

## **Do Race, Place, and Poverty Affect Internet Access?**

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The World Wide Web has become essential to our lives. But many individuals continue to have sporadic or nonexistent access even if they have fairly positive attitudes towards technology in general. National level results indicate that age, education, race and income are all important determinants in internet use (US Dept. of Commerce 2002). Teenagers are almost twice as likely as those over age 50 to use the Internet, high income families are about two and a half times more likely to use the Internet compared to very low income families, the highly educated are nearly six times more likely than those without a high school degree, and whites and Asians far outstrip Internet use among blacks and Latinos.

Yet such top level percentages hide a dynamic that is far more complex and multicollinear. Like any other commodity, Internet access is something that can be purchased. It is also something often available at the workplace. Yet Internet access has yet to reach saturation levels among all segments of the population. It requires familiarity and a positive attitude towards the technology.

Current research indicates that race and poverty play a role in conditioning attitudes and in enabling access to the Internet (Mossberger, Tolbert and Gilbert 2006). Income consistently appears as an important determinant. Race appears to be significant as well, but perhaps more because of its association with income levels. In fact, some studies suggest that African Americans as a group exhibit a more positive attitude towards Internet technology when income is held constant.

What of the importance of place? All metropolitan neighborhoods enjoy at least theoretical access – most have access to broadband channels such as cable or DSL. In this sense, place would not appear to be a factor. But place can be quite important in a number of ways. The first simply has to do with composition: places with a high percentage of lower income individuals, for instance, will exhibit a lower level of Internet access because lower income individuals do not use the Internet as much. The second place effect persists in addition to such compositional factors. We might speculate that living in a high-poverty area decreases technology access and use beyond the influence exercised by an individual's education, age, income, race, and ethnicity. This is analogous to hypotheses relating segregation levels to unequal opportunities. In the case

of Internet access, deprived neighborhoods will have fewer Internet “role models” available. Also, the schools in such neighborhoods will not properly introduce students to the technology. The third place effect could simply be a function of decreased opportunity. People who cannot or will not purchase their own Internet access often get it somewhere else. The workplace is a popular venue, but we might speculate that the combination of higher unemployment and fewer job opportunities in particular neighborhoods makes this a less likely prospect. And what of individuals who have no Internet at home or at work? In this case, they will rely on schools, libraries, and friends to help provide access. In such instances, there may be a clear desire and motivation to go online on the part of these individuals, but there are community barriers that prevent them from gaining access.

This study attempts to understand those factors that help to determine Internet use and to separate out factors that are individual in nature (such as age and income) from factors related to the neighborhoods within which people live. It employs two important sets of data. First it incorporates results from a customized random-sample telephone survey conducted in three Northeast Ohio communities in 2005. Second, it takes each respondent address and creates a series of regional buffers, as well as information related to distances from the nearest library and work, to devise a local context for each respondent.

### **Differences Between Three Northeast Ohio Communities**

To begin this study, we selected three Northeastern Ohio communities, representing a racial and socio-economic continuum: East Cleveland, Shaker Heights, and Youngstown. With a city-wide poverty rate of 32 percent, East Cleveland has many neighborhoods that fit the 40 percent threshold for concentrated poverty. Like many other communities characterized by this level of poverty, it is also highly racially segregated. The population of East Cleveland is 93 percent African-American, according to the 2000 census. East Cleveland is a majority-African American community directly adjacent to the east side of the City of Cleveland.

Shaker Heights is a racially diverse city, with a population that is about 60 percent white, 34 percent African-American, and 3 percent Asian-American. But Shaker Heights stands in stark contrast to the other two communities economically. The poverty rate is only 7 percent, and median household income is \$64,000 – more than three times the median income in East Cleveland and over 2.5 times the median income in Youngstown. This is also more than 50 percent higher than the median household income for the state of Ohio, which is about \$40,000.

With a population of nearly 80,000 people, Youngstown is more than twice as large as East Cleveland and Shaker Heights (which each have less than 30,000 people). Youngstown has suffered considerably because of the closure of steel mills and related economic activities. Youngstown also has a high poverty rate, about 25 percent city-wide. There are areas of concentrated poverty throughout the city, but there is more variation overall. The median household income of \$24,201 is about \$3,700 higher than

in East Cleveland. Non-Hispanic whites comprise about 51 percent of the population and African-Americans about 44 percent. Approximately 5 percent of Youngstown residents are Latino.

