

Inter- and Intra-group violence: Is violent crime an expression of group conflict or social disorganization?

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Abstract

The impact of residential turnover and compositional change at the neighborhood level on local patterns of crime lies at the center of most ecological studies of crime and violence. Of particular interest is how racial and ethnic change impacts intra-group and inter-group crime. Though many studies have examined this using city-level data, few have looked at it using neighborhood-level data. Using incident level data for the South Bureau Policing Area of the Los Angeles Police Department aggregated to Census tracts, we utilize a novel methodology to construct intra- and inter-group rates of robbery and assaults. The South Bureau has experienced dramatic demographic change as it has transitioned from a predominately African-American area to a predominately Latino area. We find support for the social disorganization model, as racial/ethnic transition in nearby tracts leads to greater levels of inter-group violence by both groups, as well as more intra-group violence by Latinos. Such neighborhoods appear to experience a breakdown in norms leading to higher levels of all forms of violence. Particularly noteworthy is that intra-group crime is highest in all settings, including the most heterogeneous tracts. We also find support for the consolidated inequality theory, as greater inequality across the two groups leads to more violence by the disadvantaged group.

Keywords: inter-group crime, intra-group crime, inequality, group threat theory, neighborhoods, racial/ethnic heterogeneity, racial/ethnic transition, segregation, dynamic.

Bios

John R. Hipp is an Assistant Professor in the departments of Criminology, Law and Society, and Sociology, at the University of California Irvine. His research interests focus on how neighborhoods change over time, how that change both affects and is affected by neighborhood crime, and the role networks and institutions play in that change. He approaches these questions using quantitative methods as well as social network analysis. He has published substantive work in such journals as *American Sociological Review*, *Criminology*, *Social Forces*, *Social Problems*, *Mobilization*, *Crime & Delinquency*, *City & Community*, *Urban Studies* and *Journal of Urban Affairs*. He has published methodological work in such journals as *Sociological Methodology*, *Psychological Methods*, and *Structural Equation Modeling*.

George E. Tita is an Associate Professor in the department of Criminology, Law and Society at the University of California Irvine. His research is anchored in the community and crime literature with a special focus on issues of interpersonal violence. In addition to exploring the causes and correlates of interpersonal violence, especially urban homicide, he is also interested in documenting the costs that violence impose on society that extend beyond the emotional, physical and financial burdens borne by victims. He has published in such journals as *Journal of Quantitative Criminology*, *Journal of Research on Crime and Delinquency*, *Social Forces*, *Social Problems*, and *Urban Studies*.

Lyndsay N. Boggess is a doctoral student in the department of Criminology, Law and Society at the University of California Irvine. Her research interests involve communities and crime, economics, and the housing market. In 2005 she received an Early Doctoral Student Research Grant from the U.S. Department of Housing and Urban Development to study the relationship between crime and the rate of residential turnover in Los Angeles, CA. She is currently completing work on her dissertation assessing the consequences of neighborhood change in Los Angeles. Her work has appeared in the journal *Law, Probability and Risk*.

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Given the legacy of segregation and poor race relations in the United States, the extent to which violence occurs between members of different racial/ethnic groups is of considerable public policy interest. It is crucial to know whether such violence occurs more frequently between members of the same racial/ethnic group or between members of different racial/ethnic groups, and the causes of this violence. Studies have frequently addressed this question using data aggregated to large units of analysis (Jacobs and Wood, 1999; McCall and Parker, 2005; Messner and South, 1992; O'Brien, 1987; Parker, Stults, and Rice, 2005; Wadsworth and Kubrin, 2004). As a consequence of using highly aggregated data, studies showing that crime occurs more frequently between members of the same racial/ethnic group may simply be capturing propinquity effects due to the considerable segregation in U.S. society (O'Brien, 1987). Although such studies can provide important insight into larger macro processes, such an approach precludes understanding the *neighborhood* characteristics that are important for fostering inter-group crime.

Recognizing that inter-group dynamics unfold at the local level emphasizes the importance of focusing on the structural and ecological features of neighborhoods to identify the factors that might affect this violence. Sampson's study (1984) recognized the need to move to smaller units of analysis and demonstrated a tendency for intra-group crime relative to inter-group crime at the neighborhood level. However, he did not test whether these tendencies differed based on the characteristics of the neighborhood. Our study thus picks up where this prior work leaves off in exploring the relationship between neighborhood characteristics and inter-group violence.

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Studies viewing the structural determinants of violent inter-group relations most frequently focus on the competition between groups and the notion of defended turf for fostering racial hate crime and violent events during riots (Bergesen and Herman, 1998; Green, Strolovitch, and Wong, 1998; Olzak, Shanahan, and McEneaney, 1996). This focus on a specific type of crime, or violent occurrences during such rare events as riots, leaves unanswered what effect such group competition has on more everyday violent events. Furthermore, although certain neighborhood structural characteristics may increase competition between groups and lead to increased violence, an alternative hypothesis is that this violence is simply the consequence of a socially disorganized neighborhood. That is, the long line of literature in the social disorganization tradition (Peterson, Krivo, and Harris, 2000; Sampson and Groves, 1989; Shaw and McKay, 1942) posits neighborhood instability results in a breakdown of informal social control and consequently higher rates of crime. Social disorganization theory implies that such neighborhoods experience higher rates of *both* intra- and inter-group violence, thereby highlighting the need to account for both possibilities when explaining local rates of inter-group crime.

In what follows, we describe and specify the theories purporting to explain why some neighborhoods might experience more inter-group violence. We first outline the predictions based on the group competition theories and follow up with the predictions offered by the social disorganization model. Although crime data availability limits our research site to one portion of the city of Los Angeles, it is an interesting study site in that it represents an area of about 660,000 residents that has transitioned over the last two decades from an African American majority to a Latino majority. This allows us to move beyond prior work focusing on black/white violent interaction to study black/Latino violence. Following a brief description of our novel methodology that allows us to construct inter- and intra-group robbery and aggregated

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assault rates by accounting for the probability of interaction between these two groups, we describe the pattern of inter- and intra-group violence over a six-year period (2000 – 2006). Next we evaluate the theoretical expectations of the competition models and the social disorganization model by accounting for the relationship between neighborhood characteristics and inter- and intra-group violence at one point in time (2000). Finally, we conclude and highlight implications of our findings.

