The Old Jim Crow: Racial Residential Segregation and Neighborhood Imprisonment

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Abstract

Mass imprisonment is one of the most important policy changes the United States has seen in the past forty years. In 2011, 1.6 million people, or 1 in 200 adults, in the U.S. were in prison (Guerino, Harrison, and Sabol 2011). Understanding the factors that affect neighborhood imprisonment rates is particularly important for improving the quality of life in disadvantaged communities. This paper examines the impact of one such factor, racial residential segregation, on imprisonment rates at the neighborhood level. Key to the strength of this enterprise are block-group level data on imprisonment, crime, and other demographic factors collected from state boards of elections, departments of corrections, departments of public health and the Census Bureau for 2000 for about 5,000 neighborhoods in North Carolina. These data also include information on county racial residential segregation from the Population Studies Center at the University of Michigan. Never before has such a comprehensive data collection been undertaken to determine the causal influence of racial residential segregation on mass imprisonment. These uniquely detailed and up-to-date data allow for precise regression analyses at the neighborhood level. The findings indicate that racial residential segregation dramatically affects neighborhood imprisonment rates. Hierarchical linear models that control for neighborhood characteristics such as racial diversity, crime, poverty, unemployment, median income, homeownership, and other factors show that neighborhoods in more segregated counties have higher imprisonment rates than neighborhoods in less segregated counties, all other factors being equal. On average, the difference in imprisonment between neighborhoods in counties with segregation levels of 0 and counties with segregation levels of 100 is about half of a percentage point or slightly more than one standard deviation.

Arguably, mass imprisonment is one of the most important policy changes the United States has seen in the past forty years. Since 1970, the number of people imprisoned for committing crimes in the United States has grown exponentially. Although the number of prisoners declined slightly in 2010, 1.6 million people, or 1 in 200 adults, in the U. S. are in prison today (Guerino, Harrison, and Sabol 2011). The racial disparity in imprisonment is well known: Blacks and Hispanics each make up about 13 percent of the U. S. population, but are 37 percent and 22 percent of the nation's prisoners, respectively (Guerino, Harrison, and Sabol 2011). This disparity is particularly burdensome for Blacks: non-Hispanic Black males had an imprisonment rate of 3.1 percent, a rate that is more than seven times that of non-Hispanic white males (Guerino, Harrison, and Sabol 2011). The Bureau of Justice Statistics estimates that 7.3 percent of Black males age 30-34 are incarcerated in state or federal prison (Guerino, Harrison, and Sabol 2011).

Observers have referred to the advent of mass imprisonment as 'The New Jim Crow' because of its devastating racially disparate impact (Alexander 2011). However, old elements of Jim Crow, particularly racial residential segregation, are also implicated in the mass imprisonment phenomenon. Previous research has shown that imprisonment rates vary greatly across neighborhoods, with black and poor neighborhoods bearing the brunt of imprisonment (Burch Forthcoming). Other research has shown that high imprisonment at the neighborhood level can have devastating collateral consequences for economic stability, marriage opportunities, public health, crime, and other phenomena at the neighborhood level (Baillargeon, Black, Leach, Jenson, Pulvino, Bradshaw, and Murray 2004; Braman 2002; Massoglia 2008; Western and Wildeman 2009). Therefore, understanding the factors that affect neighborhood

imprisonment rates, particularly racial residential segregation, is particularly important for improving the quality of life in disadvantaged communities.

This paper examines the impact of racial residential segregation on imprisonment rates at the neighborhood level. Theories of the concentration of poverty by William Julius Wilson and Massey and Denton show that racial disparities in outcomes, in these cases poverty, interact with existing patterns of racial residential segregation to create pockets of extreme deprivation. This project builds on this theory to incorporate mass imprisonment as a racially disparate outcome that reaches extreme levels in certain neighborhoods due to racial residential segregation. To test this theory, I measure the prevalence of imprisonment at the neighborhood level and relate it to racial residential segregation for about 5,000 neighborhoods[1] in North Carolina.[2] Key to the strength of this enterprise are block-group level data on imprisonment, crime, and other demographic factors collected from state boards of elections, departments of corrections, departments of public health and the Census Bureau for 2000. These data also include information on county racial residential segregation from the Population Studies Center at the University of Michigan. Never before has such a comprehensive data collection been undertaken to determine the causal influence of racial residential segregation on mass imprisonment. These

[1] Throughout this article, neighborhoods are defined as census block groups.

[2] Primarily, North Carolina was chosen for convenience: the Department of Correction provided considerable assistance with respect to providing address-level data for all prisoners, probationers, and parolees under its jurisdiction, data that are difficult to come by in many states. However, North Carolina also has the added benefit of being demographically average on many factors that are relevant to this analysis. For instance, the level of black-white racial residential segregation measured as the dissimilarity index across the entire state is 51, which is very close to 50, the midpoint on that scale (University of Michigan Population Studies Center, http://www.psc.isr.umich.edu/dis/census/segregation.html, Accessed 31 Oct 2012). North Carolina has imprisonment rates at the block group level (490 per 100,000 adults) that are on par with the national imprisonment rate of 477 per 100,000 adults. North Carolina's racial makeup is similar to the national makeup in that non-Hispanic Whites were about 70% of the state's population; however, North Carolina differs in that a majority of the state's minorities were Black or African-American (21.6% of the total). Hispanics were only 4.7% of North Carolina's population. North Carolina's median household income ($39,184) and poverty rate (12.3%) were slightly above the national averages of $41,994 and 10.9% respectively. The relationship between racial residential segregation and imprisonment may differ in other states, particularly if the racial or ethnic makeup of those states differs of if the extent of imprisonment differs.

uniquely detailed and up-to-date data allow for precise regression analyses at the neighborhood level.

The findings indicate that racial residential segregation dramatically affects neighborhood imprisonment rates. Hierarchical linear models that control for neighborhood characteristics such as racial diversity, crime, poverty, unemployment, median income, homeownership, and other factors show that neighborhoods in more segregated counties have higher imprisonment rates than neighborhoods in less segregated counties, all other factors being equal. In average neighborhoods, the difference in imprisonment between neighborhoods in counties with segregation levels of 0 and counties with segregation levels of 100 is about half of a percentage point. More realistically, an average neighborhood is expected to have an average imprisonment rate close to zero in a county with low segregation around 20. However, that same neighborhood in a county that is 80 percent segregated would be expected to have an imprisonment rate that of 0.3 percent.

The situation is worse for black neighborhoods. For a neighborhood that is 75 percent black with typical levels of poverty and crime for black neighborhoods in North Carolina, the imprisonment rate is expected to be around 1.04 percent when that neighborhood is located in a completely desegregated county. However, that same black neighborhood in a county that is 100 percent segregated is expected to have an imprisonment rate that is 51% higher.

The finding that racial residential segregation matters so much to neighborhood imprisonment rates makes several important contributions. As noted above, sociologists have studied the impact of residential segregation on outcomes other than imprisonment such as poverty, educational attainment, and health for decades (Acevedo-Garcia 2000; Adelman 2004;

Charles, Dinwiddie, and Massey 2004; Massey and Fischer 2000; Massey, Gross, and Eggers 1991; Sampson, Sharkey, and Raudenbush 2008). Perhaps the most important contribution of this project is to introduce imprisonment as an aspect of neighborhood context that also is shaped by racial residential segregation. As this article will show, imprisonment affects black and poor neighborhoods detrimentally and leads to clear patterns of geographic disadvantage. Exploring the effects of these patterns of inequality will become increasingly important to understanding the quality of life experienced by residents of disadvantaged communities relative to other people.

