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Dimensions of racial segregation, hypersegregation, and Black homicide rates

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A B S T R A C T

Prior research assessing the association between racial residential segregation and Black urban homicides has not considered each of the five dimensions of segregation or the phenomenon of hypersegregation. In this study, indicators of each of the five dimensions of segregation, as well as measures of severe segregation and hypersegregation were considered, in order to assess Black homicide rates across 201 metropolitan statistical areas. Four of the five indicators of segregation were found to predict the dependent variable, although some evidence of an empirical overlap between dimensions was uncovered. Additionally, two indicators of severe segregation (exposure and centralization dimensions) and two measures of hypersegregation (i.e., a dummy variable and a count of the number of dimensions of severe segregation that exist in a given metro area) were found to be associated with Black homicides. The findings were interpreted as supporting Massey and Denton's ideas about the consequences of hypersegregation and Wilson's notion of concentrated disadvantage as explanations for Black urban homicide rates.

Introduction

Racial residential segregation continues to be a defining structural characteristic of urban centers in the United States. Despite some evidence that the extent of racial segregation, particularly Black-White segregation has declined over the past decade (e.g., Iceland, Weinberg, & Steinmetz, 2002; Logan, Stults, & Farley, 2004), cumulative evidence has demonstrated that Blacks are still highly segregated from Whites in urban America. While the United States is becoming a more ethnically diverse nation, Blacks are still the most segregated racial group in America (Iceland et al., 2002; Massey & Denton, 1993; for an alternative, see Farley & Frey, 1994).

The persistence of Black-White residential segregation is troubling to many social scientists because of the well-recognized consequences of such stratification. Massey and Denton (1993, p. 2) argued that racial residential segregation "systematically undermines the social and economic well-being of Blacks in the United States." Further, racial segregation is "deeply implicated in the concentration of poverty in Black communities" (Charles, 2003, p. 197). Family instability, unemployment and underemployment, out-of wedlock births, infant mortality, welfare dependency, abandonment and dilapidated housing, high dropout rates, lower quality schools, and low educational achievement have all been linked to the isolation of Blacks in urban America (Charles, 2003; Jargowsky, 1996; Massey, 1990; Massey & Denton, 1993; Wilson, 1987). Additionally, racial residential segregation serves to attenuate social mobility for racial and ethnic minorities. In short, the isolation of Blacks "means not only that African Americans live in separate communities, but that they live in areas that are inferior to neighborhoods more heavily populated by Whites" (Peterson & Krivo, 1993, p. 1004).

One consequence of racial residential segregation that has recently received attention from social scientists is the relatively higher rates of violent crime in Black communities. While research into the association between racial residential segregation and Black violence has not been prolific, most of the studies that focused on this association had largely found evidence of a positive relationship (e.g., Logan & Messner, 1987; Messner & South, 1986; Parker & McCall, 1999; Peterson & Krivo, 1999; Sampson, 1985; Shihadeh & Flynn, 1996; South & Felson, 1990)—communities, cities, and metropolitan areas that have higher levels of racial residential segregation generally have relatively higher rates of Black violent crime.

There are provocative reasons to have revisited the association between race-based residential segregation and Black violent crime rates, however. First, while most prior studies employed one measure of segregation—the commonly used index of dissimilarity—many segregation researchers have now acknowledged that residential segregation has many different dimensions, and the index of dissimilarity captures only one of those dimensions (i.e., unevenness). Indeed, the work of Shihadeh and Flynn (1996) suggested that the use of the index of dissimilarity is both theoretically and empirically flawed. Instead, they asserted that another dimension of segregation, the exposure index, is more compatible with extant theory regarding how segregation produces violent crime and has greater predictive utility than the commonly used index of dissimilarity. No published study has provided a comprehensive answer to the second issue, however—there has been no systematic exploration of whether each of the five major dimensions of segregation introduced by Massey and

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Denton (1988) is associated with Black urban violence. This study examined this question, addressing both the question of whether each dimension of segregation predicted Black homicides individually, and explored the related question of whether these measures are independent predictors of the dependent variable, or whether there exists substantial empirical overlap in the dimensions, to the extent that each indicator's influence on Black homicides cannot be distinguished empirically.

Second, but related to the first reason, there has been no exploration of the relationship between hypersegregation and Black violent crime. As defined by Massey and Denton (1989, 1993), hypersegregation exists when a racial group is highly segregated on several dimensions of residential segregation simultaneously. Massey and Denton argued that the deleterious effects of segregation are magnified under conditions of hypersegregation, because hypersegregation intensifies the extent of isolation (1989, pp. 373-374). Further, Wilkes and Iceland (2004) argued, "the practice of considering only one dimension may misrepresent the nature of segregation in U.S. metropolitan areas and, in the case of Blacks, underestimate its severity" (p. 23). Hence, one would expect that violent crime, as a deleterious consequence of segregation, would be highest under conditions of hypersegregation, yet no published study has examined the role of hypersegregation in understanding variation in Black urban violence.

Finally, while a number of earlier studies found that the racial segregation was predictive of Black homicide rates, more recent inquiries that included measures of structural disadvantage (Massey, 2001; Sampson & Wilson, 1995; Wilson, 1987) revealed more equivocal results (e.g., Krivo & Peterson, 2000; Lee & Ousey, 2005; Peterson & Krivo, 1999). Peterson and Krivo (1999) suggested that the influence of segregation is mediated through concentrated disadvantage, stating that racial segregation "has set in motion a pattern whereby concentrated disadvantage becomes a more important force in creating urban social problems such as African-American violence; segregation, the broader macrosocial force that concentrates Black disadvantage, then has less direct impact on its own" (p. 486; see also Wilson, 1987). While it is both logical and plausible that the effect of racial segregation on Black violence is mediated by structural disadvantage, it has yet to be demonstrated whether extreme segregation (hypersegregation) exerted a direct influence on Black homicide rates, even after the inclusion of measures of structural disadvantage. That is, rather than being an antecedent to socioeconomic disadvantage, the extreme hypersegregation of Blacks in some American cities fosters a direct influence on Black urban violence, because of the extreme social isolation that it manifests. The present study was the first such effort to have examined the potential direct effect of hypersegregation on Black homicides, controlling for urban disadvantage.