Explanations of inter- and intra-group violence

Competition between groups

While much research focuses on the process through which members of a group can develop a collective sense of identification (Hogg, 1992; Simmel, 1955; Tajfel, 1981; Turner, 1987), and how this can lead to more positive social interaction and a reinforced sense of perceived cohesion (Hipp and Perrin, 2006; Hogg, 1992; Homans, 1950; Moody and White, 2003), another line of research explores the tendency of such group cohesion to foster a sense of group identity resulting in *negative* interactions between members of *different* groups (Jacobs and Wood, 1999; Messner and South, 1992; O'Brien, 1987; Parker, Stults, and Rice, 2005; Wadsworth and Kubrin, 2004). Specifically, such negative interactions include instances of violent physical and verbal conflict, and most theories focus on the role of competition between these groups as a key mechanism leading to such violence. This notion underlies the literature testing for the determinants of inter-group violence in the group threat or defended neighborhood tradition (Green, Strolovitch, and Wong, 1998) and the consolidated inequality tradition (Blau and Blau, 1982; Golden and Messner, 1987; Harer and Steffensmeier, 1992). Given that the relationship between racial/ethnic group identity and inter- and intra-group violence plays out at the neighborhood level, a key question is whether neighborhood characteristics foster these sorts

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of violence. We next consider three key theories focusing on group competition and violent inter-group interactions.

The consolidated inequality theory focuses on economic competition across groups (Blau and Blau, 1982). This perspective argues that inequality across groups heightens the social distance between them, leading to a sense of injustice and a subsequent violent response on the part of the disadvantaged group (Blau and Blau, 1982; Blau, 1977; Blau, 1987). A body of research in the 1980s and early 1990s looked at the effect of economic difference between racial groups in large cities or metropolitan areas for fostering higher levels of overall crime (Balkwell, 1990; Blau and Blau, 1982; Blau and Golden, 1986; Golden and Messner, 1987). However, these early studies focused on overall crime rather than inter-group crime. As a consequence, such studies were unable to discern which group members were committing the violence. Though later work focused on race-specific violent crime (Harer and Steffensmeier, 1992; Sampson, 1985; Velez, Krivo, and Peterson, 2003), it failed to explicitly focus on intra- versus inter-group crime. Messner and Golden (1992) did explicitly compare rates of race-specific violence by African-Americans, to rates of inter-group violence between blacks and whites, to rates of overall violence as one way to test these hypotheses. Nonetheless, by focusing on violent events aggregated to large units of analysis, the research design employed in these studies precludes one from understanding how inequality among groups plays out at the neighborhood level. Thus, whereas the model posits that neighborhoods with greater inequality *between* groups will experience higher rates of inter-group violence committed by members of the more disadvantaged group, few studies have explicitly tested this hypothesis.

Two other perspectives focusing on the role of across-group competition are the group threat model (Blumer, 1958; Quillian, 1995; Quillian, 1996), and the closely related defended neighborhood model (Suttles, 1972). The group threat model posits that the dominant group

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responds with violence to a *narrowing* of the economic gap (Blumer, 1958). This narrowing of the economic difference is perceived as a challenge to the dominant group's hegemony. One study found such effects based on violent behavior by the threatened dominant group in riot events (Olzak, Shanahan, and McEneaney, 1996). On the other hand, a study that tested whether economic competition among groups leads to hate crimes failed to detect such effects (Green, Strolovitch, and Wong, 1998).

Beyond this economic difference across groups, the defended neighborhood model argues that how the neighborhood is transforming racially/ethnically, and the subsequent racial/ethnic mixing, can have important implications for across-group violent interactions. In this model members of the dominant group perceive residential ethnic transition as a challenge and respond to this perceived competition by committing inter-group violent events in an effort to “defend” their territory (Bergesen and Herman, 1998; Green, Strolovitch, and Wong, 1998). The notion of what “group” defines itself as the dominant one of the neighborhood—with a concomitant definition of “outsiders”—can vary over neighborhoods (Suttles, 1972). In the context of the present study, it is postulated that the dominant group is defined by numeric superiority in terms of race/ethnicity, which as we previously stated, is a particularly salient characteristic for fostering a sense of in-group identity among residents in the neighborhood. In support of this postulate, one study found that whites in neighborhoods in which they were previously dominant responded to an influx of various minority groups with more hate crime events (Green, Strolovitch, and Wong, 1998). Also consistent with this perspective, a study focusing on large units of analysis (55 large SMSAs) suggested that high levels of racial segregation followed by interracial contact generated racial competition, which in turn increased the rate of ethnic and racial unrest and race riots from 1960-1993 (Olzak, Shanahan, and McEneaney, 1996). A study of neighborhoods argued that residential ethnic succession led to

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ethnic competition in which the dominant group responded by committing riot violence (Bergesen and Herman, 1998). While an innovation of this latter study was moving beyond the black/white dichotomy of earlier research to include African-American neighborhoods experiencing an influx of Latinos, it should be highlighted that it focused only on homicides occurring during an exceptional time period: the few days during the 1992 Los Angeles riots. Furthermore, although their theoretical framework *suggested* that African-Americans who felt threatened by the large Latino in-migration over the previous decade committed the homicides, they provided *no direct empirical evidence* as their data did not contain the race/ethnicity of the actual homicide offenders.

Social disorganization theory

Up to this point we have focused on theoretical models positing the importance of certain neighborhood structural characteristics for fostering group competition, which manifests itself in violence between racial/ethnic groups. In contrast, the social disorganization model has long explained general levels of crime using similar neighborhood structural characteristics, but arguing that the mechanism was not so much group competition but rather the fracturing of local levels of informal social control (Shaw and McKay, 1942). Specifically, this model posits that neighborhoods with higher levels of residential instability, racial/ethnic heterogeneity, and poverty have fewer social interactions among residents, thus reducing the ability to collectively address problems by providing social control in the neighborhood, resulting in higher rates of crime. This implies that disorganized neighborhoods will have higher rates of all types of violence—both intra- and inter-group.

