

Race, Place, and Information Technology

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An enduring concern in social science is the difference that environment makes in shaping an individual's opportunities. Scholars have long contended that place matters, particularly the concurrent geography of racial segregation and concentrated poverty (Myrdal 1944; Clark 1965). More recent research shows that serious inequities persist in poor urban communities, despite decades of civil rights and fair housing legislation, and that these restrict opportunities for education, employment, health, and safety (Massey and Denton 1993; Kozol 1991; Kasarda 1990; Hill and Wolman 1997; Rosenbaum 1995; Wilson 1987 and 1996; Jargowsky 1998; Galster, Mincy and Tobin 1997; Sampson et al. 2002). This study offers evidence that the information age may have transformed these existing disparities in very poor communities, particularly inner-city neighborhoods, into new barriers to technological access and skill. The term "digital divide" has been used to describe patterns of unequal access to information technology based on factors such as income, race, ethnicity, gender, age, and geography (Norris 2001; U.S. Department of Commerce 1995). This study explores a new dimension of digital inequality – the role of racial segregation and concentrated poverty.

The ability to use computers and the Internet requires both access and skill, and has important implications for economic opportunity and political participation. Nearly half of American workers with only a high school degree or less use computers on the job, and in skilled, professional, and managerial occupations, computer use is even more pervasive (U.S. Department of Commerce 2002; Mossberger, Stansbury and Tolbert 2003, 65). The diffusion of information technology in the workplace is in an early stage, according to some observers, and promises to increase throughout a range of occupations and industries (McGuckin and Van Ark 2001).

The growth of e-government and the explosion of political information on the web mean that the Internet has already become an important resource for civic and political information.

More interactive uses of e-government and experiments in online voting promise to expand the Internet's significance as a medium for political knowledge and participation (Coglianese 2004; Larsen and Rainie 2002; West 2003). Some research has revealed the Internet's potential for mobilizing voters and citizen participation (Bimber 1999, 2003; Tolbert and McNeal 2003; Shah, Kwak and Holbert 2001; Thomas and Streib 2003; Graf and Darr 2004). Continuing gaps in technology access and use have consequences for equality and political and economic inclusion.

The Paradox of Race and Digital Disparities

One of the puzzles emerging from recent research on digital inequalities is the effects of race and ethnicity. African-Americans and Latinos are less likely to have information technology access and skills, even when controlling for other factors such as income and education (Mossberger, Tolbert and Stansbury 2003, 30, 47). Yet, African-Americans, and to a lesser extent, Latinos, have *more* positive attitudes about information technology than similarly-situated whites. For African-Americans, these particularly positive attitudes encompass a range of issues, from the significance of the Internet for economic opportunity (employment, job-training and education), to a willingness to use public access and to learn new computer skills in a variety of ways (Mossberger, Tolbert, and Stansbury 2003, 51, 53, 69). African Americans and Latinos also have more positive views of public libraries that offer technology access than similarly situated whites. African Americans especially, as well as Latinos, have a consistent pattern of positive attitudes about technology despite lower access rates (Mossberger, Tolbert and Stansbury 2003).

If racial differences in Internet access and skill cannot be explained by apathy toward technology, or by individual differences in income and education, then we must look to other explanations. Stated more directly, if motivation and interest is not the cause of lower minority access rates, what is?

What role does environment play in influencing information technology access and skills – over and above individual characteristics such as income, education, age, race, and ethnicity? Early reports identified lower rates of home computer ownership and home Internet access for urban and rural residents. Urban and rural disadvantage have apparently faded over time, along with gender differences in computer and Internet access (U.S. Department of Commerce 1995; U.S. Department of Commerce 2002). But, what has not been examined is the influence of living in surroundings of *concentrated poverty*. African-Americans, and to some extent, Latinos, are more likely to live in conditions of concentrated poverty than whites because of racial segregation (Massey and Denton 1993, 12). Our hypothesis is that lower rates of technology access among African-Americans and Latinos may be partly explained by environmental effects, since attitudes about technology cannot account for these differences.

Using hierarchical linear modeling (HLM) we provide a test of the demographic factors affecting access to a home computer and Internet use, while also controlling for varying aggregate contexts at the community level (zip code). No previous studies of technology access have explored the impact of environmental factors such as the economic, racial and educational composition of the area. Nor has this type of analysis been conducted with an appropriate methodology, such as multilevel modeling. Since we are testing the problem of inequalities in access to technology, we turn to Mossberger et al. (2003) for national survey data and extend their work with a more definitive test. The unique relationship between nested structures, community attributes and individual technology access and use provide an opportunity and motivation for multilevel modeling.

We begin with a literature review on information technology disparities that explores the ways in which environmental factors may matter for access and skill. The methodology section that follows describes the techniques used in this paper as well as the 2001 national random-sample telephone survey on which this study is based. This survey is unique because it includes

an over sample drawn from high-poverty census tracts. We present the findings from multilevel modeling analysis, which shows that contextual factors do indeed matter for technology access. This study contributes to our understanding of both the “digital divide” and the impact of concentrated poverty on individual opportunity by examining the interactions between race, place, and the ability to use information technology.

Information Technology Disparities at the Individual-level: Review of the Previous Research

While the number of Internet users steadily climbed throughout the 1990s, this growth has leveled off more recently. As of 2003, 45 percent of Americans do not have Internet access at home (Lenhart 2003). This study uses 2001 data, but there has been little change since that time, when 46 percent of Americans were not online at home (Mossberger, Tolbert, and Stansbury 2003; U.S. Department of Commerce 2002). Rates for Internet use measured as access at either work or home are somewhat higher, but still 37% of Americans do not use the Internet in either location (Horrigan 2004). Whether Internet access is measured by connectivity at home and work, research has found systematic inequalities in access to computers and the Internet based on demographic and socioeconomic factors (Lenhart 2003; Mossberger, Tolbert, and Stansbury 2003; Norris 2001; Bimber 2003).

There is a general consensus that inequities are based in part on race and ethnicity, as well as income, education, and age. Major surveys published by the National Telecommunications and Information Administration (NTIA) and the Pew Internet and American Life project present descriptive data that shows that African-Americans and Latinos have lower rates of home access to computers and the Internet (see for example, US Department of Commerce 2002). Research employing multivariate statistical analysis confirms the importance of race and ethnicity even when controlling for other socioeconomic variables (Lenhart 2003; Mossberger, Tolbert, and Stansbury 2003; Bimber 2003; Neu, Anderson, and

Bikson 1999). A few academic studies or market surveys have produced different results, but these studies lack statistical controls or suffer from other serious methodological flaws.¹

Inequities based on gender have diminished over the years (US Department of Commerce 2002), and some predictions have been made that racial and ethnic gaps are currently insignificant or will soon disappear of their own accord. The “strong version” of this scenario is that all differences between groups, including those based on income and education, are being erased by the rapid diffusion of the Internet and computers throughout society (Compaine 2001; US Department of Commerce 2002). To understand why this is not likely requires a closer examination of what digital inequalities entail, at least among some disadvantaged groups.