There were two primary aims of the present study. First, each of the five dimensions of segregation was examined independently to determine if each influenced Black homicide rates. Additionally, evidence was presented to consider whether the effects of these dimensions overlap to the extent that their independent influences on Black homicide were confounded. Second, measures of hypersegregation were included in models to assess its predictive utility for explaining variation in Black homicide rates, controlling for other salient predictors, including measures of economic disadvantage. These questions were addressed using data from the 2000 decennial census and homicide victim data from vital statistics spanning a three-year period, from 2000-2002 (U.S. Dept. of Health and Human Services, 2002).

Background

Although a number of studies found that there exists an association between racial residential segregation and Black violent crime, the theoretical basis for explicating such a connection is not always clear. Nonetheless, two explanations could be gleaned from extant studies to help explain this association: concentrated disadvantage (Massey, 2001; Sampson & Wilson, 1995; Wilson, 1987) and relative deprivation (Blau & Blau, 1982; Logan & Messner, 1987).

The concentrated disadvantage thesis is rooted in the logic of social disorganization theory (Shaw & McKay, 1942). Shaw and McKay's pioneering scholarship was predicated on the interplay of three structural dimensions of many lower class communities: economic dependence, population heterogeneity, and population turnover. The coalescence of these structural conditions impeded the ability of communities to organize and solve their problems, provide adequate social control mechanisms, and promote and preserve important normative institutions, resulting in a condition referred to by Shaw and McKay (1942) as social disorganization. Thus, socially disorganized communities are more likely to experience relatively high rates of crime and violence.

The importance of social disorganization theory as a basis for understanding the relationship between racial residential segregation and Black violence cannot be understated. Nonetheless, one component of the original thesis of social disorganization—that social disorganization increases with rising population *heterogeneity*—is logically inconsistent with racial segregation, which produces neighborhoods comprised of greater racial *homogeneity*. Surprisingly, this fundamental contradiction was rarely mentioned in studies advocating social disorganization theory as a basis for understanding the segregation-violent crime association. The key idea underlying social disorganization, however, the notion that structural factors produce barriers for the community to develop formal and informal ties and solve their common problems (Parker & McCall, 1999), is logically compatible with the expectation of an association between racial segregation and Black violent crime. As Peterson and Krivo (1999, p. 486) asserted, racial residential segregation "sets in motion patterns of community disorganization and diminished social control that have deadly consequences for African Americans."

The notion of concentrated disadvantage is clearly an extension and elaboration of social disorganization theory. First articulated by Wilson (1987; see also Massey, 2001; Massey & Denton, 1993; Sampson & Wilson, 1995), the core thesis is that racial residential segregation, coupled with structural economic transformations (including economic dislocation, the polarization of the labor market into low paying and high paying jobs, and the out-migration of middle class Blacks from traditionally Black communities), "concentrates poverty and anything associated with it" (Massey, 2001, p. 322; see also Massey & Eggers, 1990). According to Wilson (1987), poverty concentration and racial segregation serve to produce severe social isolation among some Black communities. This severe social isolation as defined by Wilson (1987, p. 60) as the lack of sustained interaction with mainstream individuals and institutions) is conducive to higher rates of Black violence because of both (a) the lack of social control mechanisms to inhibit such behavior and (b) the presence of factors that encourage it (Krivo & Peterson, 1996). Included among these factors are: a weakened labor force attachment by the isolated poor (due to a lack of successful role models in these communities and the lack of stable and rewarding employment opportunities); decreased opportunities to reasonable mortgages, insurance, consumer, auto, college, and entrepreneur-based loans; housing loss and the lax enforcement of housing codes leading to fewer quality housing options (including housing projects); a weakened social stigmatization associated with arrest, conviction, and incarceration due to isolation from middle class citizens (see also Anderson, 1978); lack of access to high quality schools (Krivo, Peterson, Rizzo, & Reynolds, 1998); and disproportionate cuts in public services to poor communities because of the anemic political power of the poor (Wilson, 1987).[1] Such communities may lack adequate police services, the resources necessary for implementing security and target hardening

strategies, and other social control mechanisms that may reduce criminal behavior (Peterson & Krivo, 1993). Violent behavior becomes both an adaptive and normative response in such concentrated disadvantaged communities and a behavior for which there are few and ineffective social control measures available to prohibit (Wilson, 1996). According to Massey (2001), racial segregation and poverty concentration create a niche of violence, in which the risk of violent victimization in these socially isolated communities inspires a threatening demeanor among people, which inspires more violence, and ultimately generates a spiral of crime and violence. "Violent behavior and an obsessive concern with respect become rational strategies for survival" (Massey, 2001, p. 327).

While the concentrated disadvantage thesis has inspired several recent inquiries, relative deprivation theory has also been utilized as an explanation of the association between racial residential segregation and Black violent crime. Relative deprivation was formally introduced in Blau and Blau's (1982) seminal work in which they explicitly argue that it is not absolute disadvantage, but relative disadvantage that generates relatively high rates of violent crime and homicides specifically.[2] According to Messner and Golden (1992), relative deprivation theory emphasizes the collective consciousness of the disadvantaged, their realization of shared economic interests, and the perceived inability of the disadvantaged to get a fair redistribution of resources and open access to wealth. Such structured inequality, particularly if it is ascriptive (as opposed to merit) based, generates violence by creating frustration and aggression among disadvantaged groups. Racial residential segregation is viewed as a "central component of ascriptive inequality" (Peterson & Krivo, 1993, p. 1004). Although relative deprivation and concentrated disadvantage promote somewhat different intervening mechanisms that link residential segregation with high rates of Black violence, both explanations suggest a very powerful association between the two factors.[3]

Dimensions of segregation and urban violence

While most of the studies that examined this association employed one indicator (the index of dissimilarity) as the measure of racial residential segregation, Massey and Denton (1988) argued that there are five key dimensions of residential segregation: evenness, exposure, concentration, centralization, and clustering. Evenness (typically measured by the aforementioned index of dissimilarity) captures the differential distribution of a group population across a geographical area, while exposure captures the potential contact between groups. Concentration refers to the relative amount of physical space that a minority group occupies. Centralization refers to the degree to which a group is located near the center of the urban area. Clustering captures the extent to which a minority group lives disproportionately in contiguous areas. Hence, a minority group is segregated if its members are not evenly distributed across an urban area, its members are unlikely to share the same neighborhood with majority members, its members are confined to relatively small proportion of the available physical space in an urban area, its members disproportionately occupy the center of an urban area, and/or minority group neighborhoods are contiguous and closely packed with respect to each other (Massey & Denton, 1988).