Rather than focusing on how ethnic heterogeneity might foster competition across groups, the social disorganization model therefore focuses on how it will lead to more crime by reducing social interaction and the ability to provide social control. Indeed, numerous studies

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have found that neighborhoods with higher levels of racial/ethnic heterogeneity have higher levels of crime (Bellair, 1997; Hipp, 2007b; Roncek and Maier, 1991; Rountree and Warner, 1999; Sampson and Groves, 1989; Warner and Pierce, 1993; Warner and Rountree, 1997). This raises an important distinction: whereas the defended neighborhood and the social disorganization model both posit that increasing levels of racial/ethnic heterogeneity will result in higher levels of *inter*-group violence—though for different reasons—the social disorganization model posits that rates of intra-group crime will rise as well. In contrast, the defended neighborhood model makes no prediction about intra-group crime.

Given that the social disorganization model posits that social distance will reduce interaction, which will then reduce social control, one implication is that the social distance fostered by income inequality should also reduce interaction. Indeed, studies have suggested that inequality does affect social interaction (Blum, 1985; Erickson, 1996; Hipp and Perrin, Forthcoming), and other research has tested the relationship between overall inequality in a neighborhood and crime (Crutchfield, 1989; Hipp, 2007b; Messner and Tardiff, 1986). This overall inequality may lead to an increase in overall crime due to the increased feelings of inequity, but there is little reason to expect it to affect inter- or intra-group crime disproportionately. Furthermore, Blau (1977) argued that the combination of income inequality with the ascriptive characteristic of race would have a pronounced negative effect on social interactions. Messner and Golden (1992) pointed out that this implies that racial inequality will lead to higher levels of both intra- and inter-group violence. These considerations point to a difference between the social disorganization model, which posits that general inequality or racial inequality will increase both inter- and intra-group crime, and the group identity models that posit more specific effects in which across-group inequality increases inter-group crime.

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Finally, the nexus between neighborhood transition and violence underpins the social disorganization model, suggesting that the racial/ethnic transition of the neighborhood may play a destabilizing role. In this model, disadvantaged neighborhoods experience a constant turnover in racial/ethnic composition, but maintain higher constant crime rates. This racial/ethnic transformation will lead to general disorder and hence higher levels of both inter- and intra-group crime. Following Pastor et. al (2001), we use the phrase “ethnic churning” in describing this process of racial/ethnic transition in a neighborhood: they measured ethnic churning as the sum of the absolute value of changes in proportions of each racial/ethnic group in the neighborhood over a ten-year period. This captures the degree of racial/ethnic change in the neighborhood over the previous ten years. While they focused on ethnic churning’s effect on neighborhoods’ ability to band together politically to fight the placement of a toxic waste site, the social disorganization model posits that ethnic churning will lead to higher levels of all types of violent crime. Again, this contrasts with the group competition models that posit a more specific effect on only one type of inter-group crime during racial/ethnic transformation.

Modeling spatial effects

Neighborhoods are not self-contained, insular units, but rather social processes can spill over into adjacent neighborhoods and have independent effects on the focal neighborhood. Specifically, we consider how measures related to the racial/ethnic composition along with the measures of poverty and inequality are likely to have important implications for a focal neighborhood. For instance, in an ethnographic study of four Chicago neighborhoods Wilson and Taub (2006) described how racial/ethnic changes in adjacent neighborhoods affected the behavior of residents in the focal neighborhood. Local residents often worried about, and reacted to, the encroachment of different groups into the peripheral areas of the community. Even in instances in which a particular group was numerically dominant, social interactions could

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become strained when members of various groups competed for geographically situated resources such as parks or recreational centers. By simply focusing on the racial/ethnic transition occurring within a particular small area of a community such as a census tract, one may miss an important part of the story with regards to racial and ethnic change.

To the extent that poverty and income inequality increase rates of violence, there is little reason to expect that such violence would be constrained to one particular neighborhood. Indeed, one study of Chicago found that the concentrated disadvantage of nearby neighborhoods had a direct effect on the general homicide rate in a focal neighborhood (Morenoff, Sampson, and Raudenbush, 2001). Typical mobility patterns will almost certainly expose one to criminal events as either the victim travels, or the offender forages, into nearby neighborhoods (Tita and Griffiths, 2005).

Summary

Although we outlined theories focusing on group competition leading to higher levels of inter-group violence, there is scant research testing this question with neighborhood level data. We test these group-level theories of inter-group violence while simultaneously taking into account possible social disorganization effects. Our desire to test separate neighborhood effects for inter- or intra-group violent crime highlights a limitation of prior work focusing simply on the relative likelihood of intra- or inter-group crime: such prior work cannot distinguish between competition effects and social disorganization effects at the local level. Though prior research into inter-group violence certainly informs the present study (Jacobs and Wood, 1999; Messner and South, 1992; Parker, Stults, and Rice, 2005; Wadsworth and Kubrin, 2004), it falls short as city-level data does not permit one to estimate the *rates* of both inter- and intra-group crime to disentangle which neighborhood-level process is at work. As noted by Hipp (2007a), the choice

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of one's unit of analysis must be consistent with one's theory: focusing on large cities when the social processes are occurring in the neighborhoods *within* these cities can obscure these effects.

