendly for elders. Therefore, tailored interventions need to use current scientific research related to criteria for accessibility to online information for older adults. Such guidelines were developed and used in the NIHSeniorhealth.gov

Web site, a joint project of the National Library of Medicine and National Institute of Aging.[28]

CONCLUSION

This study found that the prevalence of computer use and activities among urban older adults is similar to that of older adults in general. In addition, significant differences not previously reported were found in demographic and health-related characteristics between urban elder computer users and nonusers. These findings indicate that the Digital Divide continues to exist in the urban setting. This has implications for future investigations, especially in the area of health information and management tools, as well as development of new innovative programs that will be important to moving forward in improving use and access for this population.

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