Despite these different dimensions, most prior studies of the association between segregation and Black violent crime have only used the index of dissimilarity. Indeed, only Shihadeh and colleagues (Shihadeh & Flynn, 1996; Shihadeh & Maume, 1997) explicitly considered alternative dimensions of segregation than unevenness. In two separate studies, Shihadeh and colleagues explored the influence of indicators of exposure (Shihadeh & Flynn, 1996) and centralization (Shihadeh & Maume, 1997), compared to the utility of the commonly used index of dissimilarity. In both studies, the authors concluded that once the alternative dimensions of segregation (captured by the respective indicators employed; the interaction index for exposure and the relative centralization index for centralization) the effect of unevenness "becomes negligible" (Shihadeh & Flynn, 1996, p. 1348), suggesting that the other two measures were superior indicators of the association between segregation and violent crime.

While Shihadeh and colleagues' work represents an important contribution to understanding how the dimensions of residential segregation are associated with urban Black violent crime, there are reasons to question the conclusion that one (or two) indicators have greater importance than others (e.g., the index of dissimilarity). First, Shihadeh and Flynn (1996) argued that their measure of exposure, the interaction index, captures racial isolation while the index of dissimilarity does not. Thus, these authors implied that measures of unevenness, such as the index of dissimilarity, are ill-suited to test Wilson's thesis of concentrated disadvantage. This inference can be challenged, however. As Massey and Denton (1989) argued in their seminal work, "a high level of segregation on any of these dimensions [evenness, exposure, concentration, centrality, clustering] is problematic because it isolates a minority group from amenities, opportunities and resources that affect social and economic well-being" (p. 373). In short, Massey and Denton suggested that each of these dimensions of segregation serve to isolate Blacks from Whites, albeit it in conceptually distinct ways. Hence, an argument can be forwarded that each of these dimensions are logically consistent with the concentrated disadvantage thesis, since each serves to increase Black isolation. If Massey and Denton are correct, one would expect to find that each of the measures of segregation would have an independent influence on Black violent crime.

Secondly, while Shihadeh and Flynn (1996) argued for the use of an exposure index as a measure of Black isolation (versus the index of dissimilarity), they failed to recognize that only the index of dissimilarity is independent of the racial composition of the population. Since exposure indices (by design) capture the relative size of the majority and minority groups in an urban area, while the index of dissimilarity (as a measure of unevenness) does not, a minority group that comprises a small proportion of the overall population will experience high levels of exposure to the majority group, regardless of the pattern of unevenness (Massey & Denton, 1988; see also Lee & Ousey, 2005, p. 40). While generally such a distinction is important in differentiating the two respective dimensions, it also means that a well-established (and obvious) predictor of Black violent crime rates—percent Black—is captured by most exposure measures. Since Shihadeh and Flynn did not include percent Black in their regression models, it is not too surprising that a measure that already captures it (the interaction index) would be judged a stronger predictor of Black violent crime than a measure (the index of dissimilarity) that does not capture this well-established predictor. Assessing whether both dimensions of segregation predict Black violence should either (a) consider an overall model including both measures of evenness *and* percent Black and compare that model to a model that includes a measure of exposure; or (b) utilize an exposure measure that controls for the effect of relative size of minority group, such as correlation ratio (Eta^2; although this indicator has been argued to be a measure of evenness, see Massey & Denton, 1988).

Although each of the five dimensions represents a spatially distinctive pattern of segregation, one remaining question is whether the different dimensions of segregation produce independent effects on Black violent crime rates, or whether there is substantial empirical overlap between the indices, such that it is difficult to assess their independent effects on the dependent variable. Theoretically, there are compelling reasons to expect that these dimensions of racial segregation would exert an independent influence on urban crime rates. For example, unevenness (the overrepresentation of Blacks in some neighborhoods) and isolation (likelihood of contact with Whites in the neighborhood) in the segregation of Blacks would lead to neighborhoods where Black residents' contacts are largely with other Blacks. The lack of access to social networks comprised of Whites likely reduces the opportunities to develop social capital with more powerful actors, reduces access to informal job networks, and reduces opportunities to

have access to successful role models (Granovetter, 1974; Wagmiller, 2007, p. 541). While centralization may not reduce contact with Whites per se, it likely contributes to the problem of a spatial mismatch for Blacks seeking work, because of the tendency in urban areas for much of the new job growth to occur in the suburbs. Likewise, the concentration of a Black resident in a relatively small amount of physical space or the clustering of Blacks in a few contiguous communities produces what Wilson (1996) referred to as jobless ghettos—neighborhoods comprised of high rates of poverty, unemployment, population density, and undereducated residents that produce greater competition for jobs, resources, and opportunities (Crutchfield, 1989; Wagmiller, 2007, p. 542). Crutchfield, Matsueda, and Drakulich (2007, p. 204) suggested that the high concentration of jobless and marginally unemployed Black males in some communities produces conditions wherein many residents have plenty of free time to frequent places where violent crime is more likely to occur (taverns, nightclubs, street corners, pool halls) and a weak commitment to work and other institutions that may serve to curb violence. Although the dimensions of segregation may contribute to the production of Black homicides in theoretically distinctive ways, the extent to which some of these dimensions covary may render assessing the independent contributions that each makes to explaining Black homicide rates difficult. Hence, an analysis of whether these dimensions are empirically distinctive predictors of the dependent variable was also warranted.