Data and Methodology

Data

For our analyses, we combined data obtained from the Los Angeles Police Department (LAPD) with data from the U.S. Census on the socio-demographic characteristics of these census tracts. The police data contained all reports for robberies and aggravated assaults for the entire South Bureau Policing Area of the LAPD for the period 2000-06; no crime data were available for other parts of the city. In the models testing for differences in inter- and intra-group violence over neighborhoods, since our independent variables are only measured in year 2000, we aggregated the crime events for 2000-02 to smooth over yearly fluctuations and estimated cross-sectional models (Baller, Anselin, Messner, Deane, and Hawkins, 2001; Morenoff and Sampson, 1997; Parker and McCall, 1999; Rosenfeld, Messner, and Baumer, 2001; Wadsworth and Kubrin, 2004). Given that this area is undergoing rapid neighborhood change, using the later years of crime data is not advisable in these models as the later years are more distal from our predictors.¹ In addition to the race and ethnicity of the offender and victim (when known), the data also included the address of each crime. The data were geocoded to street addresses and then aggregated to 2000 census tract boundaries.² Population for South Bureau in 2000 was approximately 660,000 persons distributed among 149 tracts (out of 713 total tracts in Los Angeles), and was about 51% Latino, 33% African-American, 10% white, 4% Asian, and 2% other races. The average median income in these census tracts was \$29,053 with a 30.4 percent poverty rate. Although this is a relatively disadvantaged area, arguably it is quite representative of the types of areas that would experience an African-American to Latino transition, given the

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economic position of these two groups in U.S. society. Included in the analyses are all tracts that contained a “normalized” population of at least 50 persons for the relevant groups of that particular model, as described in the methodology section.³ We show the geographic location of South Bureau in reference to Los Angeles city and county in the map in the Appendix (Map 1).

Outcome measures

For each crime event, we classified the type of crime based on the race/ethnicity of the offender and the victim. We coded all events for which the race/ethnicity was known of both offenders and victims.⁴ This information was known for approximately 87.6 percent of the victims of robberies and 99.8 percent of the victims of aggravated assaults; it was known for approximately 97.5 percent of the offenders of robberies and 93.7 percent of the offenders of aggravated assaults. Since we are focusing on Latinos and African-Americans, there are four possible types of crime:⁵

- 1) black on black (c_{bb})
- 2) Latino on Latino (c_{ll})
- 3) black on Latino (c_{bl})
- 4) Latino on black (c_{lb})

The outcome measure is a count in the tract for each of these types of crime.

Exogenous variables

In our models, we included several measures that are likely important predictors of crime. These measures come from the 2000 U.S. Census. To take into account the racial/ethnic composition of the tract, we included measures of the percent Asian, white, Latino, and other race (with percent African-American as the reference category). We included a measure of racial/ethnic heterogeneity by using a Herfindahl index (Gibbs and Martin, 1962: 670) of these same five racial/ethnic groupings, which takes the following form:

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$$(1) \quad H = 1 - \sum_{j=1}^J G_j^2$$

where G represents the proportion of the population of ethnic group j out of J ethnic groups. Subtracting from 1 makes this a measure of heterogeneity. Larger values of H indicate more heterogeneous tracts. We measured ethnic churning by:

$$(2) \quad \sqrt{\sum_{j=1}^J (G_{j00} - G_{j90})^2}$$

where G represents the percentage of the population of ethnic group j out of J ethnic groups in 2000 (00) or the 1990 U.S. Census (90). By taking the square root of this sum of squares, we are placing the measure back into approximately the same metric as the difference in percentage over the decade.

We created measures of income inequality *between* racial/ethnic groups. To test the group threat model, we created a measure of *relative racial inequality* of Latinos and African-Americans: this is computed as the difference in logged median income between Latino and African-American households for each tract. By subtracting these logged measures, we are capturing a ratio. To test the consolidated inequality theory that any inequality between groups increases violence, we created an *absolute racial inequality* measure: this is calculated as the absolute value of this difference in logged incomes. This measure captures income difference between these two groups, rather than treating one as the dominant group.

Because the social disorganization model argues that the economic resources of the tract are important for addressing crime in the neighborhood, we included the tract median income.⁶ To capture the effect of broken families that might reduce oversight capability, we included the percent single parent households in the tract. To account for the effect of residential stability, we included the average length of residence of households in the tract in 2000. We list the summary statistics of the variables used in the analyses in Table 1.

<<<Table 1 about here>>>

Methodology

Researchers testing within and across group preferences for either positive or negative social interactions face the challenge of accounting for propinquity effects. That is, social interactions are a function of three processes: 1) the physical closeness (propinquity) of other group members; 2) the relative composition of the groups in the geographic area; and 3) the preference for interaction with fellow group members. Propinquity is simply the notion that those who are closest in physical space will be most likely to interact, and requires taking into account the local context in which such interactions occur. The composition of the groups represents the relative possibilities for interaction. Our model accounts for these propinquity and group composition effects, and then estimates the preference for within-group interaction.

An important innovation of our study is appropriately taking into account the possibility of contact between the group members for the crime type of interest by using tract-level data and accounting for the conditional probability of interaction. There is frequent confusion in the inter-group crime literature as to which “population” is appropriate to use in the denominator when calculating intra- and inter-group crime rates. One approach uses the population of the victim’s group or the offender’s group as the denominator when calculating these types of crime as rates (Jacobs and Wood, 1999; Parker and McCall, 1999), while another simply uses the total population as the denominator (Wadsworth and Kubrin, 2004). A final approach simply conditions on the existence of an event (Sampson, 1984; South and Felson, 1990). Besides relying on the quite strong assumption that the process generating the victimization event is exogenous to the decision of which group member to attack, this approach can only compare the relative probability of inter- and intra-group violence, and cannot test whether *both* are increasing. We build on prior insight (O'Brien, 1987) and suggest that a more appropriate

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approach employs the conditional probability of within or across group interaction. Thus, given that an interaction has occurred, the probability that it involved two members of group A (i_{aa}) in a particular census tract is:

$$(3) \quad i_{aa} = [(N_A)(N_A-1)] / [(N)(N-1)]$$

where N_A is the size of group A, and N is the tract's total population. Since the denominator captures the total number of possible interactions, this measure captures the proportion of interactions that should be between two members of group A. The equation for group B is analogous:

$$(4) \quad i_{bb} = [(N_B)(N_B-1)] / [(N)(N-1)]$$

where all terms are as defined before, and N_B is the size of group B. The possibility of inter-group interactions initiated by members of group A is defined by the expression:

$$(5) \quad i_{ab} = [(N_A)(N_B)] / [(N)(N-1)]$$

where all terms are as defined before. The possibility that members of group B initiated inter-group interactions is the same value. Since the probability of interaction across groups is the same regardless of who initiates the interaction, we only needed this one conditional probability interaction to handle these two possible crime types.