Neighborhood Disparities in Imprisonment: the Role of Race

There is evidence that imprisonment is concentrated in particular communities. For instance, incarceration rates vary across neighborhoods throughout New York City (Fagan, West, and Holland 2004). In Brooklyn, "eleven percent of the block groups in that borough . . . account for 20 percent of the population, yet they are home to 50 percent of the parolees" (Travis 2004: 252). Individuals within these communities tend to cycle in and out of justice supervision; in the blocks mentioned in Brooklyn, "about one in every eight parenting-age males is sent to prison or jail each year" (Travis 2004: 252). In Cuyahoga County, Ohio, less than 1 percent of the county's block groups account for 20 percent of the county's prisoners (Travis 2004: 252). Also at the local level, Lynch and Sabol and Lynch, et al. find evidence of clustering of incarceration in Baltimore (Lynch and Sabol 2004; Lynch, Sabol, Planty, and Shelly 2002).

Statewide data confirm that imprisonment is also concentrated in North Carolina. The descriptive statistics for imprisonment and the other demographic characteristics for North Carolina block groups in 2000 can be found in Table 1. This table paints an overall picture of

inequality as it relates to imprisonment rates. North Carolina's overall imprisonment rate in 2000 was on target with the national imprisonment rate of 477 per 100,000 adults at that time (Beck and Harrison 2001); however, in one block group, the imprisonment rate reached eight percent.

Figure 2 presents a map of imprisonment for two sample cities: Charlotte and Greensboro, North Carolina. In each map, block groups are shaded based on imprisonment rate, with darker shading representing higher imprisonment. These maps show great variation in imprisonment across neighborhoods. Neighborhoods with high imprisonment are scattered southeast of the city center in Greensboro, while they are more concentrated north of the city center in Charlotte.

More general evidence makes it clear that predominantly black neighborhoods tend to have higher imprisonment rates than other neighborhoods. The black proportion of the population is highly correlated with imprisonment rates in North Carolina as shown in Figure 3 Pearson's R = 0.656. More visual evidence confirms this correlation: Figure 4 depicts a map of Charlotte. In this map, block groups are shaded by the percentage of black residents, with darker shading representing a higher percentage of blacks living in the block group. Points representing imprisonment are superimposed on this map of block groups. From this map, two facts are readily apparent. First, Charlotte is still a segregated city; there is a clear line of demarcation between areas where blacks do and do not live. Second, those areas correspond to imprisonment: most prisoners come from black neighborhoods.

Racial Residential Segregation

At the beginning of the twentieth century, African-Americans primarily resided within Southern states. Such a pattern (e.g. between states/regions) can be described as macro-scale segregation. However, as African-Americans migrated north during the first half of the century, residential segregation transformed from a macro-scale phenomena to a micro-scale one (Cutler, Glaeser, and Vigdor 1997; Massey and Hajnal 1995). Micro-scale segregation first appeared as segregation *within* cities at the neighborhood level. However, white migration out of urban areas and into suburban enclaves in the post-World War II era shifted the geographic scale of segregation once more. While tract-level indices of segregation remained largely stable, albeit very high, in the middle decades of the twentieth century, *between* city segregation steadily rose (Massey and Hajnal 1995).[3] The depth of segregation between whites and Blacks by the 1980 census, meanwhile, was dire enough that Massey and Denton classified African-Americans as 'hypersegregated' (Massey and Denton 1993b).

Massey and Denton (1993b) relied upon census data terminating with the 1980 census to make their argument regarding Black/White segregation. Subsequent Censuses have been used to update the patterns identified by Massey and Denton. The basic trend revealed in these analyses is one of declining residential segregation between African-Americans and whites, with the boom times of the 1990s serving as the key decade of change (Farley and Frey 1994; Fischer, Stockmayer, Stiles, and Hout 2004; Logan, Stults, and Farley 2004; Wilkes and Iceland 2004). More good news came from analyses showing a decline in the concentration of poverty during the 1990s (Jargowsky 2005; Kingsley and Pettit 2003). An initial glance at the evidence from the 1990s, then, reveals a largely positive reading of segregation trends.

[3] Patterns of micro- and macro-level segregation do differ according to the metropolitan area to some extent. Reardon, et al. (2008) use a spatial measure of segregation, for instance, to differentiate the segregation profiles of Atlanta and Pittsburgh. Segregation in Atlanta derives from the macro-scale segregation of the races; whites and Blacks live within homogeneous areas that are separated from one another. Segregation in Pittsburgh, on the other hand, is more strongly driven by smaller-scale patterns.

Although segregation seemed to decline throughout the 1990s, important caveats abound. First, declines in residential segregation were not uniform across regions. Metropolitan areas in the South and the West exhibited greater declines in residential segregation than did the urban areas of the Northeast and Midwest. The dissimilarity index, which ranges from 0 to 100, for the New York metro area only declined by 0.2 over the course of the 1990s, for instance, while Los Angeles-Long Beach saw a decline of 13.7 points on the scale and Phoenix-Mesa saw a decline of 17.9 points (Logan, Stults, and Farley 2004 10). Second, absolute levels of segregation in metro areas within the Northeast/Midwest remained high even when looking at places where segregation declined. Chicago, for instance, saw a 7.5 point decline in segregation during the 1990s, but remained extremely segregated as revealed by its dissimilarity index score 80.8. [4] This geographic heterogeneity is problematic because a majority of African-Americans living in metropolitan areas live in these Northeastern and Midwestern metro areas; so, while segregation declined in one sense, the everyday experience of many African-Americans remained one of extreme segregation.[5] Finally, while the concentration of poverty declined during the 1990s, African-Americans remain more likely to experience long durations of exposure to poverty (de Souza Briggs and Keys 2009; Timberlake 2007; Timberlake 2009). Despite the marked improvements experienced during the 1990s, it was evident that much work remained to be done in reducing racial segregation and its negative side-effects.

While the last decade of the twentieth century was an economic boom-time, the first decade of the twenty-first was characterized by lackluster job growth and was bookended by recessions. What effect did this change in aggregate economic fortunes have for residential segregation and the concentration of poverty? Some initial evidence is available to judge recent

[4] Dissimilarity scores greater than 60 are considered high.
[5] Logan and Stults (2011), for instance, note that "progress during the 1980s and 1990s was greatest in the metropolitan areas with the smallest black populations" where segregation was already lower (5).

trends in concentrated poverty and residential segregation. Lichter, et al. (2011), for instance, use 2005-2009 American Community Survey data to explore trends in the concentration of poverty and suggest the improvements of the 1990s were arrested. They note a "recent uptick in the number of poor places (and growing number of poor people living in them)" after declines during the 1990s, with a "31 percent increase in the number of poor places during the post-2000 period, i.e. places with poverty rates exceeding 20 percent" and an even larger increase "of places with poverty rates over 30 percent" (383). Meanwhile, Logan and Stults (2011) have provided the first analysis of 2010 Census data with regards to segregation. Racial segregation declined during the decade, albeit slowly. Segregation levels remain very high in the metro areas of the Midwest and Northeast, a region that the authors note "could well be described as America's Ghetto Belt" (9). Recent evidence thus suggests another decade of uneven and slow success in combating Black/White segregation.

Effects of Racial Residential Segregation—The Concentration of Social Ills

Residential segregation does not just concentrate people; it also helps structure the lives of those affected in important ways. As seen in the previous section, the direst form of residential segregation in the modern United States has been between African-Americans and whites. To summarize the literature, "segregation significantly hurts black outcomes relative to non-black outcomes" (Cutler and Glaeser 1997: 843).