Hypersegregation and Black homicides

As mentioned previously, there had been no published study that had examined the role that hypersegregation may play in predicting urban Black violence. By focusing on individual dimensions of racial segregation separately, studies may not have captured the full extent of Black segregation in the United States (Massey & Denton, 1989, p. 388). Hence, prior studies may have underestimated the influence of racial residential segregation on Black violent crime. As Massey and Denton (1989) suggested, "segregation becomes more profound as it accumulates across dimensions, and hypersegregation across five dimensions simultaneously implies a level of spatial isolation that is much greater than heretofore recognized" (p. 389). Furthermore, it may be erroneous to assume that such extreme racial segregation is adequately captured by including measures of socioeconomic disadvantage. Indeed, Jargowsky (1996) noted that racial segregation is much greater than economic segregation in the United States and that racial segregation is *not* reducible to economic segregation. While prior work suggests that concentrated disadvantage may largely mediate the influence of a single indicator of racial segregation on Black violence (e.g., Peterson & Krivo, 1999), the work of Massey and Denton raises the possibility that this may not be the case when hypersegregation is considered. While there may be significant covariation among each of the five dimensions of segregation that renders an assessment of their independent influence on the dependent variable difficult, hypersegregation measures enable an assessment of whether the cumulative effect of severe segregation influences Black urban violence.

In summary, the present inquiry addressed two central questions. First, does each dimension of segregation produce an independent effect on Black homicide rates? Second, does hypersegregation, a measure of the accumulation of segregation across different dimensions, predict Black urban homicides, controlling for other salient predictors of Black homicides, including a measure of socioeconomic disadvantage?

Data and methods

The data for this study were obtained from two sources: the 2000 U.S. Census and Vital Statistics of the U.S. data for the years 2000-2002.[4] Metropolitan areas with a minimum of 2,500 Blacks and reporting homicide data for the years 2000-2002 were included in the analyses, producing a sample of n=201 metropolitan statistical areas (MSAs).

Dependent variable

The dependent variable was the number of reported Black homicide victimizations across a three-year period that was reported by the National Vital Statistics System (2000-2002). The use of multiple years of homicide data was employed to smooth out fluctuations in the pattern of homicides and was consistent with many prior studies (e.g., Peterson & Krivo, 1999; Phillips, 2002; Sampson, 1985). Victimization data were used instead of offender data because of the large proportion of missing data on offender race in the Supplemental Homicide Report data.[5] The use of victimization data was also utilized in one of the seminal studies of the association between racial segregation and Black urban violence in the past, for the same reason (Peterson & Krivo, 1993). Additionally, Phillips (2002) found in her analysis of both homicide offending and victimization rates as dependent variables over a thirty-year period that the results were not sensitive to the use of victimization versus offending data.[6]

Independent variables

In order to capture each of the major dimensions of racial residential segregation as articulated by Massey and Denton (1988), five measures of racial segregation were employed, each representing a different dimension. The indexes employed to represent each of the five dimensions of segregation were the same as utilized by Iceland and colleagues (i.e., Iceland et al., 2002; Wilkes & Iceland, 2004) on the basis of their "assessment of the indexes, Massey and Denton's recommendations, and earlier research" (Iceland et al., 2002, p. 8). Evenness (the differentiation distribution of the minority population) was captured by the index of dissimilarity.[7] The index of dissimilarity captures the percentage of Black residents who must move in order for the percent Black in each census tract in the city to be equivalent to the percent Black in the entire city. Exposure (the potential for contact between Whites and Blacks) was measured by using the isolation index.[8] It represented the probability that a Black would come into contact with another Black in their neighborhood (generally equated to a census tract). Concentration (the relative amount of physical space that the minority group occupies) was captured by delta.[9] Delta was the proportion of Blacks (in this study) who resided in census tracts with an above-average density of Blacks—it provides the proportion of Blacks that would have to move in order to achieve uniform density (Wilkes & Iceland, 2004, p. 26). The index of dissimilarity, the interaction index, and delta varied from 0 to 1. For the index of dissimilarity and delta, higher scores represented greater segregation. For the interaction index, higher scores represented lower segregation.

Centralization (the extent to which Blacks lived near the center of the metropolitan area) was measured using the absolute centralization index.[10] This index ranged from -1 to 1: positive scores meant that Blacks were more likely to reside in close proximity to the city center while negative scores meant that Blacks were more likely to live on the periphery. A score of 0 indicated that Blacks had a uniform distribution throughout the metropolitan area. The final dimension, clustering (the degree to which Blacks living in contiguous areas) was captured using the spatial proximity index.[11] Higher scores indicated greater segregation (Blacks living in neighborhoods contiguous to each other).[12]

In order to capture hypersegregation, three approaches were utilized. First, using the same criteria established and utilized by Massey and colleagues (Massey & Denton, 1993; see also Wilkes & Iceland, 2004), each of the five dimensions was dummy-coded to capture severe segregation on that dimension. The cutoff point of .6 was used, consistent with Massey and Denton's (1993) definition.[13] This set of dummy variables was then utilized to capture hypersegregation as Massey and Denton defined it: a dummy variable was constructed that indicated whether a metropolitan area scored at least at .6 on four of the five indexes. Finally, a count variable was constructed to capture whether metro areas with more dimensions of severe segregation (as an alternative measure of hypersegregation)

Table 1
Descriptive statistics (N=201)

Variable	Mean	Std. Dev.	Min.	Max.
Disadvantage index	.03	1.52	4.46	3.90
Stability	45.41	8.76	16.11	61.01
Black population (log)	10.81	1.31	7.88	14.25
Percent young Black males	7.93	1.55	4.69	15.35
Density	1615.75	3035.76	39.70	16634.40
Ratio of Black/White head of household income	.63	.09	.41	.90
Percent Black	.14	.11	.01	.51
Percent college graduates	7.62	2.99	2.64	19.01
Evenness	.54	.12	.31	.85
Exposure	.40	.19	.03	.81
Concentration	.78	.10	.40	.97
Centralization	.70	.19	.02	.96
Clustering	1.19	.15	1.01	1.82
Hypersegregation (dummy)	.12	.33	0.00	1.00
Hypersegregation (count)	2.17	1.12	0.00	5.00
Homicides	93.37	212.92	1.00	1726.00

were more likely to have experienced higher homicide rates than areas with fewer dimensions of segregation.