There are clear differences in information technology use between the three cities. When asked “Do you ever use the Internet, for any reason?,” only 52 percent of respondents in East Cleveland and 51 percent in Youngstown answered yes, in comparison with 79 percent of the respondents in Shaker Heights. Even among those who did respond that they have used the Internet, there are contrasts in the places where they use computers or go online, and these differences have implications for frequency of access and opportunities to develop skills. Only 39 percent of East Cleveland residents had Internet access at home, compared to 46 percent of Youngstown residents and 76 percent of Shaker Heights respondents. Although only 39 percent of East Cleveland residents have Internet access at home, 52 percent of them have still gone online, indicating that for at least 13 percent of these respondents home is not the primary place of use. This differs markedly from the other cities. There are only 5 percent more Youngstown residents and 3 percent more Shaker Heights residents who report being online in comparison with the percentage of residents who have Internet connections at home.

Table 1 below shows a greater tendency among East Cleveland residents to rely on public access and networks of friends and relatives. We asked respondents to name the three most frequent places where they used computers in the past month, and then asked how often they had used them in that place in the past month.

**Table 1. Place Where Respondent Uses Computers and the Internet *Most Often***

	<b>E. Cleveland</b>		<b>Youngstown</b>		<b>Shaker Heights</b>	
	Computer	Internet	Computer	Internet	Computer	Internet
Work	22.5%	15.6%	20.7%	16.6%	36.7%	32.4%
Home	55.0%	63.0%	70.1%	71.3%	59.0%	62.6%
Library	7.0%	6.3%	2.4%	3.2%	2.2%	2.7%
*School	6.2%	3.9%	1.8%	1.3%	0.4%	--
Friends/	7.0%	8.6%	1.8%	6.4%	1.3%	1.8%

\*All respondents are adults

While home is the most frequent place of use for computers and the Internet for all cities, it is interesting to note that work is the most frequent place of use for a much higher percentage of residents in affluent Shaker Heights. Libraries (or community centers), schools, and friends or relatives are the *most frequent place of use* for a higher percentage of East Cleveland residents; nearly 20 percent of East Clevelanders who use technology access both computers and the Internet most frequently outside home or work. This compares with only about 6 percent of computer users and 11 percent of Internet users in Youngstown, and 4 percent of computer users and 4.5 percent of Internet users in Shaker Heights.

A higher proportion of East Cleveland residents rely upon their social networks for technology use, as well as upon public access. Social networks may play a more important role in technology use in low-income communities, according to our data. This is consistent with studies of “kinship,” lending, and resource-sharing in low-income communities (Stack 1974). Still, it is unlikely that personal networks alone can fulfill the need for technology use, and while public access has made important contributions, the limits of technology use in poor communities are apparent.

Because home and work are the most common places for frequent access, this means that East Cleveland residents are likely to use computers and the Internet much less regularly. Frequency of use suggests both regular access and the skill to use technology. In East Cleveland, 31 percent of Internet users went online 10 times or less in the past month in the place where they used the Internet most often. This compares to 20 percent and 15 percent of Internet users in Youngstown and Shaker Heights who went online 10 times or less in the place where they most frequently used the Internet. These individuals have less time to become familiar with the Internet and to develop skills in searching for information.

Overall, East Cleveland stands out when we compare cities. But, do the poorest neighborhoods in Youngstown look similar to East Cleveland? Table 2 below shows that respondents living in areas with poverty rates of 30% or more in Youngstown have higher rates of Internet use outside of home or work than in Youngstown as a whole. Although respondents in high-poverty areas in East Cleveland show somewhat higher rates of use outside home and work than similar neighborhoods in Youngstown, the high-poverty neighborhoods outrank their cities in use outside home and work in both instances. This indicates what may be a more general trend, in other very poor communities (see Gates Foundation 2004). Institutions and especially libraries provide the sole or primary means of Internet access.