Policy debate and research have often shared an overly-narrow definition of the divide as an issue of access alone. Access, however, is insufficient if individuals lack the skills needed to use technology. Technical skill, or the ability to use computer hardware and software, is only one dimension of the skills needed to use computers. With the advent of the Internet, technology use requires reading comprehension and the ability to search for, use, and evaluate information. Evidence indicates that this is a more challenging threshold for technology use. Twenty percent of Americans report needing help using a mouse or keyboard, but 37 percent say they need help navigating the Internet (Mossberger, Tolbert, and Stansbury 2003, 45). Segments of the population that have limited basic literacy and little education will not likely develop the more sophisticated skills required for effective use of the Internet. According to the National Adult Literacy Survey conducted in 1992, between 21 and 23 percent of the population operates at the lowest level of literacy, unable to perform more than the most rudimentary tasks (Kaestle et al.

¹ Some market research has found that Latinos have higher rates of access than whites (Walsh 2001). This market survey has been quoted by academic sources (see Compaine 2001, Chapter 14), but it was based on a mail survey, for which the response rate was not disclosed. Nie and Erbring (2000) and Wilhelm (2000) dismiss the influence of race, but Nie and Erbring do not use multivariate statistical controls, and Wilhelm’s findings on race and ethnicity are suspect because of the way in which he analyzed the statistical data. Wilhelm included two dummy variables for whites in his analysis, one variable for race, and one for ethnicity. This created a situation of near perfect multicollinearity. He also used the residual category “other race” as the left-out group in his analysis, again fostering multicollinearity, because of the small number of individuals in that category. As a result, his analysis obscures the real impact of race and ethnicity.

2001). Internet use may have peaked due to the literacy and education requirements of the medium. Some digital inequalities may be a new reflection of fundamental educational divides that follow the geography of race, ethnicity, and class in the United States.

Racial and Ethnic Attitudes toward Technology

The case for environmental effects is also strengthened by other results from the Mossberger, Tolbert, and Stansbury (2003, chapter 4) survey analysis. While over two-thirds of Americans view the Internet and computers as important for “keeping up with the times,” or as important for economic opportunity, African-Americans are significantly more likely to agree with these statements than similarly situated whites. Using multivariate statistical analysis to hold other demographic factors constant, the authors found that 80 percent of Latinos and 78 percent of African Americans agreed with this statement compared to 65 percent of whites. Similarly, 76 percent of African Americans agreed that “you need computer skills to get ahead” compared to only 66 percent of whites, all else equal. African Americans are also more likely than whites to be willing to learn new computer skills in a variety of formats (group instruction, online instruction, printed manuals), and are more willing to use public access sites for computers and the Internet. In terms of actual behavior, the authors report that African-Americans are more likely than whites to have used computers for job search or to have taken an online course. These results are supported by other survey research on Internet job search (Pew 2000), but Mossberger et al. find that racial differences in both behavior and attitudes are statistically significant even after controlling for differences in income and education, and that this behavior is consistent with broader beliefs about the importance of technology for economic advancement.

Attitudinal differences based on ethnicity are less pronounced, but Latinos are more likely than whites to say that the Internet is necessary to keep up with the times, and are more willing than white respondents to take computer classes to learn new skills. Otherwise, Latino

attitudes differ little from those of white respondents in the sample (Mossberger, Tolbert and Stansbury 2003).

Other studies have also shown that African-Americans, Latinos, and urban residents are among the Internet nonusers who are most likely to say they will use the Internet someday (Lenhart 2003).

How Environment May Matter

Research on racial segregation and concentrated poverty suggests structural conditions in poor urban neighborhoods may account for racial and ethnic differences in access and skill. Neighborhoods with 40 percent or more of the population living at or below the official poverty level are often defined as areas of concentrated poverty, and 94 percent of such neighborhoods are located in central cities (Jargowsky 1998). Concentrated poverty is especially prevalent in the Northeast and Midwest, where economic restructuring has been most severe (Jargowsky 1997; Massey and Denton 1993, 12; Wilson 1987 and 1996; Galster, Mincy, and Tobin 1997). African-Americans are most likely to live in such conditions because of higher levels of segregation and urban residence, although Latinos living in central cities also experience concentrated poverty (Massey and Denton 1993, 12). The 2000 census marked a slight reversal in the rapid growth of concentrated poverty that has occurred over the past several decades (Pettit and Kingsley 2003). Still, it remains a significant problem in central cities.

The consequence of this spatial concentration of the poor is the accumulation of disadvantage: inferior schools and neighborhood services; elevated rates for school drop-out and teenage pregnancy; chronic unemployment and isolation from the labor market; high incidence of crime and drug use; deteriorated housing and neighborhood infrastructure; loss of neighborhood businesses; and estrangement from the larger society (Wilson 1987 and 1996; Quane and Rankin 1998; Massey and Denton 1993, 2, 12-13; Holzer 1987; Kasarda 1993). Drawing on this research, we identify three ways in which location could influence technology

access and skill: public and nonprofit institutions (particularly schools, but also libraries and community centers); social networks for information and informal learning; and employment.

Institutions

The potential effect of public institutions is clearest in regard to the quality of education, something that measures such as individual educational attainment fail to capture. There are marked disparities between central city and suburban school districts (Bahl et al. 1992; Bahl 1994). These district-wide inequalities are often exacerbated, however, within the poorest neighborhoods (Kozol 1991). Investment in technology hardware through the federal E-rate program has not closed the technology gap in poor urban schools, despite an increase in the number of computers in poor districts. Students in low-income schools may use technology less frequently because of insufficient teacher training or the time required to familiarize students with basic technical skills that more affluent students have acquired at home. More fundamentally, however, lower levels of student achievement in basic skills such as reading comprehension affect the development of Internet literacy and technical skills (Bushweller 2001; Manzo 2001; Trotter 2001).