Control variables

In order to assess the veracity of the association between racial residential segregation and Black homicide rates, a set of control variables was selected using the same process suggested by Phillips (2002, p. 354): (1) theory, (2) prior studies of homicide rates, and (3) concerns regarding multicollinearity. Most studies predicting Black homicide rates included indicators of structural disadvantage and community instability, given that these factors are implicated in most explanations of community crime rates (e.g., social disorganization theory, concentrated disadvantage). Included in the analysis were three measures that reflect Black socioeconomic disadvantage: (1) percent of Black residents below the poverty line, (2) percent of Black families headed by females with children under the age of eighteen, and (3) the percentage of civilian noninstitutionalized Black males above the age of sixteen that were unemployed or not in the labor force (Krivo & Peterson, 1996). A principal components analysis revealed that these three measures produced high factor loadings, suggesting redundancy. Thus, z-score transformations of each of the three measures were summed to form an overall index of Black socioeconomic disadvantage. Another measure of Black socioeconomic status, the percent of Blacks who were college graduates, was also included in the analysis. Residential stability was measured by the percent of Black residents who had lived in the same residence for the past five years. Finally, a common measure of racial economic inequality, the ratio of Black to White median household income was included to consider the possible influence of such inequality on Black homicides (Blau & Blau, 1982). Higher scores on the ratio indicated greater economic equality.

In addition to Black socioeconomic disadvantage and residential stability, other controls were incorporated into these analyses, including: the percentage of the total population that was Black (Land, McCall, & Cohen, 1990) and the percentage of the Black population that was young (i.e., fifteen to twenty-four) and male, and population density. All these variables were included in the analysis as controls so as to avoid basing conclusions on spurious or suppressed relationships.[14]

The dependent variable, the Black homicide victimization rate, is a relatively infrequent occurrence. Osgood (2000) argued that a negative binomial model is preferable to ordinary least squares regression because of the skewed and relatively rare nature of homicide events. Consistent with Osgood and others, a negative binomial model was utilized instead of a Poisson-based regression model because of the assumption of the latter model that all of the meaningful variation was accounted for in the linear model. In order to evaluate homicide victimization rates and not counts of homicides victimizations, however, the counts must be converted to the equivalent of a rate for each MSA. Thus, an offset was included—the natural logarithm of the size of the Black population, with the parameter set to 1—to convert the counts to equivalent rates (MacDonald & Gover, 2005; Osgood, 2000; Ousey & Augustine, 2001).[15] Means, standard deviations, and ranges for all the variables are presented in Table 1.

Results

Table 2 presents the negative binomial regression results predicting the Black homicide rate.[16] Each of the models analyzed differed by the dimension of segregation considered (the column header indicates which dimension of segregation was included in the analysis). Overall, only one variable reached statistical significance across all five models: the size of the Black population (logged). Metro areas with larger Black populations had higher Black homicide rates. Of the remaining control variables, two variables were found to reach statistical significance in some of the models analyzed. Contrary to expectations, residential stability was found to have a significant, positive association with the Black homicide rate in the models that included the concentration and centralization indicators of segregation, while percent Black was found to have an inverse, but negative association with the dependent variables in the models that included

Table 2
Negative binomial regression predicting Black homicides (N=201)

	1	2	3	4	5
Disadvantage index	.026 (.034)	.035 (.034)	.019 (.032)	.030 (.032)	.031 (.035)
Stability	.002 (.005)	.004 (.006)	.013* (.005)	.014** (.005)	.006 (.005)
Black population (log)	.144*** (.041)	.162*** (.046)	.147** (.036)	.165*** (.035)	.167*** (.046)
Percent young Black males	-.033 (.029)	-.020 (.029)	-.018 (.028)	-.015 (.028)	-.023 (.029)
Density	-.00001 (.00001)	.00001 (.00001)	.0001 (.00001)	.0001 (.00001)	.0001 (.00001)
Ratio of Black/White household income	-.279 (.454)	-.536 (.450)	-.342 (.428)	-.360 (.427)	-.627 (.421)
Percent Black	-.393 (.428)	-1.262** (.430)	-.025 (.423)	-.666 (.373)	-.969* (.386)
Percent college graduates	-.023 (.017)	-.022 (.018)	-.024 (.017)	-.032 (.017)	-.024 (.017)
Evenness	1.038** (.355)				
Exposure		.600 (.396)			
Concentration			1.638*** (.365)		
Centralization				.840*** (.174)	
Clustering					.464 (.331)
Constant	-9.028*** (.659)	-8.828*** (.708)	-10.41*** (.696)	-9.848*** (.655)	-9.208*** (.653)
X^2	81.82	75.72	92.20	95.41	75.74

Note: Standard errors are in parentheses.
†<.1.
*<.05.
**<.01.
***<.001.

the exposure and clustering dimensions of segregation. Somewhat surprising is what were *not* found to be significant predictors of the dependent variable—the disadvantage index, capturing poverty, Black male unemployment, and female-headed households; and the indicator of racial inequality. Additional analyses (not reported) that excluded any measure of segregation revealed that the measure of racial inequality did reach statistical significance ($p<.05$), suggesting that racial segregation mediates the association between racial economic inequality and the Black homicide rate.

Of the key independent variables in these analyses, the measures representing the five dimensions of segregation, three were each found to be significant predictors of the dependent variable. Evenness, concentration, and centralization were each found to be predictive of Black homicide rates, even after considering other important predictors of the dependent variable. While exposure was not found to have a significant association with the dependent variable, subsequent analyses (not reported) revealed that an analysis of a model that excluded percent Black evinced a statistically significant, positive association between the exposure indicator of segregation and Black homicide rates. Hence, this analysis was wholly consistent with the earlier issues raised regarding the redundancy between measures of percent Black and the exposure index of segregation. Only one segregation measure, clustering, failed to reach statistical significance in the models analyzed (with or without percent Black included in the model).

Since four of these measures were found to be significant predictors of the dependent variable, the next logical question to be addressed was whether the independent influences of each dimension could be determined when the dimensions were considered together. To address this question, three strategies were employed: (a) a model was evaluated in which each of the five segregation indicators were included, with subsequent diagnostics conducted to evaluate issues of multicollinearity, (b) a principal components analysis was conducted in order to simplify the correlation between the indicators and to determine if "superdimensions" could be evinced, and (c) a negative binomial regression analysis of a model that included only the superdimensions of segregation. The first step, an analysis of a model that included all five segregation indices (not reported), revealed that (a) only the centralization measure of segregation reached statistical significance ($p<.05$), and (b) substantial issues with multicollinearity. Indeed, a cursory examination of the correlation matrix of the five segregation indicators (Appendix A) revealed substantial correlations between these indicators. Hence, including each of these dimensions together in models predicting Black violent crime may prevent one from determining the independent effect of each segregation dimension on the dependent variable.