For each of these conditional probabilities, we multiply it by the tract population and include it in the equations we estimate.⁷ This provides us what we term a *normalized population*. For a neighborhood in which these are the only two groups, these conditional probabilities sum to one. Thus, multiplying by the tract population places these into the familiar metric of per capita crimes. Given this is a count outcome, we estimated negative binomial regression models for these four separate outcomes (the Poisson distribution is augmented with an additional parameter with an assumed gamma distribution that accounts for the non-independence of the

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crime events). For instance, the black on black violent crime equation when looking at all years of data is:

$$(6) \quad c_{bb} = \alpha + i_{bb} + \Gamma Y$$

where i_{bb} is the conditional probability of an interaction between two black residents given the tract population size, as defined above in equation 4 (with a coefficient constrained to 1), Y is a matrix of indicator variables for the year of the data with a vector of Γ effects, and α is an intercept. The exponentiated value of α gives an estimate of the number of crime events per 1,000 normalized population in 2000 (since we multiplied the value by 1,000). By adding the estimate of the yearly indicator to the intercept before exponentiating, we obtain estimates of crime rates for the other years of the 2000-06 period.

We generalize this model by including our exogenous measures of interest in the full models:

$$(7) \quad c_{bb} = \alpha + i_{bb} + BX + \rho WX$$

where all terms are as defined above, X is the matrix of exogenous measures (e.g., racial/ethnic composition, inequality, etc.), B is a vector of their effects on the outcome, WX are the spatially lagged variables (described below) and ρ is the estimated effect on the outcome. For the inter-group crime models we substituted for i_{bb} the conditional probability from equation 5 (i_{ab} , multiplied by the tract population) in the model with a coefficient constrained to one.

To increase the efficiency of our estimates, we estimated each of these four equations separately and then combined the covariance matrices of results into a single covariance matrix before computing the standard errors. Such an approach is implemented in the *suest* command in Stata. This procedure combines the results for these models, and allows for significance testing across equations. For all models, we tested for evidence of multicollinearity or influential observations and found no such effects.⁸

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To account for possible spatial effects, we specified and estimated a model including spatially lagged predictors. Spatial lag and/or spatial error models have become, unfortunately, the default choices among those estimating ecological models of crime (or other deleterious outcomes). We follow the lead of Elffers (2003) and Morenoff (2003) and argue that in the case of intra- and inter-group crime, the theoretical justification for such models is lacking (see also Anselin, 2003: 161). To model our outcomes using a spatial lag model we would need to argue that the level of either intra- or inter-group crime in a neighboring area has a direct “contagion” effect on crime in a focal area. We do not believe this is the case, especially with respect to inter-group crime events. We could estimate a spatial error model to account for the possibility of unobservable similarity or interdependence among units of analysis. Rather than assuming “unobservable similarity” we instead include spatially lagged versions of some of our key predictors that we posit exhibit positive spatial autocorrelation or “similarity.” Specifically, we argue that it is theoretically reasonable to expect important effects from: the racial/ethnic composition of adjacent neighborhoods (as these group compositions could affect inter- and intra-group crime rates in the tract of interest), how that racial/ethnic composition has changed, the income level of adjacent neighborhoods (which might create additional stress or protective effects), and economic inequality in adjacent neighborhoods. We created these measures by multiplying the values of these variables in nearby tracts by our spatially weighted (W) matrix. This W matrix is constructed as a distance-decay with a two-mile cutoff (row standardized) given that prior research suggests that offenders travel, on average, between 1 and 2.5 miles, depending on the crime type (Pyle, 1974). Another advantage of using spatial lags of our neighborhood characteristic measures is that they do not suffer from boundary effects. That is, whereas we only have information on crime events that occurred within the tracts of South Bureau, we have information from the U.S. Census on the demographic characteristics of all

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surrounding tracts within two miles of the focal tract, regardless whether they are actually in South Bureau. We tested for spatial autocorrelation and all of the measures showed positive and significant Moran's I values, ranging from .25 for the ethnic churning variable to .78 for percent African-American.

Results

Tendency of intra- versus inter-group violent crime

We begin by comparing the level of intra-group violent crime with the level of inter-group violent crime in the models run on all seven years of data, but only including the yearly indicator variables. Turning first to the results for aggravated assault, two key findings can be highlighted: 1) this type of crime largely occurs within members of the same racial/ethnic group; 2) the rate is much higher for African-American intra-group aggravated assault than any of the other types. For instance, Figure 1 highlights that the rate of African-American intra-group aggravated assaults per 1,000 normalized population was 54.2 in 2000, increased to 57.2 in 2002, and then began a general decline until reaching 40.5 in 2006. This rate is almost 500% greater than the rate of Latino intra-group aggravated assaults over this period, which ranges from 5.6 in 2000 to 9.8 in 2006. We also see that the rate of *intra*-group assault is considerably higher than the rate of *inter*-group assault. For instance, over this time period an African-American is 435% more likely to assault a fellow African-American as a Latino (48.3 rate for black on black compared to a 9.0 rate for black on Latino). Likewise, over this time period a Latino is about 50% more likely to assault a fellow Latino than an African-American (8.1 rate for Latino on Latino compared to 5.3 rate for Latino on black). We emphasize that these results are obtained even after accounting for propinquity and local compositional effects.