Poor communities may also lack adequate institutional supports for technology use at libraries or community centers. Federal grants and non-profit agencies have provided funding for community technology centers in poor neighborhoods, but such centers are not universally available, and their operations often rely upon volunteers or unstable funding sources. One study of Los Angeles conducted by the Tomas Rivera Institute concluded that in many neighborhoods, the only available resource for public access was the neighborhood library (Trotter 2001). According to the American Library Association, 95 percent of libraries in the United States offer public access on at least one computer, and almost half of them provide some type of technical assistance or training for patrons (Trotter 2001). Yet we know little about the extent or quality of these computer services, especially in poor communities.

Both schools and libraries are heavily dependent on local revenues. The needs/resource dichotomy means that central cities have less fiscal capacity to provide public services, despite the need to serve residents who are often unable to purchase equivalent services in the private sector (Rusk 1995, 47). Moreover, central cities have a higher fiscal burden for police, fire, and courts, limiting their ability to invest in other services, such as libraries (Pack 1998). Poor neighborhoods within central cities may fare worst of all, because some studies have indicated lower rates of satisfaction with urban services in minority neighborhoods may reflect actual differences in the quality of services (Van Ryzin et al. 2004; DeHoog, Lowery and Lyons 1990).

Social Networks

Social networks facilitate technology use, according to the Mossberger, Tolbert, and Stansbury (2003) survey. Computers and the Internet are used far more frequently at the homes of friends or relatives than at public access sites. Twenty-percent of all respondents reported using computers and the Internet at the homes of others, and twenty-four percent of respondents without home computers relied on friends and relatives. This is about 10 percentage points higher than rates of usage of public access computers at libraries² (Mossberger, Tolbert, and Stansbury 2003). Informal processes of learning about computers and their uses may be as significant as public access and formal training. Much has been written about the lack of resources and information in social networks in areas of racial segregation and concentrated poverty (Coleman 1988; Wilson 1987 and 1996; Holzer 1987; Ihlanfeldt 1997; Ainsworth 2002; Sampson et al. 2002). Individuals living in high-poverty neighborhoods are more likely to have friends who are out of the job market and less-educated (Rankin and Quane 2000), and may therefore have less exposure to technology through personal networks. A recent survey shows that 31 percent of those who are “truly unconnected,” or who have never used the Internet, say

² Ten percent of all respondents use computers at libraries, whereas 13 percent of respondents without home computers use them at libraries.

that very few or none of the people they know go online, whereas only 4 percent of Internet users report such social networks (Lenhart 2003).

Employment

Finally, the workplace provides formal and informal training in computer and Internet use. Many individuals introduced to computers on the job eventually acquire them at home, so jobs can represent an important step in technology adoption (US Department of Commerce 2002). Low-skill jobs requiring less education are less likely to demand information technology use, but 45 percent of Americans who have a high school education or less used computers at work, and 25 percent used the Internet on the job in 2001 (Mossberger, Tolbert, and Stansbury 2003; see also Holzer 1996, 49; Kruse and Blasi 2000, 72; Moss and Tilly 2001, 83).

To the extent that place of residence affects employment, it may also diminish technology use and skill development. Shifts from manufacturing to the service sector coupled with the movement of many employers to the suburbs may create a “spatial mismatch” between the occupational skills of inner-city residents and the requirements of the knowledge-intensive professional jobs experiencing growth in nearby downtowns (Kain 1968; Kasarda 1990; Hill and Wolman 1997; Galster, Mincy, and Tobin 1997). The spatial mismatch thesis suggests that there are few chances for low-skill central city residents to secure jobs in knowledge-intensive (or computer-intensive) occupations. High levels of unemployment in areas of concentrated poverty may be perpetuated by social networks lacking in information and contacts that could lead to employment or better jobs (Granovetter 1973; Hill and Wolman 1997; Ihlanfeldt 1999).

There is sufficient support in the literature to assert that concentrated poverty may play an important role in limiting individual technology access and skill. Fully testing the causal mechanisms within poor communities goes beyond the data available for this study. Instead, we take the initial step of establishing whether or not concentrated poverty and racial segregation account for the incongruity between African-American and Latino attitudes and technology use.

Research Hypotheses

We hypothesize that place matters in access and use of information technology. Based on the literature, we expect individuals residing in poor socioeconomic environments to be less likely to have access to technology. Three primary hypotheses structure this research, drawn from the empirical literature. 1) We expect that concentrated poverty should reduce technology use, measured by the median income of the respondent's community. 2) We also hypothesize that individuals residing in communities with low educational attainment will have reduced technology access. We use the educational attainment of the respondent's zip code as a proxy for quality of educational opportunities as well as a general measure of socioeconomic context, which might include occupations in the community and a supportive climate for educational achievement. Oliver and Mendelberg (2000) have argued that educational attainment of an area is a more complete measure of socioeconomic context than income. 3) Most importantly, as the title of this paper suggests, we hypothesize that race and place (poverty) interact, to reduce opportunities for economic opportunity, in this case technology access and use. Do African-Americans residing in areas of concentrated poverty have reduced economic opportunities, measured by access and use of technology, than African-Americans residing in non-poverty areas? For Latinos, do ethnicity and concentrated poverty interact to reduce technology use as well? We measure the impact of race and place by creating interaction terms of the race/ethnicity of the respondent and the median income of the community in which they live. This final interaction serves not only as a measure of race and poverty, but of racial segregation, as the literature (and our data) shows most African-Americans and Latinos who are in poverty reside in highly segregated communities.

Low-Income Survey Data

Because we are interested in the environments in which individuals use information technology, we turn to aggregate data to measure social and economic context. This research

extends the findings from a unique 2001 survey reported in Mossberger, Tolbert and Stansbury (2003) by merging the survey data with zip code-level data from the 2000 US Census. Zip codes are commonly used to measure neighborhood-level phenomena (Oliver and Mendelberg 2000) even in central cities (Bondonio and Engberg 2000). For each respondent in the survey we recorded information about the zip code in which they reside using reverse telephone number searches. Environmental data is used to measure socioeconomic context, concentrated poverty, and racial diversity. We focus on two questions (or dependent variables): whether the respondent has a home computer (access), and frequency of home Internet use. Internet use can serve as an indicator for skills, as individuals who use technology frequently develop improved technical competency skills.

The national random digital dialed telephone survey included an over-sample of respondents drawn from all high poverty census tracts in the 48 states, excluding Alaska and Hawaii. High poverty tracts were defined as those with 50 percent or more of the households living at or below 150 percent of the official federal poverty level. The average response rate for the survey was 90 percent.³ Federal data shows that telephone service now reaches 94 percent of the population (U.S. Department of Commerce 1995), so telephone surveys are a reasonable methodology for obtaining sample data even in low-income communities.