This matrix also suggested that there were a couple of different superdimensions underlying these indicators, however, a conclusion supported when a principal components analysis was conducted (results available upon request from author). This analysis suggested that there were two segregation superdimensions—one dimension that included evenness, exposure, and clustering, and another dimension that included centralization and concentration. These findings reinforced the conclusions reached by Johnston, Poulsen, and Forrest (2007), who concluded in their empirical analysis of Massey and Denton's five dimensional schema of segregation that there exists two superdimenions of segregation: separation (covering Massey and Denton's unevenness, exposure, and clustering) and location (covering concentration and centralization).

A negative binomial regression analysis including the two indices produced from the scores derived from this principal component analysis revealed that only one of the two segregation superdimensions—location, capturing centralization and concentration—was found to be a significant predictor of Black homicide rates (Table 3). Overall, these findings revealed that there does appear to be two superdimensions of segregation that predict Black homicides, but when considered together, only the superdimension of location (concentration and centralization), rather than separation (unevenness, exposure, and clustering), is a significant predictor of Black homicides.

Table 3
Negative binomial regression predicting Black homicides and segregation indices derived from principal component analyses considered (N=201)

	1
Disadvantage index	.019 (.033)
Stability	.014* (.006)
Black population (log)	.145** (.043)
Percent young Black males	-.019 (.028)
Density	.00001 (.00001)
Ratio of Black/White household income	-.252 (.428)
Percent Black	-.079 (.403)
Percent college graduates	-.028† (.017)
Separation index (evenness/exposure/clustering)	.044 (.032)
Location index (centralization/concentration)	.130*** (.035)
Constant	-9.172*** (.746)
X^2	98.47

Note: Standard errors are in parentheses.
† <.1.
* <.05.
** <.01.
*** <.001.

While the prior models examined the linear association between the dimensions of segregation and Black homicides, the relationship between severe segregation and Black homicides is examined in Table 4 to evaluate whether there existed a threshold effect between high segregation and Black homicides. Two predictors (percent Black and the log of the Black population) were found to have significant associations with the dependent variable regardless of the dimension of segregation considered. Additionally, residential stability and percent college graduates were found to be significant predictors of Black homicide rates in one and two (respectively) of the five models.

Of the dummy variables capturing the state of severe segregation, only two dimensions—centralization and exposure—were found to be significant predictors. Accordingly, these two measures are consonant with the two superdimensions (location and separation) of segregation uncovered earlier. Metro areas characterized by Blacks residing principally in neighborhoods close to the center of the geographic area and metro areas where Blacks reside in neighborhoods where they largely only come into contact with other Blacks are the metro areas that had high rates of Black homicides.

The last two columns of Table 4 present the results of negative binomial regressions including measures of hypersegregation. In the first column, the model included a dummy measure that captures hypersegregation, following the criteria of Massey and Denton (1993; four of the five indices must have been defined as severely segregated). Utilizing this measure, hypersegregation was a significant, independent predictor of Black homicide rates. Using an alternative conception of hypersegregation, a count variable that indicates the number of dimensions of severe segregation that besets a metropolitan area, provided further evidence that cities with a greater number of dimensions of severe segregation experienced a greater Black homicide rate, controlling for other salient factors.

Finally, additional models were analyzed to consider two possibilities: (1) that hypersegregation conditioned the association between segregation and the dependent variable, and (2) that the association between segregation and Black homicide rates was curvilinear, with higher levels of segregation associated with an accelerating Black homicide rate. Both Massey and Denton (1989) and Wilkes and Iceland (2004) suggested that the influence of segregation may be magnified under conditions of severe or extreme segregation, especially under conditions of severe segregation across dimensions. Both of these possibilities were tested (i.e., models including interaction terms between hypersegregation and each of the five segregation measures and equations that modeled a curvilinear term for each of the segregation measures), but the results failed to produce any evidence

Table 4
Negative binomial regression predicting Black homicides, severe segregation indicators considered (N=201)

	1	2	3	4	5	6	7
Disadvantage index	.041 (.034)	.021 (.035)	.039 (.034)	.024 (.033)	.052 (.034)	.027 (.035)	.013 (.034)
Stability	.006 (.005)	.006 (.005)	.008 (.005)	.011* (.005)	.007 (.005)	.006 (.005)	.007 (.005)
Black population (log)	.190*** (.038)	.190*** (.036)	.190*** (.037)	.170*** (.035)	.218*** (.037)	.182*** (.037)	.151*** (.038)
Percent young Black males	-.021 (.029)	-.025 (.029)	-.028 (.029)	-.029 (.028)	-.017 (.029)	-.024 (.029)	-.035 (.029)
Density	.00001 (.00001)	.00001 (.00001)	.00001 (.00001)	.00001 (.00001)	.00001 (.00001)	.00001 (.00001)	.000001 (.00001)
Ratio of Black/White household income	-.538 (.452)	-.636 (.438)	-.634 (.444)	-.419 (.429)	-.648 (.447)	-.653 (.439)	-.430 (.434)
Percent Black	-.821* (.404)	-1.299** (.404)	-.765† (.407)	-.719† (.376)	-.987* (.388)	-1.071** (.386)	-.743† (.382)
Percent college graduates	-.027 (.017)	-.032† (.017)	-.027 (.017)	-.036* (.017)	-.029 (.018)	-.030† (.018)	-.032† (.017)
Severe segregation: evenness	.097 (.074)						
Severe segregation: exposure		.233* (.096)					
Severe segregation: concentration			.208 (.126)				
Severe segregation: centralization				.303*** (.070)			
Severe segregation: clustering					-.183 (.185)		
Hypersegregation (dummy)						.201* (.100)	
Hypersegregation (count)							.107** (.031)
Constant	-9.00*** (.684)	-8.82*** (.677)	-9.18*** (.667)	-9.21*** (.646)	-9.27*** (.675)	-8.77*** (.694)	-8.76*** (.663)
X^2	75.13	79.22	76.09	90.77	74.39	77.47	84.93

Note: Standard errors are in parentheses.
† <.1.
* <.05.
** <.01.
*** <.001.

supportive of these propositions (results available upon request). While these results were not definitive, they suggest that some sort of threshold, additive effect exists between severe or hypersegregation and Black homicides rather than a curvilinear or a conditional association.