**Table 2. Where Internet is Used Most Often in Youngstown and East Cleveland, Overall and in High-Poverty Areas.**

	Youngstown	East Cleveland	Youngstown 30% or more poverty	East Cleveland 30% or more poverty
<b>Sample Size</b>	164	128	29	89
<b>Home</b>	71.3%	63.3%	67.9%	58.9%
<b>Work</b>	16.6%	15.6%	14.3%	17.8%
<b>Other</b>	12.1%	21.2%	17.9%	23.3%

### **Individual and Contextual Factors Driving Internet Use**

We use multivariate analysis to explore the individual and contextual factors that explain higher rates of Internet use and to examine the relative significance of race, income and place.

Based on the literature, we hypothesize that contextual characteristics matter in patterns of technology use. Three primary hypotheses structure this research: 1) We expect that individuals residing in areas with enhanced socioeconomic characteristics, measured by average household income and percentage of college graduates within a half-kilometer of the respondent's residence, will use the Internet more than individuals residing in areas with resource-poor socioeconomic characteristics. 2) We also hypothesize that individuals who do not possess daily Internet access will use technology more when residing closer to a public access site. Distance to the closest public library from a respondent's home is used to measure proximity to public access. In each community in the sample, libraries are the primary and only consistent public access sites. 3) Finally, we hypothesize that individuals living in communities with a high proportion of African-Americans will use technology outside home and work more than individuals residing in more heterogeneous communities. Prior research at the zip code level (Mossberger, Tolbert and Gilbert 2006) shows that disparities among African-Americans are due to place effects of segregation and concentrated poverty rather than an individual's race alone. Yet, the descriptive data here suggest a positive impact for technology use *when we are considering those individuals who lack regular access*. Individuals who are poor and living in high-poverty areas may lack frequent access, but are making efforts to go online nonetheless.

After exploring the use of several different dependent variable specifications, we decided that a simple binary of "Do you use the Internet?" provided the most meaningful results. Individual-level attributes were those found in most studies of the "digital divide". Binary variables measure gender (male), race (black), and children (presence under 18 years old). Education is measured on a five-point scale with responses ranging from 1= less than a high school degree to 5= postgraduate work. Age is recorded in years. Income is measured on a five-point scale with responses ranging from 1 =<\$18,000 to 5 = over \$72,000.

Next we include contextual factors that control for socioeconomic characteristics of the respondent's community as well as distance to the closest technology public access site (or public library) in the three communities. In order to best represent the context of each individual, we created a series of buffers around each respondent's place of residence. Information that is available at the block group level – such as educational attainment, race, and income – could be calculated for each buffer. A geographic information systems package was utilized to extract and reassemble the information for each context. Because each respondent had a unique residential location, there were as many buffers as there were respondents. These buffers could be of any radius, and we developed buffers of both one kilometer and a half kilometer in radius. In the end, we decided to utilize the ½ kilometer buffers as a way to determine a respondent's more immediate neighborhood environment. The buffered variables allow us to build models that take the effects of place into account even more accurately than census tracts or block groups.

Table 3 presents the results of our study, using the entire sample. The first model in the left-hand column includes the variables measuring the respondent's individual characteristics as predictors for using the Internet. Consistent with previous research on digital inequality (Mossberger, Tolbert and Stansbury 2003; US Department of Commerce 2002; Lenhart 2003) we find that respondents who are more affluent, educated, young, and parents are statistically more likely to use the Internet at home than respondents who are poor, less-educated, older and childless. Also, African-Americans are statistically less likely to use the Internet than whites. Prior survey research (Mossberger, Tolbert and Stansbury 2003) demonstrates African-Americans' lower rates of access and skill, despite their positive attitudes toward technology. In sum, a number of individual predictors are statistically associated with the dependent variables of home computer access and frequency of Internet use at home, and these are consistent with previous studies.