Segregation has had important economic effects for African-Americans by leading to the concentration and reproduction of high poverty within black metropolitan communities. Segregation has helped concentrate poverty due to the lower income levels of African-Americans (Massey and Fischer 2000; Massey, Gross, and Eggers 1991). Segregation does not just concentrate poverty however; it also helps reproduce it. Segregated neighborhoods, for instance,

are more likely to be especially sensitive to large changes in the economy. While the departure of manufacturing jobs from American cities hurt many workers, for instance, this effect was especially dire for residents in racially segregated communities. The social isolation, and smaller and less well educated, social/political networks of individuals living within segregated communities, particularly poorer neighborhoods, contributed to continued unemployment since job searches are often most productive when conducted through weak ties (Cohen and Dawson 1993; Granovetter 1983; Leighley and Matsubayashi 2009; Small 2007). However, the weak ties of segregated individuals are ill equipped to produce jobs emanating from outside of the neighborhood. The spatial mismatch between the location of new post-industrial jobs and segregated neighborhoods, moreover, only added to the disadvantage of segregation by making commuting more difficult (Wilson 1987). Plus, while some middle class Blacks could move out of segregated neighborhoods to be closer to jobs, this escape hatch was not widely available due to white apprehension over neighborhood integration (Emerson, Chai, and Yancey 2001; Massey, Gross, and Shibuya 1994). White avoidance of Black neighborhoods (Quillian 2002), meanwhile, helps undermine the worth of housing in these communities thanks to lower demand; this, in turn, leads to lower wealth in the community. This state of affairs, meanwhile, helped set the stage for the aggressive marketing of subprime lending within segregated neighborhoods, which, with the burst housing bubble, has only served to undermine recent reductions in concentrated poverty experienced by segregated neighborhoods (Rugh and Massey 2010). The core result of these interlocking causal processes is a significant relationship between segregation and lower income for African-Americans as well as a higher likelihood of long exposures to poverty (Cutler and Glaeser 1997; de Souza Briggs and Keys 2009; Timberlake 2009). The linkage between segregation and the concentration of poverty is, by now, fairly well accepted.

The concentration of poverty attendant with residential segregation also helps concentrate other associated social outcomes. Particular attention has been paid to the connection between segregation and crime, with existing research consistently finding a significant relationship between the two (Krivo and Peterson 1996; Peterson and Krivo 1999; Sampson, Raudenbush, and Earls 1997; Shihadeh and Flynn 1996). While such studies are mainly based upon comparisons between communities that vary in terms of segregation, more evidence for the segregation-crime link comes from studies that compare how physical mobility at the individual level influences the probability of engaging in criminal activity. Kling et al. (2005), for instance, analyze data from the Moving to Opportunity (MTO) housing voucher experiment and find that adolescents who moved to neighborhoods with lower aggregate poverty rates were less likely to engage in criminal activity, although there were some heterogeneous gender effects. Sharkey and Sampson (2010), meanwhile, leverage data from a longitudinal survey of Chicago residents and come to a similar conclusion: adolescents who moved outside of city limits displayed less violent behavior and were less likely to be victims of violence. Segregation has also been connected to rates of incarceration, with segregation influencing incarceration rates independent of crime rates. Sampson and Loeffler (2010) note that "communities that experienced high disadvantage experience incarceration *more than three times higher* than communities with a similar crime rate" (5). The greater incidence of criminal activity associated with poverty, of course, also helps reproduce the negative economic outcomes discussed above by making the affected communities less attractive to businesses.

It should not be surprising, based upon the preceding discussion, to find that residential segregation has also been connected with poorer physical and mental health outcomes for community members. African-Americans experience higher mortality rates than whites, with

residential segregation, and the higher incidence of violent victimization associated with it, identified as a key cause (Acevedo-Garcia, Lochner, Osypuk, and Subramanian 2003; Collins and Williams 1999; Polednak 1993; Williams and Collins 2001). Segregation has also been connected with lower birth weights and higher infant mortality and to a greater likelihood of exposure to air pollutants, which also feeds into mortality trends (Acevedo-Garcia 2000; Morello-Frosch and Jesdale 2006; Sampson 2003). While physical health outcomes appear to be negatively influenced by residential segregation and the concentration of poverty, mental health outcomes are also affected. Using data from a longitudinal study of college students, Charles, et al. (2004) and Massey and Fischer (2006) connect residential segregation to a higher incidence of stressful life events. The degree of stressful events experienced by students from segregated neighborhoods is quite high, akin to the "stress associated with a personal injury or serious illness" (Charles, et al. 2004, 1362). Kling et al. (2007), meanwhile show that significant improvements in mental health outcomes occurred for participants in the MTO housing experiment who moved from their original segregated neighborhoods to communities with less poverty and a greater degree of racial integration. What is particularly worrying about these results is that the negative effects of stress may accumulate over time and lead to other negative physical and mental health outcomes, such as heart disease and memory impairment (Massey 2004). Indeed, the available evidence suggests that segregation, particularly in the context of concentrated disadvantage, has durable effects on later educational performance, which will influence neighborhood selection and exposure to the health stressors identified above (Charles, Dinwiddie, and Massey 2004; Massey and Fischer 2006; Sampson, Sharkey, and Raudenbush 2008). Residential segregation sets up the inverse of a cumulative advantage process (DiPrete and Eirich 2006), with segregation increasing the likelihood of early disadvantage, which then

increases the probability that this disadvantage is reproduced through social and bio-social mechanisms.

Residential segregation also influences family structure and the upbringing of children in ways that help reproduce social stratification. Sucoff and Upchurch (1998), for instance, find a significant association between residential segregation and premarital childbearing; they note that "we have found that living in a highly segregated neighborhood is associated with an elevated rate of premarital first births, regardless of the neighborhood's economic affluence" (581). Similarly, Cutler and Glaeser (1997) discover significant effects of segregation for African-Americans on single mother household status. Single-parent households help reduce the available material and social resources available to children, which has subsequent effects on myriad life outcomes.

Linking Segregation and Imprisonment

The preceding section discusses the trends and effects of racial residential segregation over time. The most important conclusion of this section is that racial residential segregation has important effects on outcomes for African-Americans in all aspects of life, including economics, health, and social relationships. This paper takes these findings one step further, testing whether racial residential segregation shapes incarceration outcomes in a similar fashion. I hypothesize that a positive, statistically significant relationship between racial residential segregation and imprisonment rates should be evident.

Several processes might account for this relationship. In particular, the disproportionate involvement of African Americans with the criminal justice system might be a root cause. Several factors account for the disproportionate involvement of African Americans with the criminal justice system. First, Black communities may be policed more aggressively (Harris

1997; Harris 1999; Herbert 2010). Second, Blacks may commit more crimes (Kleck 1981; Peterson and Hagan 1984; Tucker 2002). Third, Blacks and the poor may face discrimination in charging, conviction, and sentencing outcomes.[6] Finally, Blacks more often get prison sentences than whites and other groups for similar crimes (Demuth and Steffensmeier 2004).

According to Massey et al., racial residential segregation acts as an invisible mechanism: "Segregation . . . confines blacks to a small set of geographically isolated, tightly clustered, and racially homogenous neighborhoods" (Massey, Gross, and Shibuya 1994: 427). When this large, segregated group experiences a disproportionate rise in imprisonment, certain neighborhoods necessarily will experience dramatic increases in imprisonment rates. Thus the geographic concentration of imprisonment is inevitable given racial residential segregation.