Discussion and conclusion

The term hypersegregation was coined by Massey and Denton in 1989 to capture the severe and multidimensional nature of Black segregation in the United States. The present research, inspired by Massey and Denton and the subsequent research examining the nature and extent of severe segregation along its various geographic dimensions, was the first systematic attempt that comprehensively evaluated the association between such dimensions of severe segregation, hypersegregation, and Black urban homicide. The general pattern of findings suggest that hypersegregation, measured either the way that Massey and Denton defined it, or as the number of dimensions of severe segregation that exist in a metro area, is predictive of Black urban homicide, even after controlling for other salient predictors. The present study was the first published examination that found that hypersegregation was a statistically significant predictor of Black homicides. These results suggest that hypersegregation is one important disadvantage that Blacks experience that is salient to understanding urban Black homicide. In essence, these findings support the core idea of Massey and Denton that segregation becomes more isolating as it accumulates across the five dimensions. Indeed, it should be emphasized that hypersegregation was a significant predictor of Black homicide, even while controlling for other salient predictors of such violence, including the ever-popular index of disadvantage (comprised of percent poverty, percent female-headed household, and percent males unemployed). While it is generally recognized that racial residential segregation is an important endogenous factor that contributes to the concentration of multiple forms of disadvantage like poverty, female-headed households, and unemployment in Black isolated neighborhoods, the present research revealed that hypersegregation was a significant *direct* predictor of Black homicides, even after controlling for such disadvantages. Indeed, the index of structural disadvantage failed to reach statistical significance when racial segregation was considered, supporting Wilson's (1987) notion that such isolation is not simply reducible to economic disadvantages and Massey and Denton's thesis that hypersegregation is capturing a degree of social isolation that is not captured by the other predictors.[17] Such severe isolation, according to Sampson and Wilson (1995) and Massey (2001) can produce cultural adaptations to this isolation that provide a basis for tolerating criminal activity, or even promoting it as a rational response. Future research should continue to investigate whether measures of structural disadvantage are significant indicators of Black urban violence once hypersegregation is considered.

Although the present inquiry could not decipher how precisely such severe segregation contributes to Black homicides in urban areas, the evidence clearly signified the importance of considering hypersegregation as a structural condition that affects Black urban violence beyond the mere inclusion of a single dimension of segregation. Indeed, the present study suggested that the consideration of only one dimension of segregation in models predicting Black urban violence may underestimate the adverse consequences of segregation in some urban areas.

The results also revealed that four of the dimensions of segregation were significant predictors of Black urban violence. For instance, the finding that the index of dissimilarity was a significant predictor of the dependent variable provided additional evidence that unevenness is predictive of Black urban violence (Lee & Ousey, 2005; Logan & Messner, 1987; Peterson & Krivo, 1993; Sampson, 1985). Additionally, this finding appears to contradict the conclusions forwarded by Shihadeh and Flynn (1996) regarding the importance of using a measure capturing the exposure dimension of racial segregation instead of a measure (i.e., the index of dissimilarity) that captures another dimension of racial segregation—this study suggested that both of these dimensions of segregation affect the Black homicide rate, but that the exclusion of percent Black from the analysis was necessary in order to eliminate redundancy between that measure and the exposure measure of segregation.[18] Indeed, the present study provided qualified support (four of the five measures were found to be significant predictors) for the aforementioned position articulated by Massey and Denton (1989, p. 373) that all of the dimensions of racial segregation isolate Blacks from resources and opportunities that are salient factors in understanding urban homicide rates.

While the present study found that four of the dimensions of segregation affect the Black homicide rate, the question of whether these dimensions are empirically interdependent or not was also considered. The finding that there exists significant empirical overlap between the various dimensions of segregation has been found in

other recent examinations of Massey and Denton's (1988) conceptual schema (Johnston et al., 2007). Hence, these findings revealed support for Johnston et al.'s (2007) notion of two superdimensions of segregation (separation and location) rather than five. While it may be the case that these dimensions tend to covary, however, such that urban areas that experience high levels of exposure also tend to experience high levels of unevenness and clustering (and urban areas that experience high levels of concentration also have high areas of centralization), the reader should remember that the subsequent findings examining the association between hypersegregation and Black homicides found that the greater the degree of various dimensions of segregation, the greater the Black homicide rate. The present findings suggest that research that only considers the influence of one dimension of segregation may underestimate the totality of the effects of segregation on Black urban violence.

Finally, the present study found that of the two superdimensions of segregation, only location (capturing the centralization and concentration dimensions) was a significant predictor of the dependent variable. While speculative, this finding can be interpreted as supportive of the aforementioned spatial mismatch hypothesis, which suggests there may exist a sort of mismatch between the skill level of Blacks residing in the central city and the employment opportunities that are in proximity to these neighborhoods (Blackley, 1990; Kain, 1968; Weinberg, 2000; see also Wilson, 1987). The decline in semi- and unskilled manufacturing jobs in the United States, coupled with the exodus of Whites and middle class Blacks from the geographic centers of many metro areas have left many Blacks that continue to reside in these neighborhoods unable to compete for the high skill employment opportunities that dominate the central cities of urban America. While manufacturing jobs have been (somewhat) replaced by growth in semi-skilled service industry jobs, these positions are in proximity to those that demand (and have the means to pay for) these services—Whites and middle class Blacks who reside on the periphery of the metropolitan area. Hence, center city Blacks are not only isolated from residing with Whites (and to a lesser extent, middle class Blacks) in such cities (as captured by the index of dissimilarity), they are also spatially distant from employment opportunities that match their skills in the metro area. Weinberg (2000) reported that centralization accounts for between 48 and 62 percent of the Black-White employment gap among young adults in the work force. Indeed, in an analysis of the mismatch hypothesis in the metro Atlanta area, Ihlanfeldt (2002) found that neighborhood Black crime rates were predicted by a measure capturing intra-metropolitan youth job accessibility. He reported that Black neighborhood property and violent crime rates would drop by 21 and 5.5 percent, respectively, if Black youth had the same level of job access as White youth have in their neighborhoods. The present study can be interpreted as supportive of a hypothesis that when spatial mismatch is severe, metro areas will suffer from relatively high homicide rates.