**TABLE 3: Do you use the Internet? Individual FULL SAMPLE Community**

<b>FULL SAMPLE</b>				
<b>Variables</b>	$\beta$ (se)	p> z	$\beta$ (se)	p> z
<i>Individual Level</i>				
African American	<b>-0.45 (0.21)</b>	<b>0.03</b>	<b>-0.50 (0.27)</b>	<b>0.06</b>
Non African American	---	---	---	---
Education	<b>0.89 (0.11)</b>	<b>0.00</b>	<b>0.83 (0.12)</b>	<b>0.00</b>
Income	<b>0.50 (0.08)</b>	<b>0.00</b>	<b>0.46 (0.09)</b>	<b>0.00</b>
Age	<b>-0.06 (0.01)</b>	<b>0.00</b>	<b>-0.06 (0.01)</b>	<b>0.00</b>
Male	0.03 (0.20)	0.88	0.02 (0.21)	0.92
Female	---	---	---	---
Parent	<b>0.82 (0.23)</b>	<b>0.00</b>	<b>0.83 (0.23)</b>	<b>0.00</b>
Non-parent	---	---	---	---
<i>Community Level</i>				
African American Population			0.28 (0.38)	0.46
College Educated Population			1.33 (1.07)	0.21
Household Income			0.00 (0.00)	0.97
Library Distance			-0.12 (0.09)	0.18
Constant	0.11		0.07	
Cox & Snell R2	0.40		0.41	
Nagelkerke R2	0.55		0.56	

Note: Binary logistic regression coefficients with standard errors in parentheses. Parameters in bold are significant at .10 or better. A dash in the place of coefficients indicates the variable's reference category. Listwise deletion of cases results in a final N of 820 selected cases.

There are no clear differences between the full sample model including variables measuring respondent’s individual characteristics (Table 3, Column 1) and the full sample model including both variables measuring respondent’s individual characteristics and contextual community variables (Table 3, Column 2). None of the contextual variables have a statistically significant relationship with Internet usage. This suggests, when considering all types of Internet access (at home, work, and other places), the areas in which individuals live do not significantly shape their Internet usage.

Like the model containing only variables measuring the respondent’s individual attributes, once we control for the contextual variables – African-American percent of the population, college-educated percent of the population, and average household income within a one half-kilometer radius of the respondent’s residence – we find that respondents who are affluent, educated, young, white, and parents are still statistically more likely to use the Internet at home than respondents who are poor, less-educated, older, African-American and childless. Distance to the nearest library is not significantly associated with general Internet use.

Yet, using the full sample may not really get to the importance of context. This is because the nature of the neighborhood context is more likely to matter to people who lack access at home or at work. Without readily available Internet access at home or work, individuals are forced to look to other individuals in their social networks or public institutions within their communities, such as schools and libraries, to gain access to the Internet. In our sample, 59 percent lacked internet access at home, 80 percent lacked internet access at work, and 54 percent lacked access at both home and work. We thought it might be useful to estimate a model examining only those individuals with obstacles to Internet use to see whether context plays a larger role.

Table 4 reports our two models estimating Internet usage for survey respondents who do not possess access to the Internet at home or work. Largely paralleling the findings for the overall sample, in this model those who are younger, more educated, white and parents are still significantly more likely to use the Internet. However, income is no longer a statistically significant predictor in explaining Internet usage. The sub-sample has a much smaller mean income than the full sample. Thus income may not be a significant predictor because of its lack of variance across the respondents included in the sub-sample.

**TABLE 4: Do you use the Internet? SUB-SAMPLE – Individuals without Internet access at home or work**

<b>SUBSAMPLE</b>				
<b>Variables</b>	$\beta$ (se)	p> z	$\beta$ (se)	p> z
<i>Individual Level</i>				
African American	<b>-0.55 (0.27)</b>	<b>0.05</b>	<b>-0.86 (0.35)</b>	<b>0.01</b>
Non African American	---	---	---	---
Education	<b>0.63 (0.15)</b>	<b>0.00</b>	<b>0.58 (0.15)</b>	<b>0.00</b>