Because the survey targeted high poverty areas, the sample included a relatively large proportion of racial and ethnic minorities, compared to standard surveys, improving the validity of the data. Of the 1837 respondents, 70 percent were white non-Hispanic, 19 percent were African-American, 9 percent Latino and 1.5% Asian-American. Thus, Latinos and African-Americans comprised 28 percent of the sample population, compared to 25 percent of the U.S. population in the 2000 census. Thirty-eight percent of the sample had household incomes below

³ While the response rate was high compared to standard surveys, the Kent State University survey lab used multiple call-backs to obtain a completed survey. The large sample of low-income respondents, compared to standard surveys, may have contributed to the high response rate.

\$30,000, allowing accurate inferences to minority and low-income Americans as a whole. The survey generated data that was comparable to large-sample studies. Sixty-one percent of respondents reported having access to a home computer, and 54 percent reported having home Internet access. This closely tracks the figures in the U.S. Census Current Population Survey conducted in September of 2001 – 57 percent for home computer and 51 percent for home Internet access, and 66 percent and 54 percent for computer and Internet use in any location (US Department of Commerce 2002).

Two different dependent variables are analyzed. In the first model, the dependent variable is binary --“Do you personally have a home computer?”--coded 1 for yes, and 0 for no. We estimate a logistic hierarchical linear regression with a binomial distribution. Next, we measure frequency of Internet use with the following survey question: “In the last month, how often did you access the Internet from home” with responses ranging from 1 (zero times) to 5 (more than 100 times). For this model, we estimate an ordinary least squares HLM model.

Explanatory or independent variables measure individual-level demographic and attitudinal factors, as well as geographical characteristics of the respondent’s community (See Table 1 for variable descriptions). As the literature suggests, concentrated poverty is potentially important in technology disparities, but rarely analyzed. Concentration of poverty is measured by median household income at the zip code-level. We measure racial diversity by the percent African-American, Latino or Asian-American population in the zip code. We measure socioeconomic context by the percentage of the population with a high school diploma or higher. This environmental data drawn from the U.S. Census (2000) provides a more complete picture of the influences on technology access and use than relying on the survey responses alone, significantly reducing the random error in our models.

Control variables measure individual-level attributes of the respondents and were included to measure income, education, race, ethnicity, gender, age, and partisanship. Dummy

variables measure gender, race, ethnicity, partisanship, and income. This means that they are coded as categories, with female, African-American, Latino, Asian-American, Democrat, Republican and those with an annual income less than \$30,000 coded 1, and 0 otherwise. For race, whites were the reference group, while for ethnicity, non-Hispanics were the reference group. For partisanship, those without strong partisan identification – independents – were the reference group. Education was measured on a 5-point scale with responses ranging from 1= less than a high school degree to 5= postgraduate work. Age was recorded in years.

The explanatory variable of highest interest is the interaction of respondent's race and place of residence. "Race and place" interactions are created by multiplying an African-American respondent by the median income of his/her community (zip code). This term measures an African-American residing in an area of concentrated poverty vs. an African-American residing in an economically well-off area. Similar interactions are created for Latino respondents. These interactions also serve as a proxy for racial segregation, as our data shows that poor African-Americans have an increased probability of residing in highly segregated communities (zip codes).

The data indicates concentrated poverty and racial segregation tend to go together—as zip codes become poorer, they also become more racially segregated (see box below). Stated another way, poor African-Americans tend to live in more racially segregated areas than middle-class or wealthier African-Americans. Frequencies indicate that 56% of the African-American respondents in the sample reside in zip codes where the majority (51% or higher) of the population are black. When we repeat this calculation for only the zip codes with median income at the mean (\$34,000 per year) or less (the lower half of the sample), the probability of an African-American residing in a primarily black zip code increases to 65%, a 10% increase. When analyzing only poor zip codes (median income less than \$20,000 per year, one standard deviation below the mean), the probability of an African-American residing in a majority black area jumps

to 76%. Thus 3 out of every 4 African-Americans residing in poverty areas also reside in highly segregated communities. These findings are consistent with the literature on the interaction between racial segregation and concentrated poverty based on earlier census data (Massey and Denton 1993). We hypothesize that the combined impact of race and concentrated poverty further reduces access to information technology for racial minorities and the poor.

Concentrated Poverty and Racial Segregation go together: Percent of African-Americans residing in Majority African-American zip codes varying Median Income

	All Zip codes	Zip codes w/ Median Income less than \$34,000	Zip codes w/ Median Income less than \$20,000
African-Americans Chance of Residing in a Majority African- American Zip Code	55.9%	64.9%	75.8%

Multilevel Models

We use hierarchical linear modeling (HLM) to analyze access to a home computer and home Internet use.⁴ Such multilevel models are appropriate to estimate the influences of both individual and community (zip code-level) factors on technology access and use. Multilevel models control for random effects (variation) across geographic levels, allowing for valid estimates of contextual effects. In this case individual-level phenomena are not fixed, but vary across space. The dependent variable fluctuates as well, instead of being a fixed value, and is a function of multilevel influences. Standard modeling approaches fail to account for the true contextual effects than can occur when the dependent variable is a result of multilevel structures. By allowing the dependent and independent factors to vary across context, we may derive more accurate statistical estimates than standard analyses restrained at one level of analysis.

⁴ We estimate generalized linear latent and mixed models. The hierarchical (multilevel) models are random coefficient models. The random effects (intercepts and coefficients) are assumed to be correlated only within the same level, not across levels. Home computer access is modeled using a binomial conditional density and logit link model, whereas the frequency of home Internet use is modeled using linear regression with a gaussian conditional density.

Multilevel models appropriately consider the error structures at both the individual and community (zip code) level. Our multilevel models consist of an individual-level equation (level 1) and a zip code-level equation (level 2). Table 1 presents the descriptive information for each of the variables considered in these analyses, while the appendix provides the correlation matrices for the level 1 and level 2 variables. Of the 1,837 respondents, 1,345 had identifiable zip codes and were included in level 1. At level 2, there were 1,035 unique zip codes. The intercept of the level 1 equation is modeled as a function of level 2 properties and a zip code-level error term. The level 1 and level 2 equations are:

$$Y = \gamma_0 + \beta_1(\text{Median Income}) + \beta_2(\text{Educational Attainment}) + \beta_3(\text{Percent black}) + \beta_4(\text{Percent Latino}) + \beta_6(\text{Percent Asian}) + \varepsilon$$

$$\gamma_0 = \gamma_{00} + \beta_{01}(\text{Income}) + \beta_{02}(\text{Education}) + \beta_{03}(\text{Age}) + \beta_{04}(\text{Male}) + \beta_{05}(\text{African-American}) + \beta_{06}(\text{Latino}) + \beta_{07}(\text{Asian-American}) + \beta_{08}(\text{Democrat}) + \beta_{09}(\text{Republican}) + \beta_{010}(\text{African-American} * \text{Median Income}) + \beta_{011}(\text{Latino} * \text{Median Income}) + \varepsilon$$