<<<Figure 1 about here>>>

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For robbery, we highlight two key findings: 1) African-Americans are far more likely to commit this type of crime, and 2) there is essentially no in-group tendency among African-Americans for this type of violence. The average rates of African-American intra- and inter-group robberies (24.0 and 27.8 respectively) over this period are far higher than the average rates of Latino intra- and inter-group robberies (5.4 and 2.4 respectively). Thus, there is little evidence that African-Americans are more likely to rob fellow group members when taking into account propinquity effects: we see in Figure 2 that a slight in-group tendency at the beginning of the study period disappears very quickly. On the other hand, Latinos show a consistent tendency towards intra-group robberies, as they are 130% more likely to rob a fellow group member than an African-American over this period. Again, these results account for both propinquity and local compositional effects.

<<<Figure 2 about here>>>

Effect of tract racial/ethnic composition

We next ask whether these rates of intra- and inter-group violence differ over neighborhoods, and what characteristics of neighborhoods might explain these differences. The full results for the models are shown in Table 2 for aggravated assault and Table 3 for robbery. Since it is not appropriate to separately interpret the coefficients for racial/ethnic composition and heterogeneity, we provide a sense of the magnitude of these effects by plotting the intra- and inter-group crime rate for different racial/ethnic combinations in tracts. We simulated the rate of a particular type of inter- or intra-group crime for four hypothetical racial/ethnic compositions in neighborhoods (holding the non-race variables to their mean values): 1) nearly all Latino (80% Latino, 20% African-American), 2) nearly all African-American (80% African-American, 20% Latino), 3) half Latino and half African-American, 4) high heterogeneity (20% Asian, 5% other race, and 25% of the other three groups).⁹ These plots provide two types of information: 1) how

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a particular type of intra- or inter-group violent crime differs over various neighborhood racial/ethnic compositions; 2) what the pattern of inter- and intra-group crime types look like in a particular neighborhood composition. We begin by describing the first type of information.

<<<Tables 2 and 3 about here>>>

Focusing on African-American within-group violence, the neighborhood's racial/ethnic composition has similar effects on aggravated assault and robbery, as seen by comparing the horizontal-lined bars in Figures 3 and 4. Within-group assault and robbery happens most frequently for African-Americans in mixed-group contexts, and happens least frequently in mostly African-American tracts: the rate of African-American intra-group aggravated assaults is just 8.5 per 1,000 normalized population in nearly all black tracts, but rises to 10.2 in a high heterogeneity tract and 22.1 in a tract equally composed of blacks and Latinos. In fact, within group robberies and aggravated assaults for African-Americans occur most frequently in Latino-dominated tracts (81.6 aggravated assaults per 1,000 normalized population). This highlights the importance of accounting for propinquity effects, given that the opportunity for within-group violence is greater in mostly African-American tracts.

<<<Figures 3 and 4 about here>>>

The pattern is similar for Latino within-group violence: Latinos assault and rob fellow Latinos least frequently when Latinos are numerically dominant in the tract, as seen in the vertical-lined bars in Figures 3 and 4. Within-group assault and robbery is highest for Latinos in mixed-group contexts. Whereas the rate of intra-group aggravated assaults for Latinos is just 5.8 in nearly all Latino tracts, this rises to 6.7 in high heterogeneity tracts, 9.7 in black/Latino tracts, and 24.0 in nearly all black tracts.

Turning to *inter*-group violence, we see different patterns depending on whether we are viewing violence committed by blacks or Latinos. Black on Latino aggravated assaults occur

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more frequently in high heterogeneity tracts as seen in the diagonal-lined bars in Figure 3. Black on Latino violence occurs least frequently in tracts equally composed of Latinos and blacks. The pattern for Latino on black violence is slightly different. Latino on black violence occurs most frequently in tracts in which Latinos have an appreciable presence, and least frequently in mixed race tracts, as seen in the solid bars of Figures 3 and 4. Thus, there is little evidence that greater racial/ethnic mixing leads to more inter-group violence on the part of Latinos.

What do these findings imply for the types of inter- and intra-group crimes in tracts of various racial/ethnic compositions? First, consider those tracts in which one group comprises a significant numerical majority. In tracts that are nearly all Latino the highest rate for both aggravated assaults (Figure 3) and for robberies (Figure 4) are intra-group crimes among African-Americans (81.6 for aggravated assaults and 27.5 for robberies) followed by a high rate of black on Latino robberies (19.9). The other types of crime occur much less frequently in such tracts. Likewise, in a tract that is nearly all African-American, the highest rates of violence occur among Latinos (24.0 for aggravated assaults and 25.0 for robberies). Again, the numerical majority group engages in relatively less within-group violence in these tracts. But while there is a high rate of robberies among Latinos in mostly black tracts, there is also a high rate of black on Latino robberies (16.9).

It is important to highlight that whereas prior research has found higher crime rates in racially mixed tracts, we see little evidence here that inter-group violence is driving this effect. In fact, in racially mixed tracts the highest rate of aggravated assaults occurs *among* African-Americans, and the second highest rate occurs *among* Latinos. And the evidence for robberies seems to suggest that African-Americans generally commit robberies regardless of whether they are robbing fellow African-Americans or Latinos. The highest rates in these racially mixed tracts occur for black on Latino robberies, but the second highest rate is generally for black on

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black robberies. These findings are an important clue for disentangling why we observe higher crime rates in racially/ethnically mixed neighborhoods: explanations pointing to heightened conflict and hence violent interactions between these group members are clearly inadequate for explaining the expressive crime of aggravated assault.

Effect of inequality

We next turn to the question of whether inequality in various forms affects these crime types. We found somewhat unexpected results for the intra-group models: on the one hand, within group inequality had no effect on these crime types in initial models we estimated (results not shown). On the other hand, absolute racial inequality was important for intra-group aggravated assault, as seen in models 1 and 2 in Table 2. There was a particularly strong effect from absolute racial inequality in nearby tracts. A one standard deviation increase in absolute racial inequality in the tract increases black on black aggravated assaults 16.9% ($\exp(.431 \times .36) = 1.169$), and an equal increase in absolute racial inequality in the surrounding areas increases it 66.4%, as seen in model 1. And whereas absolute racial inequality in the tract does not appear to affect Latino on Latino aggravated assaults, a one standard deviation increase in this inequality in surrounding tracts increases Latino intra-group aggravated assaults 18%. However, there is no evidence of significant effects of this absolute racial inequality on intra-group robberies, a more instrumental form of violence.