Income	0.06 (0.12)	0.62	0.02 (0.14)	0.87
Age	<b>-0.06 (0.01)</b>	<b>0.00</b>	<b>-0.05 (0.01)</b>	<b>0.00</b>
Male	-0.29 (0.27)	0.27	-0.29 (0.28)	0.29
Female	---	---	---	---
Parent	<b>0.97 (0.30)</b>	<b>0.00</b>	<b>1.08 (0.31)</b>	<b>0.00</b>
Non-parent	---	---	---	---
<b><i>Community Level</i></b>				
African American Population			<b>0.86 (0.52)</b>	<b>0.10</b>
College Educated Population			<b>3.35 (1.59)</b>	<b>0.04</b>
Household Income			0.00 (0.00)	0.30
Library Distance			0.00 (0.16)	0.99
Constant	0.53		0.13	
Cox & Snell R2	0.23		0.24	
Nagelkerke R2	0.33		0.35	

Note: Binary logistic regression coefficients with standard errors in parentheses. Parameters in bold are significant at .10 or better. A dash in the place of coefficients indicates the variable's reference category. Listwise deletion of cases results in a final N of 422 selected cases.

There is a noticeable difference when we compare the coefficients from the full sample model with both individual and contextual variables (Table 3, Column 2) with the sub-sample model with both individual and contextual variables (Table 4, Column 2). Respondents with a greater proportion of African-Americans and a college-educated population within a one-half kilometer radius from the respondent's residence are statistically more likely to use the Internet than individuals living in communities with a smaller proportion of African-Americans or a smaller college-educated population. That is, when we examine only individuals who must regularly seek out Internet access in order to use the Internet, community characteristics become a statistically significant predictor of Internet usage.

Surprisingly, average household income for the buffered area surrounding respondents' residences is not statistically significant. Also, although respondents without Internet access at home or work may rely on public access sites for Internet use, the distance to library variable, which is a measure for the ease of gaining access at a public site, is not statistically significant. Respondents may pursue Internet use primarily (or more frequently) through their social networks, such as friends and family, rather than public institutions. Education and other individual-level variables may be more important for motivating information technology use at libraries than proximity and convenience.

We consider the model in Table 4, Column 2 to be the fully-specified model, but include the other models as a reference to the general population and the influence of individual characteristics (Table 4, Column 1). This analysis suggests that, as hypothesized, community characteristics shape usage rates for those individuals who have obstacles in accessing technology (Internet at home and work), beyond individual-level factors.

Probability simulations are used to understand the substantive magnitude of the effect of geographic factors on Internet use, while holding other explanatory variables constant at their mean or modal values. All simulations are for the sub-sample – that is, those lacking Internet access at home or at work. The probabilities shown in Box 1 below are reported as percentages, but are based on the logistic coefficients reported in our fully-specified model (Table 4, Column 2). The box presents simulations for a hypothetical respondent who is African-American, male, childless, with mean education, income, and age. The respondent is assumed to reside at a location with average African-American population, household income and educational attainment. The distance to the library variable is also set at the mean. Table 5 varies the percent African American and college graduates within one half-kilometer of the respondent’s residence, holding other factors constant.

**Table 5: Impact of Context on Internet Use for African Americans**

	African American %	Probability of Internet Use	College Graduates %	Probability of Internet Use
Very High (+2 SD)	100%	17.10%	50.40%	32.50%
High (+1 SD)	96.30%	16.60%	33.20%	21.00%
Mean	59.20%	12.60%	16.00%	12.60%
Low (-1 SD)	22.10%	8.60%	0.00%	8.20%
Very Low (-2 SD)	0%	8.30%	--	--

Two main findings are striking. First, the size of the African American population and the educational attainment of the community matter substantively and result in disparities in Internet use, holding individual demographic factors constant. Second, educational attainment has a larger impact on Internet use.

Though not as large of a disparity, we find that holding other factors constant, African-American respondents residing in areas with a small African-American population are *less* likely to use the Internet than the same respondent living in a residence with an average or above-average African-American population. This suggests that positive attitudes in communities or social networks with high proportions of African-Americans are supportive of technology use and are associated with the effort that individuals without regular access make to use technology. But, better-educated communities provide an even more conducive environment, either because of social networks or the resources provided in places like Shaker Heights. These results are consistent with the powerful effect that education has in determining technology access and use in general, an effect that has been stable across a number of studies (Katz and Rice 2002; Mossberger, Tolbert and Stansbury 2003; Fairlie 2004). Overall, place factors clearly matter for respondents without Internet access at home or work.