Before we estimate a full model with both level 1 and level 2 predictors included, we examine a random coefficients model to determine if: 1) the level 1 predictors are associated with the dependent variable; and 2) each of the level 1 predictors varies significantly across zip codes. Thus, all the level 1 predictors are allowed to randomly vary across districts, while no level 2 variables are included in the equation. In Tables 2 and 3, the first column models the level 1 demographic variables as predictors of having a home computer (Table 2) and frequency of Internet use at home (Table 3). Consistent with previous research on the digital divide (Mossberger, Tolbert and Stansbury 2003; US Department of Commerce 2002; Lenhart 2003) we find the wealthy, educated, young, and white are statistically more likely to have a home computer and use the Internet at home than respondents who are poor, less-educated, older, African-American, and Latino. Individuals with Republican partisanship are more likely to have a home computer than Democrats or Independents, but we found no partisan differences for Internet use. Also, males have higher home Internet use rates than females, but consistent with

other recent research, we found no gender differences for access to a home computer (U.S. Department of Commerce 2002). In sum, a number of individual (level 1) predictors are statistically associated with the dependent variables of home computer access and frequency of Internet use at home.

How Place Matters: Access to a Home Computer

Table 2 presents the hierarchical linear modeling (HLM) analysis of home computer access that contains the individual and the zip code-level predictors. The data is presented using different baselines. Baseline 1 (column 2) includes only one of the two socioeconomic contextual factors--zip code median income without zip code educational attainment due to a moderate correlation between the variables (Pearson $r=.66$, see appendix). Baseline 2 (column 3) includes both zip code median income and educational attainment.

One clear difference between the HLM models (baseline 1 and 2) and the analysis including only the individual-level predictor is that African-Americans are no longer statistically less likely to have a home computer. Once we control for concentrated poverty and low socioeconomic status environments, African-Americans, whites and Asian-Americans have comparable access rates to a home computer. This suggests there are important interactions occurring between racial minorities and the communities in which they live, shaping access to technology. Both baseline models 1 and 2 continue to show that the poor, less educated, older individuals and Latinos (as compared to non-Hispanics) are significantly less likely to have access to a home computer. Controlling for concentrated poverty and educational environments does not diminish the effects of ethnicity on access, as Latinos continue to have reduced access rates compared to white non-Hispanics.

Not only is race no longer statistically significant, we also find that place matters. As shown in baseline 1, concentrated poverty is important. Respondents residing in zip codes with lower median household income are statistically less likely to have access to a home computer,

controlling for other contextual and individual-level factors. Individual-level demographic factors as well as concentrated poverty define the contours of the digital divide in terms of access to a home computer. While previous research has focused on the individual-level predictors of access to information technology, no previous research we are aware of has shown the importance of concentrated poverty and the environment on access to technology.

The educational attainment of the community is also important as shown in baseline model 2 (Table 2). Respondents residing in zip codes with lower educational attainment (measured by percent of the population with a high school diploma or higher) are statistically less likely to have a home computer than those residing in geographic areas with higher educational attainment. This suggests that socioeconomic context (and possibly educational opportunities) measured by educational attainment of a community is important in understanding digital inequalities. In sum, individuals residing in low socioeconomic status environments (measured by median income or educational attainment) have statistically lower probability of access to a home computer.

In both baseline models, Latinos had lower access rates than other racial and ethnic groups, but in baseline model 2, residents of zip codes with higher Latino populations had statistically higher access rates. How can this be? These data indicate that other cultural or regional characteristics of geographic areas with large Latino populations are associated with increased computer use. Latino populations are concentrated in the southwest, a region with the highest percent of high-technology industries. The percentage of African-Americans or Asian-Americans in the respondent's zip code had no measurable impact on home computer access.

The question driving this research, however, is the interaction of race and place on technology access. What is the effect of being a racial or ethnic minority and living in a poor community on the probability of access to a home computer? Hierarchical linear models presented in columns 4 and 5 (Table 2) are identical to those presented in columns 2 and 3, but

also include two interaction terms modeling the effect of an African-American residing in an area of concentrated poverty (black * median income of the zip code of residence) and the effect of a Latino residing in an area of concentrated poverty (Latino * median income of the zip code of residence) on digital access. Column 4 includes the primary predictor for only median income and column 5 for median income and educational attainment in the zip code, paralleling columns 2 and 3 analyzed earlier. We consider the model in column 5 to be the fully specified model, but include column 4 as a reference.

The results are decisive. As hypothesized, the interaction term for African-Americans is statistically significant and negatively related to home computer access. African-Americans residing in areas of concentrated poverty (race * place) have significantly lower access than African-Americans residing in wealthier neighborhoods. Thus race and place (concentrated poverty) interact to further decrease access rates to technology. There is an interactive effect, beyond individual or environmental factors at play. Community poverty and racial segregation are significant impediments for African-Americans in terms of technology access.

Controlling for socioeconomic conditions, we find distinct differences from previous published research on the digital divide, which found racial and ethnic minorities were less likely to have home computer access (US Department of Commerce 2002; Lenhart 2003; Mossberger, Tolbert and Stansbury 2003). The model in column 5 indicates that when we control for the fact many African-Americans reside in very poor areas, the primary coefficient for African-American becomes positive and statistically significant. Controlling for the poor socioeconomic environments in which many minorities live, African-Americans are actually more likely to have technology access. African-Americans residing in non-poverty areas are actually *more* likely than whites or Asian-Americans to have a home computer, once we control for concentrated poverty and racial segregation. This is consistent with previous research showing African-Americans are more interested in using technology for economic opportunity, education

and technology skill acquisition (Mossberger, Tolbert and Stansbury 2003). Thus apathy or motivation is not the problem in reported low access rates for African-Americans, but concentrated poverty is. The interaction term for Latinos residing in areas of concentrated poverty is not statistically significant.

The fully specified model in column 5 indicates not only that race and place interact, but that concentrated poverty (measured by zip code median income) and low socioeconomic status environments (measured by educational attainment) continue to matter and shape access to a home computer. Individuals (or all racial and ethnic backgrounds) residing in poorer zip codes with a smaller percent of the population with a high school diploma are significantly less likely to have a home computer, regardless of individual demographic factors.

How Much Does Place Matter for Access?