As noted above, segregation concentrates poverty. However, segregation also leads to the perpetuation of economic distress because residents of segregated neighborhoods often lack the cultural and social capital that is so important to finding work. Unemployment and economic isolation in turn contribute to imprisonment; for instance, in a national sample of state prisoners, only 55 percent of state prisoners were employed full time at the time of their arrest and only 15 percent reported earning more than $25,000 before their arrest Beck, Gilliard, Greenfeld, Harlow, Hester, Jankowski, Snell, Stephan, and Morton 1993). Research by Wacquant and others also suggests that states purposely use prisons to control growing unemployed populations (Chiricos and Bales 1991; Chiricos and Delone 1992; Wacquant 2001).

[6] Please see Sweeney, Laura T., and Craig Haney. 1992. "The influence of race on sentencing: A meta-analytic review of experimental studies." *Behavioral Sciences & the Law* 10 (2):179-95; Pratt, Travis C. 1998. "Race and sentencing: A meta-analysis of conflicting empirical research results." *Journal of Criminal Justice* 26 (6):513-23; and McDougall, Cynthia, Mark A. Cohen, Raymond Swaray, and Amanda Perry. 2003. "The Costs and Benefits of Sentencing: A Systematic Review." *Annals of the American Academy of Political and Social Science* 587:160-77 for more extensive reviews.

Cultural factors may also link segregation to imprisonment. One definition of culture is that of "modes of behavior learned within the community" (Hannerz [1969] 2004: 180). The adoption of deviant[7] behaviors may thus be explained as a process of "socialization to subcultural values condoning as right conduct" what the dominant culture thinks of as deviance (Kornhauser 1978). Culture of poverty theorists first developed this notion to explain why social problems affected residents of the ghetto at high rates. As an example, Lewis writes, "By the time slum children are age six or seven, they have usually absorbed the basic values and attitudes of their subculture and are not psychologically geared to take full advantage of changing conditions or increased opportunities which may occur in their lifetime" (Oscar Lewis, as cited in Wilson (Wilson, 1987 #61)). Massey and Denton also argue that segregation "concentrates male joblessness, teenage motherhood, single parenthood, alcoholism, and drug abuse, thus creating an entirely black social world in which these oppositional states are normative" (Massey and Denton 1993a). Evidence suggests that imprisonment may become normal in some neighborhoods where it is common, lifting the stigma of serving time and increasing its commonality (Foreman Jr. 2002; Hairston 2003).

Data

Perhaps the lack of attention to imprisonment context in prior research stems from data constraints or other difficulties in studying the criminal justice system. These difficulties are particularly burdensome when attempting to study neighborhood-level effects. For instance, data on crime are not reported uniformly below the city or county levels, and producing data on

[7] As used here, the term deviant seems to connote irrationality. However, deviant, as used in this context, is less loaded and refers mostly to attitudes that are not mainstream, regardless of their rationality or source (Kornhauser 1978). The term 'cultural deviance' is used not to cause controversy, but merely to remain consistent with a long sociological literature that describes the processes at hand.

neighborhood imprisonment requires laborious and time consuming work to obtain and geocode administrative data from state departments of corrections.

One of the most exciting facets of this study is that it explores residential racial segregation and neighborhood imprisonment using administrative data on millions of prisoners and crime data maintained by various state agencies. In this way, the study overcomes the limitations faced by previous researchers who might have included neighborhood criminal justice information in their studies. The data for this study were obtained by combining census demographic data for block groups with data on prison inmates, county racial residential segregation, and crime. The result of this massive effort is the combining criminal records and geographic data into a dataset on which spatial analyses can be performed.

Demographic Data

As a reminder, block groups constitute neighborhoods throughout this article and are the units of analysis.[8] Data from the 2000 decennial census were used to provide information on home ownership, percent black, percent Hispanic, median age, percent in group quarters, adult population, block group high school completion rate, and citizenship. Using census data also allowed for the inclusion of additional variables such as the block group unemployment rate and

[8] According to the Census Bureau, block groups typically contain 300 to 3,000 people, with an optimum size of 1,500 ("Glossary of Geographic Terms" 2007). The choice of block groups as the unit of analysis matters in spatial analysis because of three well-known problems: boundary, scale, and modifiable area units (Chou 1997). The boundary problem refers to how different choices with respect to boundaries (block groups instead of blocks) can lead to different statistical relationships depending on the data. For instance, a pattern of imprisonment may appear dispersed if one is looking at one block, but clustered if one enlarges the picture to include four other blocks in which no one is imprisoned. The scale problem refers to the fact that spatial descriptive statistics can vary as increasingly aggregated units are used. Thus, imprisonment for an area may be different when measured at the census tract level as opposed to the block group level. The modifiable units problem refers to the fact that units may be aggregated differently (for instance, the assignment of census blocks to block groups may be arbitrary, although they are contiguous) and that different patterns of aggregation may result in different statistical results.

median income. The block group 2000 homicide rate and information about ex-inmate serving institutions in 2000 were obtained from the North Carolina Department of Public Health. One hundred seventy-six block groups were excluded from the data due to no population or a large proportion of residents in group quarters, bringing the sample size from 5,271 block groups to 5,095.

Department of Corrections Data

The North Carolina Department of Correction maintains highly detailed data on all offenders convicted of felonies who are sentenced to state supervision in prison or in the community through probation or parole. People convicted of felonies in federal court who served sentences under federal authorities and people convicted of misdemeanors or infractions in municipal court who served time in county jail are not included in the analysis.[9] All offenders accused of state felonies are tried, convicted, and punished by state authorities, such that the files represent a complete list of people who have or are being supervised for felony convictions by the state. People with misdemeanor convictions who were supervised by local authorities are absent from the data, as are people convicted under Federal law.

The North Carolina Department of Correction provided deindividuated data on the race, gender, offense, age, sentence length, punishment type, and address for all individuals under state supervision for felonies as of November, 2000, as well as a separate file of individuals who were admitted to state prison, probation, or parole between August 1, 2000 and February 4, 2001.

[9] In 2008, federal courts commenced 2437 cases against criminal defendants in NC (Administrative Office of the United States Courts. 2008. "Table E-2, Persons under Supervision." Available online http://www.uscourts.gov/uscourts/Statistics/FederalJudicialCaseloadStatistics/2008/tables/E02Mar08.pdf. Accessed 21 June 2010). Although comparable data on the number of felony cases commenced by state authorities are not available, similar data on admissions to supervision show that in 2006, more than 80,000 were admitted to state prison and probation in NC (Sourcebook on Criminal Justice Statistics, "Table 6.3.2006," Available online from http://www.albany.edu/sourcebook/pdf/t632006.pdf. Accessed 21 June 2010. Sourcebook on Criminal Justice Statistics, "Table 6.0009.2008." Available online from http://www.albany.edu/sourcebook/pdf/t600092008.pdf. Accessed 21 June 2010.).

Criminal Justice Context Variables

These data from the Department of Correction, along with supplementary information from other agencies, were used to construct several measures of criminal justice context at the neighborhood level. The most important variable, imprisonment rate, measures the total number of people serving time in prison from the neighborhood divided by the neighborhood's adult population.

Uniform data on violent crimes are not available at the block group level. Instead, data on 2000 homicides were obtained from the North Carolina Department of Public Health. The *Homicide rate* for each block group is then defined as the number of fatal intentional injuries sustained among residents living in the block group, divided by the block group adult population. The count of fatal intentional injuries excludes self- and state-inflicted injuries (such as suicides, executions, and police shootings). One might think of the homicide rate as superior to other crime measures because homicides are not usually subject to reporting or other biases (Levitt 1996).

Ex-felons deserve special discussion because the number of ex-felons in a community should also matter for political outcomes for several reasons. First, in North Carolina, ex-offenders regain their voting rights once they fulfill all the terms of their punishments. Second, labor market discrimination and other disadvantages continue after the official punishment ends, such that many ex-felons remain unable to contribute financially to their families and neighborhoods, and may even turn or return to crime (Holzer, Rafael, and Stoll 2004; Pager and Quillian 2005). Third, ex-offenders may continue to share their negative experiences and beliefs about government with those around them—in particular, returning prisoners have even more

opportunity than current prisoners to share their now past experiences and attitudes with their neighbors.