For inter-group violence, we found that *relative racial inequality* had a stronger effect than did the *absolute racial inequality* measure. The economically disadvantaged group appears more likely to engage in inter-group aggravated assaults. In tracts surrounded by areas in which Latinos are economically disadvantaged relative to African-Americans, there are higher levels of Latino on black aggravated assaults, as seen in model 3 of Table 2. A one standard deviation increase in black income relative to Latino income in nearby tracts increases Latino on black

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aggravated assaults 37.4%. And in tracts in which blacks are economically disadvantaged relative to Latinos, there are higher rates of black on Latino aggravated assaults in model 4 of Table 2: a one standard deviation increase in this inequality results in an 20.5% increase in this crime type. For robberies, we see that there are more black on Latino robberies in tracts in which blacks are economically disadvantaged relative to Latinos (17.3% more for a one standard deviation increase), and this effect is exacerbated when blacks are also economically disadvantaged relative to Latinos in the surrounding tracts (9% more for a one standard deviation increase), as seen in model 4 in Table 3. Finally, we note one unexpected effect in that there are more Latino on black robberies in tracts in which Latinos are economically *advantaged* relative to blacks (46.8% more for a one standard deviation increase), though Latino economic *disadvantage* in the surrounding tracts again increases this type of crime (20.5% for a one standard deviation increase).

In ancillary models we found little evidence that other forms of inequality affect violence. We found little support for the hypothesis that general inequality will increase violence, as this measure never showed a significant effect (results not shown).¹⁰ A measure of within-group inequality did not affect intra-group violence by either Latinos or African-Americans. Also, including a measure of the change in the ratio of Latino to black income over the prior decade—to test a dynamic version of the group threat theory in which the change in this inequality affects crime—had no effect on inter-group violence (results not shown).

We briefly note that the effects of the control variables were generally in the expected direction. One somewhat unexpected finding was the positive effect of residential stability for black on black aggravated assault. Although this finding is contradictory to the social disorganization model, we found in ancillary bivariate models the expected negative relationship

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between residential stability and black intra-group assaults. Thus, it is only in the context of our fully specified models that this effect reverses sign.

Effect of changing tract racial/ethnic composition

Moving beyond these static effects, we next ask whether racial/ethnic transition affects inter- and intra-group violence. There appears particularly strong evidence in Table 4 of a spatial effect of racial/ethnic transformation in the prior decade on *both* inter- and intra-group aggravated assault. That is, whereas racial/ethnic transformation within the tract itself has little effect on inter- and intra-group violence, racial/ethnic transition in surrounding tracts appears to have strong positive effects on most types of violence within the tract. Although the group threat model posits that ethnic churning will increase black on Latino violence, we see increases in other types of violence as well, consistent with the social disorganization perspective. For instance, although a one standard deviation in racial/ethnic churning in the surrounding tracts significantly increases black inter-group assaults (25.5%), it also increases Latino inter-group assaults (23.2%) and Latino intra-group assaults (20.6%). The pattern is similar, but somewhat weaker, for robbery, as a one standard deviation increase in racial/ethnic churning in surrounding tracts increases black on Latino robberies (17.8%), but also increases Latino intra-group robberies (25.6%). Thus, it appears that understanding the context of racial/ethnic transition, or “churning”, in nearby tracts is important for understanding rates of inter- and intra-group violence in a particular tract.¹¹

<<<Table 4 about here>>>

Controlling for the probability of interaction

Before concluding, we highlight the importance of our innovative approach accounting for the probability of interaction when estimating rates of inter- and intra-group crime by briefly comparing the results to those obtained when using the two commonly used denominators for

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estimating inter-group crime rates: 1) total population, and 2) population of the offender (or victim's) racial/ethnic group. Note that these models are all estimated on the same dataset with the same estimation strategy as described above. The differences are not trivial when viewing the effects of racial/ethnic composition on these crime types—in fact, they are quite dramatic. The differences for the non-race variables in the model are more modest, and will in general differ as a function of the extent to which they are correlated with the racial composition and the outcome measure. We focus just on the aggravated assault models in which African-Americans are the offenders (the differences are generally equally dramatic for the models in which Latinos are the offenders and for the robbery models).

The first three columns of Table 5 compare the results of the African-American intra-group aggravated assault models when estimating the crime rate with a denominator of: 1) our random probability of interaction; 2) the population of the offender's race/ethnicity; 3) the total population. The results sometimes differ dramatically: whereas our approach in model 1 concludes that increasing the percentage Latino increases African-American intra-group aggravated assaults, one would conclude the opposite when using the total population as the denominator for this “rate” in column 3.¹² And whereas our approach finds no significant effect from increasing the percent white in the tract, one would mistakenly conclude a strong negative effect when using the total population or the population of the offender's race as the denominator. Although the racial/ethnic heterogeneity measure has a somewhat negative effect in our model, it appears to have a positive effect when using the total population as the denominator. Note that the differences of the non-race measures are more modest. Nonetheless, the residential stability measure is about 20% smaller when using the total population as the denominator, highlighting that there can be differences based on the pattern of covariances among these additional measures.

<<<Table 5 about here>>>

For the models of African-American on Latino aggravated assault in columns 4 through 6, we again see considerable differences. Whereas our random probability of interaction approach concludes no effect when increasing the percent Latino and a negative effect from increasing racial/ethnic heterogeneity, using the population of the offender's race/ethnicity as the denominator would lead to the incorrect conclusions of a positive effect for increasing Latinos and no effect from racial/ethnic heterogeneity. Although our approach implies that increasing the percent white has a positive effect on black inter-group aggravated assault, no effect is detected when using the total population as the denominator. Our approach suggests a negative effect of racial/ethnic heterogeneity on this inter-group crime, but using the total population as the denominator would suggest a positive effect, given that it fails to account for this increased possibility of interaction. Again, the differences among the non-race measures are more modest. Nonetheless, there are some differences: the effect of relative racial inequality is 14% weaker when using the offender's race/ethnicity as the denominator, and the effect of residential stability is 47% to 63% stronger using the other two rates. Thus, the differences can be non-trivial when using these other "rates" that have little theoretical justification, and highlights the need for scholars to consider this issue more carefully.