Probability simulations are used to understand the substantive magnitude of the effect of demographic, partisan and geographic factors on home computer access, while holding other explanatory variables constant. The probabilities shown in Boxes 1 and 2 below are reported as percentages, but are based on the regression coefficients reported in our fully specified model (column 5, Table 2). The simulations are based on a hypothetical respondent who is female, white non-Hispanic, with independent partisanship, and with values for education, age and income set at their means. The respondent is assumed to reside in a zip code with average African-American, Latino and Asian-American populations, and average median household income and educational attainment. The interaction terms are also set at the mean.

Box 1: Impact of Place on the Probability of Having a Home Computer

	Median household income zip code	Probability of Access	Difference from the Mean	% HS Diploma or more in the zip code	Probability of Access	Difference from the Mean
Very High (+2 SD)	\$61,481	95%	+56	99.18	96%	+57
High (+1 SD)	\$47,599	67%	+ 28	86.59	67%	+28
Mean	\$33,716	39%	0	73.99	39%	0
Low (-1 SD)	\$19,835	11%	- 28	61.41	11%	-28
Very Low (-2 SD)	\$5,953	0%	- 39	48.82	0%	-39

Note: Estimates are based on a hypothetical respondent who is female, white non-Hispanic, with independent partisanship, and with values for education, age, and income set at their mean. The respondent resides in a zip code with average African-American, Latino and Asian-American populations, as well as average median income and educational attainment, measured by the percent of the population with a high school diploma or higher. The interaction terms were also set at the mean. Our hypothetical respondent has a 39% probability of owning a home computer. We have calculated the probability of home computer ownership, varying zip code median income and percent of the population with a high school diploma or higher, holding other factors constant.

Box 2: Who is least likely to have a Home Computer?

- **Resides in an area of Concentrated Poverty** (11% for median zip code income of \$19,835 vs. 67% for median zip code income of \$47,599) – **56 point difference**
- **Resides in areas with Low Educational Attainment** (11% for areas with 61% of population with a HS diploma or more vs. 67% for areas with 87% of population with a HS diploma or more) – **56 point difference**

Note: See note for Box 1.

The communities in which individuals reside are significant for home computer access. Holding other factors constant, respondents residing in areas of concentrated poverty (median income one standard deviation below the mean) were 56 percent less likely to have a home computer than the same respondent living in an upper middle-class community (median income one standard deviation above the mean). Respondents residing in an area of concentrated poverty (median zip code income of \$19,835) had only an 11% probability of access to a home computer in 2001, compared to those residing in an upper middle-class community (median zip code income of \$47,499), which had a 67% probability of access. Stated another way, individuals residing in wealthy communities (two standard deviations above the mean) have a 56% increased probability of a home computer compared to an individual residing in an area with mean income,

all else equal. Individuals residing in upper middle-class community (one standard deviation above the mean) have a 28% increased probability of having a home computer compared to an individual residing in an area of average income, all else equal. An individual residing in an area of concentrated poverty (two standard deviations below the mean) has a 39% decreased probability of computer access compared to the same individual living in a community of average wealth.

Educational opportunities and socioeconomic conditions are also important for technology access. Respondents residing in areas with low educational attainment (zip codes with only 61% of the population with a high school diploma or higher) were 56 percent less likely to have a home computer than the same respondent living in a zip code where 87 percent of the population had a high school diploma—a comparison of one standard deviation above and below the mean. Residents of zip codes with low educational attainment (one standard deviation below the mean) had only an 11 percent probability of having a computer, compared to 67 percent probability of access for high educational attainment communities (one standard deviation above the mean). This suggests that concentrated poverty and educational opportunities in communities shape access to technology in America, beyond individual-level factors.

Of the individual-level variables, many statistically significant factors associated with home computer access follow the contours of the “digital divide” for Internet access (Mossberger, Tolbert and Stansbury 2003; Norris 2001). The differences based on demographic factors are wider than reported in earlier research that did not control for the socioeconomic environment in which individuals reside. For example, previous research found education to be very important in access: all else equal, individuals with a college degree were 21 percent more likely to have a home computer than those with a high school diploma in 2001 (Mossberger, Tolbert and Stansbury 2003, 32). Controlling for environmental factors, we find college

graduates are 60 percent more likely to have home access compared to high school graduates, all else equal.

We also find significant disparities in home computer access based on partisanship. Previous research on the digital divide found Republican partisans were statistically more likely to have home Internet access than Democrats (Mossberger, Tolbert and Stansbury 2003, Chapter 2). Our findings support earlier research, but show much more dramatic gaps. Once we control for environmental factors, Republicans are 57 percent more likely to have a home computer in 2001 than Democrats, all else equal.

How Place Matters: Home Internet Use

Access to a computer is important, but research suggests use of the Internet at home may be more so, both for economic and political opportunities given the migration of employment and government information online.⁵ In this section we repeat the HLM models with and without interaction terms, when the dependent variable is frequency of Internet use at home. We measure frequency of Internet use with the following survey question: “In the last month, how often did you access the Internet from home” with responses ranging from 1 (zero times) to 5 (more than 100 times). While only 55% of Americans have home Internet access, the latest data indicate nearly two-thirds of Americans have Internet access at work, home or school (Horrigan 2004). Since home Internet access leads to more frequent and convenient use this may be more conducive for political participation as well as economic opportunity. We expect that both our individual-level demographic predictors and zip code-level environmental predictors will be related to the frequency of Internet use at home.

⁵ Online job search has become increasingly common with private companies like monster.com, and also the U.S. Department of Labor’s America’s Job Bank (ajb.org). The latter includes jobs at a variety of skill levels. The diffusion of e-government has been extensive as well. All federal agencies and state governments now have websites as a key mechanism for communicating with citizens. At least 80 percent of local governments have e-government websites (Norris et al. 2001).

Table 3 reports our two baselines modeling frequency of home Internet use. When we compare the coefficients from the model with only level 1 predictors discussed earlier to the two baseline models with zip code median income (baseline 1—column 2) or zip code median income and educational attainment (baseline 2—column 3) a noticeable difference is that African-Americans are no longer statistically less likely to use the Internet at home than whites. A similar pattern emerged for home computer access. That is, when we control for place (concentrated poverty), race is no longer statistically significant. Latinos, however, continue to have lower Internet use at home than the reference group non-Hispanic whites. This suggests that concentrated poverty for American Americans is a more significant factor in reducing Internet use rates for blacks than Latinos. Other factors beyond poverty, such as language and education, may be working to reduce Internet use rates for Latinos.