All of these factors make the presence of ex-felons within a community an additional contextual variable that is worth studying. Failing to control for the presence of ex-felons in a community might confound the results, but administrative data on former offenders are difficult to obtain. With the exception of sex offenders, departments of corrections rarely keep track of offenders after their sentences end and usually do not release what little data they do have. Released prisoners who do not 'max out' remain under supervision as parolees for a time; these offenders are available in community supervision data for North Carolina. Nevertheless, once all time is served, finding information about the residence and movement of ex-felons is nearly impossible. Because of these difficulties, rather than attempting to estimate the number of ex-felons living in a neighborhood, instead the data set includes a measure of institutions that are likely to attract released prisoners and other ex-felons. This measure of *Ex-felon-serving institutions* is a dummy variable that indicates whether the block group was located within half a mile of a halfway house, residential reentry center, transitional facility, or other non-profit group whose primary mission is to provide housing, training, or services to ex-felons in 2000. This indicator was constructed using the Federal Bureau of Prisons list of Residential Reentry Centers, departments of corrections lists of transitional centers, and the IRS Master List of Exempt Organizations.

Geocoding

Addresses for prisoners, ex-felon serving institutions, and homicides were converted to points with latitudes and longitudes and then to census blocks by geocoding with ArcGIS.

Matching prisoners to valid addresses was difficult. In North Carolina, about ten percent of prisoners indicated temporary housing (such as a hotel, motel, or shelter), correctional facilities, or the streets as their last known address. Of the remaining prisoners, about 90 percent with valid in-state addresses were geocoded successfully. The remainder includes offenders matched to out-of-state addresses including foreign countries and offenders who provided incomplete information or post office boxes.

Racial Residential Segregation Data

Residential segregation can occur across five dimensions: evenness, exposure, centralization, clustering, and concentration (Massey and Denton 1988; Massey, White, and Phua 1996). This paper relies on evenness as an indicator of racial residential segregation.[10] A group is unevenly distributed when its members live in particular neighborhoods within an area rather than being evenly distributed across all of them. Evenness is most commonly measured via the Dissimilarity index. The index ranges from 0 to 100 (or 0 to 1) with scores over sixty classified indicating high levels of segregation, scores of between thirty and sixty reflecting moderate segregation, and scores below thirty associated with low levels of segregation.[11] The

[10] While the Dissimilarity index is the most popular estimate of residential segregation in use, several flaws have been identified with it, and other 'aspatial', measures of residential segregation (see Lee, Reardon, Firebaugh, Farrell, Matthews, and O'Sullivan 2008 for an excellent discussion of these issues). The first involves the assumed proximity of residents within tracts. The Dissimilarity index assumes, in essence, that all individuals within a census tract are uniformly proximate to each other. This may obscure important variation in distance between neighborhoods are clustered together or not.[10] Finally, census tracts are often of disparate size and shape. As Lee, et al. (2008) point out, the "median tract size in Little Rock-North Little Rock (16.6 km^2) is nearly 80 times greater than that in New York-White Plans-Wayne (.21 km^2)" (769). Individuals living in tracts with similar dissimilarity scores, but vastly different sizes, may experience segregation much differently. This, in turn, may greatly influence the measurement of various outcomes as seen from the varying effects of racial context on racial attitudes among whites (Wong, Bowers, Williams, and Drake 2011), individuals within a census tract and between members of different census tracts. Individuals who reside on the boundary of a census tract, for instance, are treated as living closer to people on the opposite end of the tract than to neighbors living across the street in another tract. Second, the Dissimilarity index is reliant upon official boundaries (census tracts in particular) and cannot detail the degree of segregation at distances larger or smaller than those boundaries. A third issue is known as the checkerboard problem: a dissimilarity index score cannot provide information as to whether segregated

[11] These dividing points are arbitrary and used by convention.

Dissimilarity score can be read as indicating the percentage of group members that would have to move in order to produce an even distribution between the two groups measured; for instance, a score of forty for Black/White segregation specifies that forty percent of either group would have to move in order to produce an even distribution.

The black/white dissimilarity index for North Carolina counties in 2000 was provided by the Racial Residential Segregation Measurement Project at the Population Studies Center at the University of Michigan.[12] The analysis of county-level segregation uses blocks, rather than tracts, to compute the dissimilarity index.

Other Control Variables

There may be many other neighborhood characteristics that are related to both the imprisonment rate and racial residential segregation that must be taken into account in a multivariate model of these effects. Poverty, violent crime, the presence of young residents, and racial and ethnic diversity have been shown to influence imprisonment; thus, they are included in this analysis as the *poverty rate*,[13] *homicide rate*, *proportion of adults age 34 and under*, *proportion black*, and *proportion Hispanic*, from the 2000 census (Fischer 2003; Gabbidon and Greene 2005; Kautt and Spohn 2002; Pettit and Western 2004; Shihadeh and Flynn 1996; Steffensmeier, Ulmer, and Kramer 1998). To control for the influence of ex-offenders on imprisonment, the model identifies block groups with inmate-serving organizations such as halfway houses, residential reentry centers, transitional centers, and other facilities that provide housing, jobs, and other assistance to ex-offenders. Social class also affects imprisonment; for this reason, both educational attainment and median income for block groups are included in the

[12] ftp://enceladus.isr.umich.edu/Racedata/county/nccounty.zip
[13] Defined here as the percent of households with incomes under $10,000. This rate of poverty is far below the typical rate reported for families of four, but was chosen to reflect the fact that households vary in size. Some might consider this to be a measure of deep poverty.

analysis (Iceland, Sharpe, and Steinmetz 2005; Iceland and Wilkes 2006; Pettit and Western 2004). Residential stability also affects imprisonment and segregation, so the models include the census measure of the *proportion of housing units that are rented* (DeLuca and Rosenbaum 2003; Keels, Duncan, DeLuca, Mendenhall, and Rosenbaum 2005; Sharkey and Sampson 2010). Finally, the *relative proportion of non-citizens* and the presence of college students, nursing home residents, or others in group quarters might affect imprisonment so the census *citizenship rate* and *proportion of the population in group quarters* are both included in the models. Unemployment is also related to both imprisonment and to segregation (Pettit and Western 2004; Wilson 1987; Wilson 2009), so the models control for the neighborhood *unemployment rate* as well.

Methods

Hierarchical linear modeling is used to analyze the relationship between racial residential segregation and imprisonment because the data are arranged in multiple levels, as block groups situated in counties (Gelman and Hill 2007). The model includes a random intercept for the county in which the block group is located as the level 2 variable. The main causal variable of interest, county-level black-white segregation, is included as the index of dissimilarity between blacks and whites as described above. The dependent variable, imprisonment rate, is a measure of the number of adult residents of the block group who were in state prison in November 2000 divided by the total adult population of the block group. The remaining control variables are also measured at the neighborhood level.

Regression coefficients are not easily interpreted so it is easier to discuss the predicted block group prisoner density using simulations (King, Tomz, and Wittenberg 2000). [14] The expected imprisonment rate at different levels of county segregation will be presented for neighborhoods with various demographics in order to give the reader a better sense of the effect sizes.