Racial residential segregation is not an antiquated social condition in urban America with little consequence. These findings reinforce other findings that segregation and hypersegregation may produce severe consequences. In spite of a recent Supreme Court ruling that questions the importance of race in the distribution of people (in the form of students) across urban areas, the present study suggests that the isolation of Blacks exacerbates the urban crime problem in America.

Appendix A. Correlation matrix for the five segregation measures

	Centralization	Evenness	Concentration	Exposure	Clustering
Centralization	1.000				
Evenness	.209	1.000			
Concentration	.714	.402	1.000		
Exposure	-.041	.664	-.096	1.000	
Clustering	.085	.749	.117	.857	1.000

Notes

1. For an excellent and comprehensive discussion of the deleterious consequences of Black social isolation, see Shihadeh and Flynn (1996, pp. 1329-33).

2. Blau and Blau (1982) acknowledged that other explanations of community crime rates had implied or expressed the core notion of relative deprivation.

3. Some critics have raised three major limitations of using relative deprivation theory as an explanation of this link (Shihadeh & Flynn, 1996; Shihadeh & Maume, 1997). The concerns include the use of 'reductionist' frameworks to explain the relationship between macro-level phenomenon; the assumption that racial segregation is the same crime-producing mechanism as other forms of racial inequality (e.g., educational inequality, income inequality, etc.); and the lack of empirical support for an unequivocal association between economic inequality and Black violent crime. One could make the argument, however, that these criticisms apply to the more popular concentrated disadvantage thesis as well. For example, Massey (2001) admitted that the concentrated disadvantage thesis is "ultimately a theory of micro-behavior: it makes specific predictions about how people adopt to conditions of life that have been imposed…" (pp. 328-329).

4. Special thanks to the Lewis Mumford Center, which provided much of the measures of residential segregation on their Web site: http://mumford.albany.edu/census/data.html#WP.

5. Fox and Zawitz (2004) reported that the percentage of homicide cases in which the offender is unknown (including no knowledge of the race of the offender) was nearly 30 percent for the later years in the 1990s. While a number of imputation strategies have been utilized (e.g., see Fox, 2004; Fox & Zawitz, 2004) to estimate offender race when such information is missing, some critics have raised valid concerns about the underlying assumption of such imputation procedures that solved and unsolved homicides with similar victim characteristics will have similar offender characteristics.

6. There does exist evidence to suggest that offending and victimization data are not interchangeable among smaller populations, however (see Wiersema, Loftin, & McDowell, 2000).

7. The index of dissimilarity is calculated as:

$$\frac{\sum_{i=1}^{n}(t_i|p_i-P|)}{2TP(1-P)}$$

Where ti is the total population and pi is the proportion Black of tract I, and T and P are the total population and proportion Black of the entire metropolitan area, which is then subdivided into n tracts.

8. The interaction index is calculated as:

$$\sum_{i=1}^{n}\left[\left(\frac{x_i}{X}\right)\left(\frac{x_i}{t_i}\right)\right]$$

Where x_i, and t_i are the numbers of Blacks and the total population of tract *i*, respectively, and X represents the number of Blacks across the metropolitan area.

9. Delta is calculated as:

$$0.5\sum_{i=1}^{n}\left|\frac{x_i}{X}-\frac{a_i}{A}\right|$$

Where x_i and X are the numbers of Blacks in tract i and the entire metropolitan area respectively, a_i is the land area of tract i and A is total land area for the metropolitan area.

10. Absolute centralization is calculated as:

$$1-\frac{\sum_{i=1}^{n}\frac{x_i a_i}{X}-\sum_{i=1}^{n1}\frac{t_i a_i}{T_1}}{\sum_{i=n2}^{n}\frac{t_i a_i}{T_2}-\sum_{i=1}^{n1}\frac{t_i a_i}{T_1}}$$

Where n tracts are ordered by increasing distance from the metropolitan area center, and X_i and T_i are the respective cumulative proportions of Blacks and all individuals in tract i, and a_i is the cumulative proportion of land area.

11. Spatial Proximity is calculated as:

$$\frac{XP_{xx}+YP_{yy}}{TP_{tt}}$$

$$\text{where } P_{gg}=\sum_{i=1}^{n}\sum_{j=1}^{n}\frac{(g_i g_j c_{ij})}{G^2}$$

$$\text{and } (g,G)=(x,X),(y,Y),(t,T)$$

The quantity c_{ij} is the negative exponential of the distance between tracts i and j. x,X, y,Y, and t,T are the numbers of Blacks, Whites, and total population in each tract and the metropolitan area.

12. The range of this measure largely varied from one to two. It should be noted that other researchers employing this index (e.g., Massey & Denton, 1989; Wilkes & Iceland, 2004), had subtracted one from each index to produce a measure that largely varied from zero to one.

13. The spatial proximity index ranges from one to two, so a cutoff of 1.6 is used.

14. Region of country was also considered as a predictor in additional analyses but its inclusion resulted in no significant differences in the results. Additionally, all models were analyzed using different threshold values for the size of the Black population (e.g., 2,500, 5,000 minimum individuals) but did not alter the pattern of results.

15. Prior research has established that crime rates rise at a decreasing rate as the size of the population increases (e.g., Krivo & Peterson, 2000; Logan & Messner, 1987).

16. Variance inflation factors (VIFs) were calculated for all the estimated models. Serious collinearity problems do not occur when VIFs are less than ten (Gujarati, 1995, p. 339). The VIFs for individual variables did not exceed four for any of the models displayed in Table 2 nor did the average VIF exceed three in any of the models in Table 2, indicating that multicollinearity did not significantly impact the results adversely.

17. Peterson and Krivo's (1999) study of Black homicides also found that structural disadvantage failed to reach statistical significance when racial segregation was also considered.

18. It must be noted that the present study differed from the work of Shihadeh and Flynn (1996) in several ways, including the use of somewhat different control variables (e.g., percent Black), data from a different decade (1990 versus 2000), a different unit of analysis (cities versus metro areas), and even a different analytic technique (negative binomial regression versus ordinary least squares regression).

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