Paralleling the findings for home computer access, we find respondents residing in poorer areas, with lower household median income, are statistically less likely to use the Internet from home, above and beyond individual demographic factors (baseline 1, column 2). Similarly, individuals residing in zip codes with lower educational attainment (measured by the percent of the population with a high school degree or higher) have lower Internet use at home (baseline 2, column 3). Thus place, measured by concentrated poverty and low socioeconomic status, remains an important component of digital inequality—reducing Internet use rates beyond individual-level factors. Individuals living in zip codes with higher Asian-American populations tend to have higher Internet use rates. Since Asian-Americans do not have measurably different use rates than whites, this again suggests that geographic areas with high Asian populations tend to be associated with frequent Internet use. Asian-Americans reside primarily in urban areas, so this variable may serve as a proxy for urban residents who have a structural advantage in broadband access and service providers compared to rural citizens. Asian populations may also serve as a proxy for western regions with many high-technology industries.

Many of the individual-level predictors remain the unchanged from the previous published research (Lenhart 2003) with the affluent, educated and young statistically more likely to use the Internet frequently from home. One exception is the statistically higher Internet use rates for males compared to females, suggesting that while the gender divide in terms of Internet access may have closed (Mossberger, Tolbert and Stansbury 2003), there remain significant differences in Internet usage rates between women and men, with men more likely to engage in frequent Internet use at home than females. In previous research, men's self-reported technology skills were modestly higher than women's – a difference that achieved statistical significance. The persistence of the gender gap suggests that Internet use serves as an indicator of skills, as well as access.

We again include our two primary interaction terms to measure the interplay of race and place in shaping technology use reported in columns 4 and 5 (Table 3). Table 3 include models of Internet use with two interaction terms modeling the effect of an African-American residing in an area of concentrated poverty and the effect of Latino residing in an area of concentrated poverty. Again, the model in column 5 is fully specified model, while the model in column 4 serves as a reference.

Departing from the previous analysis of home computer access, neither of the interaction terms for race/ethnicity and place are statistically significant, but the baseline individual-level predictors and zip code-level predictors continue to be significant. Also, when we include the interaction terms, the primary coefficient for zip code median income fails to be statistically significant. However, zip code educational attainment remains an important predictor of home Internet use. The income level of a neighborhood (measured here by median income of the zip code and also both interaction terms) is apparently more significant for home access. If use serves as an indicator of skill, the link with community educational attainment makes sense;

what matters may be the occupations of residents, attitudes about education within the community, and how these affect technology use.

How Much does Place Matter for Use?

Probability simulations are again used to understand the substantive magnitude of the significant individual and zip code-level predictors on home Internet use, while holding other explanatory variables constant. The probabilities shown in Boxes 3 and 4 below are reported as percentages, but are based on the regression coefficients reported in column 5 of Table 3. The simulations are based on the same hypothetical respondent as in the previous analysis of home computer access.

Box 3: Impact of Place on the Use of the Internet at Home

	% HS Diploma or More in the Zip code	Times used Internet in the last Month	Percent Change (Mean Difference)
Very High (+2 SD)	99.18	16.2	45% (+5)
High (+1 SD)	86.59	13.6	21% (+2.4)
Mean	73.99	11.2	0% (0)
Low (-1 SD)	61.41	9.3	-17% (-1.9)
Very Low (-2 SD)	48.82	8.0	-29% (-3.2)

Question: “In the last month, how often did you access the Internet from home?”

Note: Estimates are based on a hypothetical respondent who is female, white non-Hispanic, with independent partisanship, and with values for education, age, and income set at their mean. The respondent resides in a zip code with average percent African-American, Latino and Asian-American populations, as well as average median income and educational attainment, measured by the percent of the population with a high school diploma or higher. Values for the interaction terms are set at the mean. Our hypothetical respondent uses the internet 11.2 times from home each month. The only statistically significant differences are the ones reported above, except age. We have calculated the number of times for using the Internet at home per month, holding other factors constant. We also calculated the percent change from the mean. SD=standard deviation.

Box 4: Who is least likely to Use the Internet at Home?

- **Resides in areas with Poor Educational Opportunities** (9.3 times for areas with 61% of population with a HS diploma or more vs. 13.6 times for areas with 87% of population with a HS diploma or more) – **46 Point Change** (Difference of 4.3 times)
- **Resides in areas without Asian Populations** (10.4 times for 0% Asian population in zip code vs. 12.6 times for 5.20% Asian population in zip code) – **23 Point Change** (Difference of 2.4 times)

- **Poor** (8.4 times for individuals with income at or below \$30,000 vs. 13.6 times for individuals with income above \$30,000) – **62 Point Change** (Difference of 5.2 times)
- **Less-Educated** (11 times for individuals high school diploma vs. 21.4 times for individuals with a bachelor’s degree) – **95 Point Change** (Difference of 10.4 times)
- **Female** (11 times for females vs. 13.8 for males) – **25 Point Change** (Difference of 2.8 times)
- **Latino** (6.5 times for Latinos vs. 11.8 times for non-Latino) – **82 Point Change** (Difference of 5.3 times)

Note: See Box 3.

Poor socioeconomic conditions measured by educational attainment appear to be the most important for Internet use at home, rather than median income in the zip code. Respondents residing in areas with low educational attainment (zip codes with only 61% of the population with a high school diploma or higher) were 46% less likely to use the Internet at home than the same individual residing in a zip code with high educational attainment (87% of the population had a high school diploma). Stated another way, residents of zip codes with low educational attainment (one standard deviation below the mean) were predicted to use the Internet from home only 9.3 times over the past month, compared to the same individual residing in a zip code with high educational attainment (one standard deviation above the mean), whose average home Internet use was 13.6 times per month, a 46% difference.

Another way to understand the substantive magnitude of place (educational attainment) on frequency of home Internet use are comparisons to the mean (See Box 3, column 3). An individual residing in a zip code with high educational attainment (one standard deviation above the mean—87% of population with a high school diploma) is predicted to use the Internet from home 23% more than the same individual residing in an area with average educational attainment (74% of population with a high school diploma). An individual residing in an area with very high educational attainment (two standard deviations above the mean—99% of the population with a high school diploma) is predicted to use the Internet 45% more than an individual living in an area with average educational attainment, all else equal. An individual living in an area of

concentrated poverty (only 49% of the population with a high school diploma) is predicted to use the Internet from home 30% less than the same individual who resides in an area with average educational attainment. This suggests that concentrated poverty and educational opportunities in communities shape use of the Internet in America, beyond individual-level factors.