Results

Table 2 presents the regression results. As shown in the table, the results imply a strong, statistically significant, positive relationship between county racial residential segregation and imprisonment rates. Overall, across-county level variation accounts for 21.0 percent of the variation in block group imprisonment rates. The remaining variation is across block groups. In the tables, the statistical significance of neighborhood-level factors such as the presence of young residents, block group educational attainment, race, and poverty suggest that these factors still exert a statistically significant residual effect on imprisonment even after controlling for other factors.[15] Additional models with interactions between county segregation and neighborhood racial composition and county segregation and neighborhood poverty were tested but are not shown because these additional variables were not statistically significant.

As noted above, simulations provide an easier way to discuss the effect sizes of imprisonment. Figure 4 shows the predicted range of imprisonment for a typical North Carolina neighborhood at different levels of county segregation. These values were predicted varying

[14] All predicted probabilities and expected values in this paper were simulated using the Clarify module in Zelig.

[15] One might notice that several coefficients, at first glance, seem to behave in unexpected ways. For instance, the coefficient on the median income is statistically insignificant. While it may be tempting to interpret these coefficients as saying that median income has no effect on imprisonment, this way of reading the results is incorrect (King 1986). To find the effects of median income on imprisonment would require a separate theory and analysis (King, Keohane, and Verba 1994).

county segregation but holding all other variables constant at their means or medians. It is clear from the gradient in the estimates that the expected imprisonment rate increases as county segregation increases, suggesting that segregation does help concentrate imprisonment. On average, the expected difference in imprisonment between a neighborhood in a completely desegregated county and that neighborhood if it were located in a completely segregated county is about .5 percentage points, or more than a standard deviation.

Race dramatically affects the base level of imprisonment at the neighborhood level, as Figure 4 also shows. North Carolina block group imprisonment rates predicted for the possible range of county segregation while holding the percent black constant at 75 percent, the poverty rate constant at 31.75 percent, the unemployment rate constant at 7.25 percent, the homicide rate constant at .0069 percent, the median income constant at 22,400, and high school completion constant at 61.89 percent (these are the averages for North Carolina neighborhoods with at least 75 percent black residents). All other variables were held constant at their means. According to this analysis, imprisonment rates in North Carolina neighborhoods in zero-segregation counties are about 0.5 percentage points lower than the imprisonment rate in neighborhoods located in counties with segregation set to 100. When all other factors are held equal as described above, going from the bottom of the dissimilarity index up to the top results in an increase in imprisonment from 1.04 percent to 1.51 percent.[16]

Poverty also affects imprisonment rates but not as dramatically as race. Similar calculations to those described above show that neighborhoods with larger numbers of people

[16] Segregation by ethnicity also seems to affect imprisonment rates, but in the opposite direction than race. Repeating this analysis with White-Hispanic segregation rather than White-Black segregation as the dependent variable finds a *negative* and statistically significant relationship between imprisonment and segregation. Further research is needed to see why this relationship is the case in North Carolina and whether this finding holds in states with larger Latino populations. However, this discussion is beyond the scope of this paper.

living in poverty have slightly higher levels of imprisonment than neighborhoods with fewer people in poverty. Estimating the imprisonment rate for neighborhoods with 17.8 percent poverty (the third quartile in the data) and all demographic characteristics held constant at their medians shows that under complete desegregation, the imprisonment rate is expected to be about -.015 percent. Under conditions of complete segregation, the imprisonment rate is expected to be about 0.44 percent. Compared with neighborhoods with median poverty rates (10.8 percent) this difference is very small: the 'typical' neighborhood is expected to have -0.1 percent imprisonment under complete desegregation and a 0.40 percent imprisonment rate under complete desegregation.

Discussion and Implications

To summarize, the evidence suggests that, at high levels, segregation leads to the concentration of imprisonment. In North Carolina, block groups located in highly segregated counties experienced higher imprisonment rates than block groups located in counties with more moderate levels of segregation. Although segregation seems to affect imprisonment only moderately at low levels, it is important to note that in these data, county level segregation reaches 95.6 in one county, suggesting that almost all the county's black and white residents would need to relocate in order to fully integrate the county.

The theory presented previously suggests that segregation might affect imprisonment through a number of mechanisms. This analysis can control for some of these mechanisms. For instance, controls for unemployment and social class (such as income, poverty, and educational attainment) suggest that segregation shapes imprisonment not just through these mechanisms, but also through others because segregation is still statistically significant even after controlling for

these causes. However, this work cannot distinguish whether and how the other mechanisms might contribute to the relationship between racial residential segregation and imprisonment. Future research might take up the task of distinguishing these mechanisms further.

This paper contributes to the well-established notion that racial residential segregation affects the structural context of neighborhoods, particularly African-American neighborhoods, and therefore contributes to the negative outcomes many African-Americans experience as a result of neighborhood disadvantage. What are the prospects for remedying racial residential segregation? The research discussed above, particularly those studies concerned with trends in segregation, does not paint a terribly optimistic picture for the imminent reversal of racial segregation. Segregation between African-Americans and whites has declined since Massey and Denton's (1993) iconic work was first published, but remains high. Undergirding these trends is the continued influence of white apprehension over integration, either in the form of explicit prejudice or as a concern that integrated neighborhoods will bring crime and other social ills with it (Krysan 2002). Political efforts at reducing segregation and ameliorating inequality, meanwhile, also seem to have hit a standstill (Wilson 2009). Policies aimed at reducing segregation at the school level, for instance, have suffered various defeats in the judicial arena, with a general movement away from integration as a policy goal in effect (Reardon and Yun 2002).

An analysis of research concerning residential segregation does offer some reason for *long-term* optimism and some suggestions for effective social and political action. White attitudes *have* liberalized over time. While the vast majority of respondents in the 1940s might have wanted there to be strictly policed boundaries between white and black neighborhoods, as seen from the survey results reported by Massey and Denton (1993), white acceptance of

minority neighbors has edged upwards, albeit slowly. While apprehension among whites over integration remains a significant drag on integration, the long-term trend points in a positive direction.

Short- and medium-term efforts at reducing the degree of residential segregation—and its associated societal ills—would likely do well to heed the advice of Schuck (2002), who argues that judicial efforts to reduce segregation have worked best when they work with the pro-market attitudes of Americans rather than at cross-purposes to these beliefs. The Gautreaux program, for instance, has significantly reduced the degree of segregation and poverty for participants. It has done so by leveraging market forces—e.g. providing the material means for renting in previously out-of-reach locales. The successes of this program, as well as the more mixed results of the MTO program, suggest that public housing policy remains a powerful instrument in combating segregation provided it can bypass classist objections to housing assistance.

The importance of zoning regulations for the maintenance of segregation, as identified by Massey et al. (Massey, Rothwell, and Domina 2009; Rothwell and Massey 2010), suggests a closer target of collective action and one that might be more amenable to short-term change. Fighting density restrictions could plausibly lower rents in predominantly white neighborhoods—thereby positively influencing the entrance ability of non-whites—while potentially leading to a stimulus for economic growth in urban communities (Yglesias 2012). The issue of zoning regulations may be taking on even greater importance due to white population shifts from the suburbs back to central cities (Frey 2012; Nasser 2011). While this population shift may have the effect of reducing urban segregation, a potential side-effect is the pricing out of urban communities unless housing stock expands to meet increased demand. Given the dire side-effects connected to residential segregation, effort to combat it cannot wait

for slowly changing attitudes to enable greater integration, and changes to housing policy and zoning regulations present themselves as perhaps the potentially ripe targets for political action.