**Conclusion: Do Contextual Factors Matter?**

Despite a greater diffusion of information technology in recent years, regular access and use are still unevenly distributed. A national level survey by the Department of Commerce confirmed wide disparities on the basis of age, education, income, and race.

Such individual disparities tend to effect levels of access between communities. Our examination of three very different northeast Ohio cities demonstrated that communities that are poorer, with a larger minority percentage, also enjoy less Internet access. This is particularly true in the larger numbers of people who have no access at home or regular access at work.

The primary question we are asking in this project is whether these contextual differences matter, even once individual factors have been controlled for. To uncover exactly which variables were significant, we conducted a series of logistic regressions that included both local and contextual variables. In all models, the results of individual factors were largely consistent with previous studies. In the full sample, no contextual factors were significant. But in the sub-sample, that only considered households without access to the Internet at home or at work, two contextual factors emerged as potentially important: the presence of college graduates and the percentage African American within a half kilometer radius of each respondent.

Contextual variables did matter in the subsample. The percentage of African-Americans and the percentage of college graduates in a respondent's immediate environment had a positive and statistically significant effect. In some respects, the positive value of college graduates is an expected result. The presence of college graduates creates a conducive environment for technology use in more affluent communities. It also confirms the high positive relationship between individual education and Internet use.

The positive impact of living within an African American neighborhood is perhaps less expected. Indeed our models indicate that race has contradictory consequences. At the individual level, African-Americans are less likely to be Internet users. In controlling for other factors, however, living in areas with higher African-American populations has a somewhat positive influence. This makes sense when viewed through the perspective of prior research showing more positive attitudes toward technology based on race, and some evidence that African-Americans in more affluent communities have equal or even somewhat higher rates of access than similarly-situated whites (Mossberger, Tolbert and Stansbury 2003; Mossberger, Tolbert and Gilbert 2006).

The most striking aspect of our survey results is the extent to which residents of the poorest neighborhoods make an effort to compensate for a lack of home or work access by using the Internet in a more public place. While we did test for distance to the closest library, and found that this variable was not significant in our models, this in no way obviates the importance of having libraries and other public venues available for those people without work or home access. For many residents in our sample, public access, along with social networks, are crucial in getting residents on-line.

The Internet has become a critical tool in education, information, and citizenship. Those who are unable to access and use the Internet regularly bear higher monetary and time costs for political participation, government services, health, and job seeking. At a community level, widespread lack of access can hamper both the human capital of a neighborhood as well as its local development (Litan and Rivlin 2002). Since we are not

yet at a point where every person can afford Internet access at home or have access available at work, it is necessary to provide services outside. Real change will not be possible unless resources are available in these communities to maintain and improve public access in schools and libraries. Paradoxically, these communities with lower levels of home/work access are also those without the fiscal capacity to provide such services. Community technology centers, youth programs such as Boys and Girls Clubs, and the Gates Foundation have made some contributions. But more needs to be done in order to capitalize on the motivation that is evident in areas where Internet access is low.

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**TABLE A-1: Descriptive Statistics: Individual and Community Variables**

	Mean	S.D.	Min.	Max.	Definition
<b><i>Individual Variables</i></b>					
African American	0.51	0.50	0	1	Dummy coded measure of race (0=all others, 1=African American)
Educate	3.03	1.22	1	5	Index of individual educational attainment (1=some high school or less, 2=high school graduate, 3=some college, 4=college graduate, 5=post graduate work or degree)
Income	3.56	1.69	1	5	Index of individual annual income (1=<\$18,000, 2=\$18,001-36,000, 3=\$36,001-54,000, 4=\$54,001-\$72,000, 5=over \$72,000)
Age	50	18	18	56	Measured in years
Male			0	1	Dummy coded measure of gender (0=female, 1=male)
Parent	0.34	0.47	0	1	Dummy coded measure of parenthood (0=no children, 1=has child (ren))
<b><i>Contextual Variables</i></b>					
African American Population	0.52	0.37	0.00	0.99	Percentage of population African American
College Educated Population	0.25	0.24	0.01	0.87	Percentage of population college graduate
Household Income	3.56	1.67	1	6	Average household income
Library distance (n=962)					Distance to the library