Conclusion

The use of multilevel modeling allowed us to test the influence of place as well as individual characteristics in shaping digital inequalities. This has yielded a more complete and accurate model of the factors that account for systematic differences in technology access and use – recasting our conception of the “digital divide.” Introducing environmental variables has also extended the research on the impact of concentrated poverty and racial segregation, and the geography of disadvantage.

As a result of this study, we have a better understanding of how race is linked to technology access and use. Previous research based on survey data and individual demographic variables alone found that race and ethnicity (as well as income, age, and education) were statistically significant for determining access and skill (Mossberger, Tolbert and Stansbury 2003; Lenhart 2003, Bimber 2003; US Department of Commerce 2002; Neu, Anderson and Bikson 1999). When we control for community income and educational attainment, however, ethnicity (for Latinos) is still significant for access, but race (for African-Americans) is not. Community educational attainment is a significant determinant of technology use, again trumping the role of race (but not ethnicity) in explaining technology disparities. Concentrated poverty and differences in exposure to technology therefore account for disparities that at first glance seemed to be due to race.

This finding explains the paradox that appeared in prior research – the notably positive attitudes toward technology that African-Americans expressed, despite their lower rates of access and skill. The consistency with which African-Americans connected the issue of technology

with economic opportunity across a range of survey questions indicates the motivation to overcome economic disadvantage and discrimination as a powerful reason for more positive attitudes toward using public access or learning new computer skills. Further, we found evidence that African-Americans living in more affluent neighborhoods are actually more likely than similarly-situated whites to have home computer access. We used an interaction term to explore the effect of being African-American and living in areas of concentrated poverty (measured by zip code median income), and were able to untangle the different experiences that African-Americans have with technology, based on the opportunities available to them. Understanding the place-based characteristics of technology inequalities does not diminish their significance, however, for even with some reversal of segregation and concentrated poverty in the 1990s, the 2000 census data reveals that African-Americans are still disproportionately likely to reside in areas that are primarily segregated and poor.

For Latinos, the results are more complex. Ethnicity is still significant when controlling for concentrated poverty. Some Latinos are affected by concentrated poverty and segregation, but as a group, their residential patterns are more varied. Language may also be an influential factor for Latinos in access to and use of the Internet.

Comparing technology use to access, we find that the low educational attainment of poor neighborhoods is a significant factor for frequency of use, but that the area's median income (and the interaction between race or ethnicity and median income) are not. This makes sense, if the barrier to home access is affordability, but the barrier for use is skill and education. We used educational attainment as a way of capturing socioeconomic variables other than income, for example, occupational differences. There may also be some correlation between educational attainment in an area and the quality of local schools, providing some indirect evidence of the importance of local institutions. This possibility is worth further investigation.

The picture that emerges from these results is that technology matters to African-Americans. The problem is not apathy about technology – for African-Americans living in middle-class or affluent areas, there is no digital divide. But, those who live in the poorest neighborhoods and communities experience the digital divide as yet another form of the social and economic isolation that William Julius Wilson has decried (1987, 1996). Just as concentrated poverty erects structural barriers that limit educational opportunities, access to jobs, and social mobility, so too it restricts information technology access and use. The exact mechanisms that limit technology access and use merit further exploration. Causes for this outcome may be insufficient support and encouragement offered in schools or other public institutions, in employment, or through personal social networks. Place-based inequalities in education in American society may prevent the least educated from enjoying the benefits of technology, unless basic literacy is addressed as well.

The policy implications are clear, even without a more precise understanding of how concentrated poverty limits digital opportunity. The message is that place matters and that effective policy requires targeted solutions. Technology inclusion is less a matter of persuasion or demonstrating relevance than providing more chances to use computers and to develop necessary skills, targeting these to low-income communities, and making the residents of these neighborhoods aware of available resources.

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TABLE 1: Descriptive Statistics for Individual and Zip Code Variables

	Mean	S.D.	Min.	Max.	Definition
<i>Individual-level</i>					
Poor	.369	.483	0	1	Dummy coded measure of income (0=income above \$30,000, 1= income at or below \$30,000)
Education	3.00	1.158	1	5	Index of individual educational attainment (1=No high school; 2=high school graduate; 3=some college; 4=college graduate; 5=post graduate work or degree)
Age	45.886	16.829	21	103	Measured in years
Male	.381	.486	0	1	Dummy coded measure of gender (0=female, 1=male)
African-American	.196	.397	0	1	Dummy coded measure of race (0=non African-American, 1=African-American)
Latino	.075	.263	0	1	Dummy coded measure of ethnicity (0=non Latino, 1=Latino)
Asian	.015	.120	0	1	Dummy coded measure of race (0=non Asian-American, 1=Asian-American)
Republican	.293	.455	0	1	Dummy coded measure of partisanship (0=Democrat or Independent, 1= Republican)
Democrat	.478	.500	0	1	Dummy coded measure of partisanship (0=Republican or Independent, 1= Democrat)
<i>Zip code-level Variables</i>					
Concentrated Poverty	33,716	13,881	10,714	116,941	Median household income
Educational Attainment	73.998	12.595	32.26	99.59	Percentage of individuals with a High School Diploma or higher
African-American Population	21.826	26.475	0	98.14	Percentage of population African-American
Latino Population	10.752	19.335	0	97.49	Percentage of population Latino
Asian-American Population	1.770	3.429	0	48.98	Percentage population Asian-American
<i>Interaction Variables</i>					
Concentrated Poverty and Racial Segregation	5,279	11,433	0	103,614	African-American * median income in the zip code
Concentrated Poverty and Ethnic Segregation	2,347	8,958	0	96,118	Latino * median income in the zip code
(n=1,345 individuals; n=1,035 zip codes)					

APPENDIX: Correlations of Individual and Zip Code Variables

Individual level variables

	Poor	Education	Age	Male	African American	Latino	Asian American	Democrat	Republican
Poor	1.000								
Education	-.368	1.000							
Age	.101	-.102	1.000						
Male	-.060	.085	-.041	1.000					
African American	.204	-.141	-.041	-.054	1.000				
Latino	.018	-.042	-.101	-.001	-.143	1.000			
Asian American	.024	.077	-.059	.046	-.039	-.022	1.000		
Democrat	.177	-.071	-.014	-.101	.362	.083	.029	1.000	
Republican	-.103	.036	.030	.056	-.274	-.074	-.022	-.629	1.000

Zip code level variables

	Median Income	Percent high school diploma or higher	Percent African American	Percent Latino	Percent Asian American
Median Income	1.000				
Percent high school diploma or higher	.658	1.000			
Percent African American	-.424	-.403	1.000		
Percent Latino	-.101	-.426	-0.1684	1.000	
Percent Asian American	.227	.209	-0.1052	.0736	1.000