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	Minimum	Median	Mean	Std. Dev.	Maximum	N
Imprisonment Rate	0.0000	0.0030	0.0049	0.0064	0.0813	5095
County Segregation	41.4000	68.2000	67.8731	8.2878	95.6000	5095
Proportion Renter	0.0066	0.2105	0.2715	0.1805	0.9831	5095
Proportion Noncitizen	0.0000	0.0160	0.0350	0.0540	0.6657	5095
Proportion Unemployed	0.0000	0.0277	0.0335	0.0278	0.4496	5095
Median Income in 1,000s	6.4420	36.2590	39.0731	16.5289	200.0010	5095
Proportion High School or Equivalent	0.2450	0.7568	0.7572	0.1283	1.0000	5095
Proportion of Adults under Age 35	0.0530	0.2913	0.3041	0.0965	0.9865	5095
Proportion living in Poverty	0.0000	0.1085	0.1347	0.1054	0.7480	5095
Proportion Black	0.0000	0.1258	0.2259	0.2510	0.9933	5095
Presence of Ex-felon Serving Institution	0.0000	0.0000	0.0414	0.1993	1.0000	5095
Proportion Hispanic	0.0000	0.0232	0.0435	0.0589	0.8453	5095
Proportion in Group Quarters	0.0000	0.0000	0.0124	0.0310	0.1997	5095
Homicide Rate	0.0000	0.0000	0.0000	0.0001	0.0034	5095

Table 1: Descriptive Statistics.

Fixed effects	**Model**	
County Level:		
Segregation	5.42E-05	*
	(0.000)	
Block Group Level:		
Homicide Rate	1.43E+00	**
	(0.470)	
Presence of Ex-felon Serving Institution	3.10E-03	***
	(0.000)	
Proportion living in Poverty	7.41E-03	***
	(0.001)	
Proportion of Adults under Age 35	-8.13E-03	***
	(0.001)	
Proportion Black	1.38E-02	***
	(0.000)	
Proportion Hispanic	3.42E-04	
	(0.002)	
Proportion High School or Equivalent	-9.46E-03	***
	(0.001)	
Median Income in 1,000s	3.56E-06	
	(0.000)	
Proportion Renter	3.52E-03	***
	(0.001)	
Proportion Noncitizen	-1.58E-03	
	(0.002)	
Proportion in Group Quarters	-1.26E-02	***
	(0.002)	
Proportion Unemployed	6.04E-03	*
	(0.003)	
Intercept	4.51E-03	*
	(0.002)	
Random Effects		
Groups	Variance	Std.Dev.
County	4.592E-06	2.143E-03
Residual	1.729E-05	4.158E-03
N	5095	
Number of Groups	100	

Table 2: Estimates of effects of county segregation on block group imprisonment rates. County segregation defined as index of dissimilarity for blacks and whites. Standard errors in parentheses * significant at 5%; ** significant at 1%; ***significant at 0.1%.

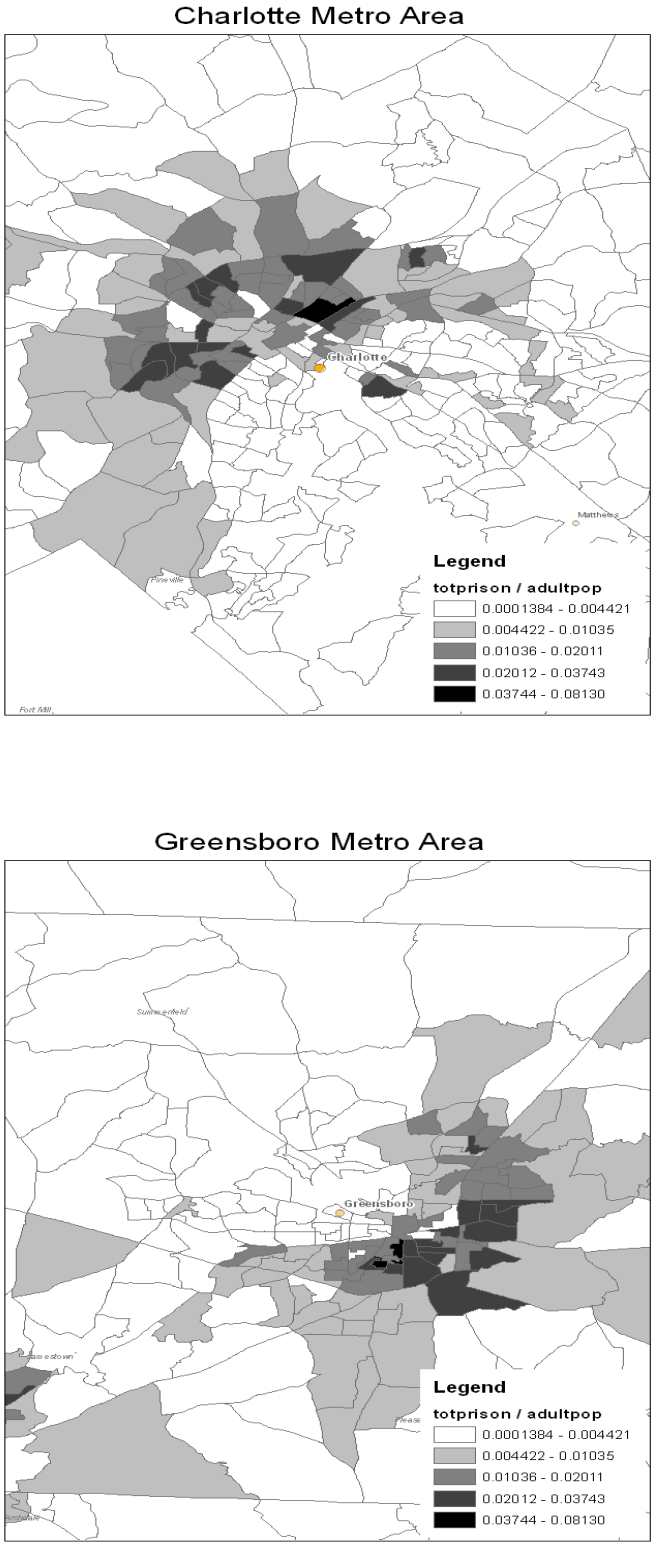

Figure 1: Imprisonment Rates for North Carolina Block Groups, Selected Cities.

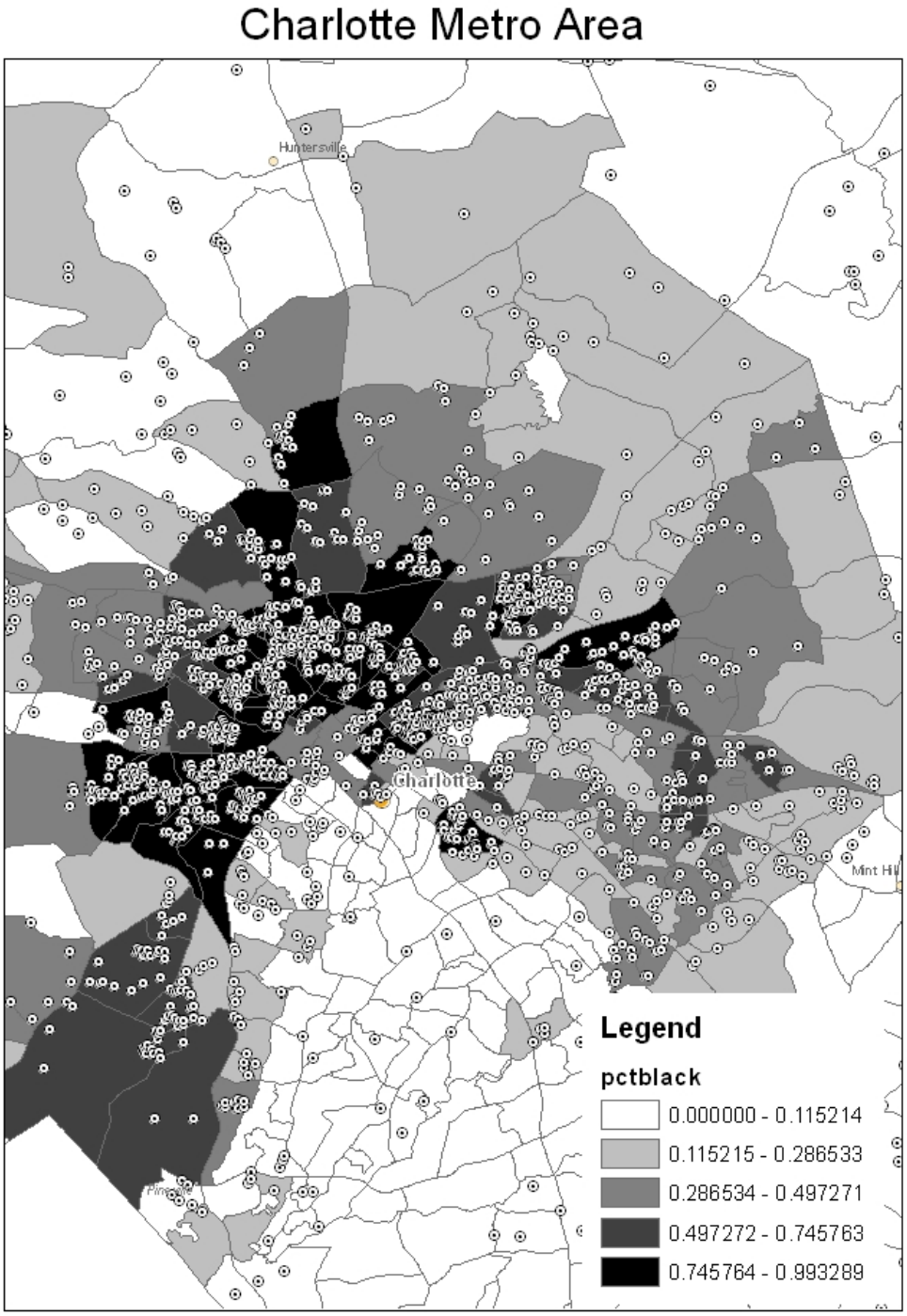

Figure 2: Race and Imprisonment in Charlotte. Points represent instances of imprisonment.

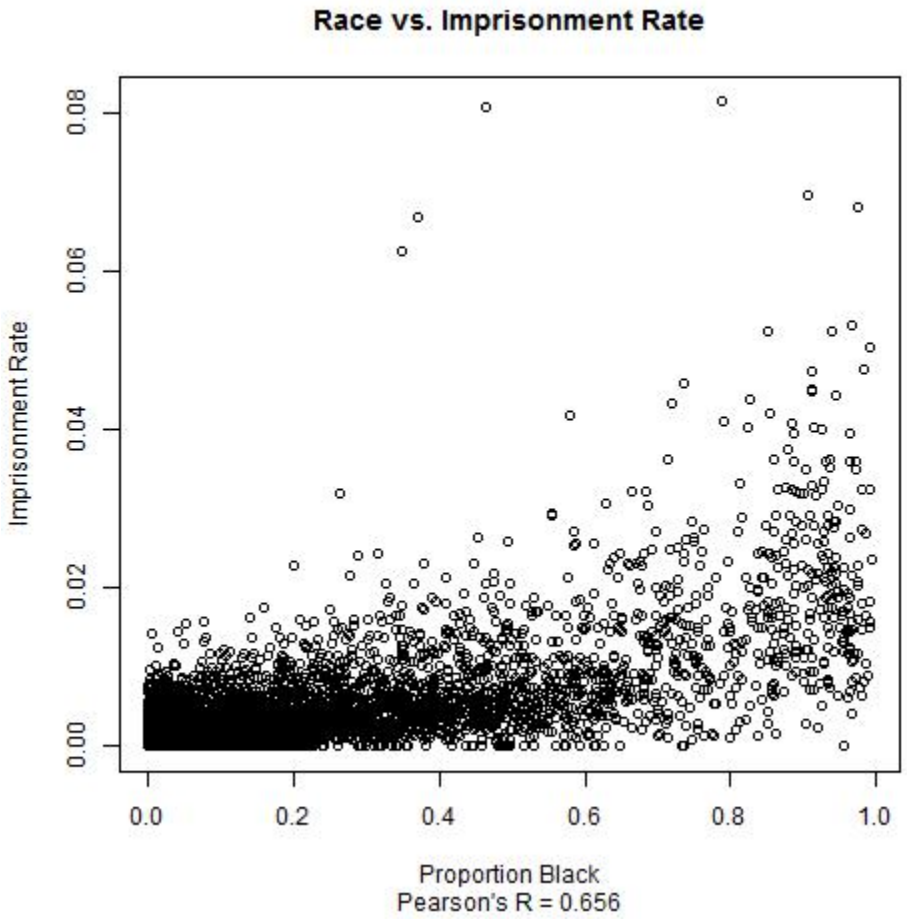

Figure 3: Scatterplot of race and imprisonment.

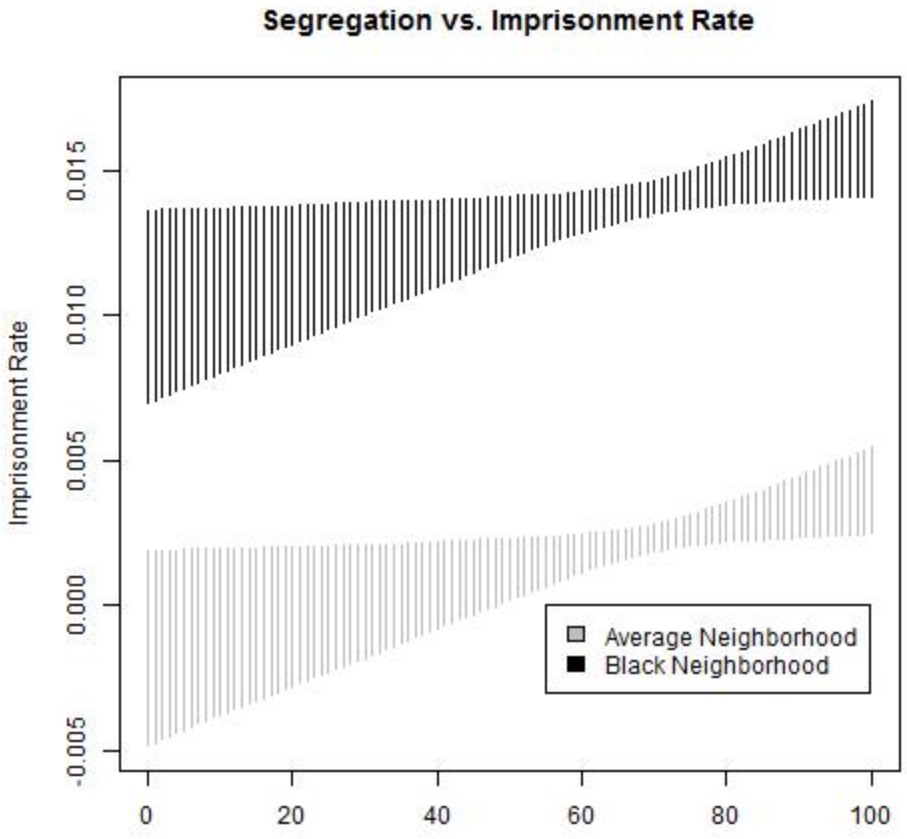

Figure 4: Predicted Imprisonment rate by Dissimilarity Index. Estimates calculated using Clarify.