Conclusion

This study has shed light on two important questions: 1) to what extent does violent crime occur inter-group versus intra-group; 2) what are the key determinants of intra- and inter-group violent crime in neighborhoods. By using data from census tracts, we were able to appropriately account for propinquity effects for this negative form of social interaction at the local level. Prior research using national-level data, or data from large cities or metropolitan

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areas, is unable to directly tease out such propinquity effects. Thus, our study provides more accurate estimates of the level of intra- and inter-group violent crime, and also allows exploring key theories of the determinants of this crime. In addition, we moved beyond the black/white paradigm of much research and viewed violent interactions between two disadvantaged minority groups: Latinos and African-Americans. By focusing on census tracts, we were able to assess which neighborhood characteristics lead to higher rates of inter- and intra-group crimes, as hypothesized by three different theoretical paradigms. Another important contribution was our innovative measure of inter- and intra-group crime rates accounting for the conditional probability of interaction. We next highlight the findings for each of these theories.

First, in support of the consolidated inequality theory, we found some evidence that the economically disadvantaged group will respond with violence against the other group: Latinos or African-Americans commit more inter-group violence when they experience relative racial/ethnic inequality. It is notable that this effect frequently was observed when it occurred in spatially adjacent tracts, rather than in the focal tract. This suggests that such structural effects do not simply play out within local area boundaries, but rather spill over into adjacent areas.

We found less support for the group threat theory. On the one hand, consistent with this theory, we found evidence that African-Americans responded with inter-group violence to increasing economic challenges from this incoming group (Latinos). On the other hand, we also found that greater relative racial inequality in nearby tracts led to more Latino inter-group violence in the focal tract. This latter finding is more consistent with the consolidated inequality model in which it is the economically disadvantaged group that responds violently.

The evidence for the defended neighborhood theory was also weaker. On the one hand, racial/ethnic transition in nearby tracts indeed led to higher levels of black on Latino robberies and aggravated assault, implying that African-Americans are responding violently to incoming

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Latinos. On the other hand, such neighborhoods simultaneously experienced increased levels of within-group and inter-group violence committed by Latinos. This finding was not anticipated by the defended neighborhood theory, and is more consistent with the social disorganization perspective that such racial/ethnic transition will lead to general disorder and increased levels of all crime types.

Many of our results were broadly consistent with the social disorganization model. For instance, the finding that the absolute racial inequality between Latinos and African-Americans led to more *intra*-group violence suggests a general disorder process. Nonetheless, we cannot say exactly why this might occur. This could occur because the social distance engendered by this economic difference minimizes social contact and reduces informal social control. Or this could occur as a corollary of the consolidated inequality theory in that such across group inequality leads to a general breakdown of norms and values (Messner and Golden, 1992). Likewise, the general effect that racial/ethnic churning had on both inter- and intra-group violence is consistent with the social disorganization model of either a fracturing of social ties, or a general breakdown in norms in such neighborhoods. Future research would need to tease apart these possible mechanisms to understand which is at work.

It is important to highlight that although racial/ethnic transition had important effects for violence, the cross-sectional effects of racial/ethnic heterogeneity were more nuanced. In general, we did not find evidence that inter-group violence occurs more frequently in racially mixed neighborhoods. We found minimal differences in the static effect of racial/ethnic heterogeneity for inter-group violence when using our approach that accounts for the conditional probability of interaction. Instead, an important finding is that intra-group violence is nearly always more common than inter-group violence. The unconditional models showed that Latinos are more likely to rob or assault fellow Latinos than they are African-Americans, and African-

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Americans are more likely to assault fellow group members, and show no particular racial preference when committing robberies.

So why do neighborhoods with more racial/ethnic mixing have more overall crime given the lack of evidence that this leads to more inter-group violence? The answer may come from an unexpected source: a robust finding was that intra-group violence happens *least* frequently in neighborhoods in which the group is numerically dominant. That is, Latino on Latino violence happens least frequently in neighborhoods in which they are numerically dominant. Likewise, African-American intra-group violence happens least frequently in neighborhoods in which they are numerically dominant. It is then a simple mathematical identity to understand the implications of this for neighborhood crime rates: given that this low rate of crime occurs among the group that is numerically dominant in the neighborhood, the total amount of crime will also be relatively low in such neighborhoods. In contrast, the higher rates of crime for the different forms of inter- and intra-group violence in mixed tracts sum up to higher levels of overall violence.

This tendency towards committing less violence against fellow group members in neighborhoods in which the group is numerically dominant does not come from existing criminological theories, but is nonetheless intriguing and informative. Why exactly do we observe such an effect? One possibility is that feelings of solidarity towards the group are highest in such a neighborhood. For instance, the solidarity literature often posits that ethnically homogeneous entities (organizations, neighborhoods, etc) will foster a greater sense of solidarity (Lau, 1989) and attachment (Connerly and Marans, 1985; Sampson, 1991). If one conceives of intra-group violence as a proxy for *a lack of* group solidarity, it may well be that ethnically homogenous neighborhoods have lower levels of intra-group violence among the numerically

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dominant group for this reason. While speculative, this suggests an important avenue for future research.

An important innovation of this study was our calculation of inter- and intra-group violence rates using the random probability of interaction as the denominator. We briefly showed that the consequences of this innovation are not trivial by estimating models on our data using different denominators. The effects of various racial/ethnic composition measures can be completely uninformative when using either the total population or the population of either the offender's or victim's racial/ethnic group as the denominator when computing inter- or intra-group rates. Because the probability of inter-group interaction changes nonlinearly as the population composition changes, simply using the total population or the population of the offender's or victim's group will not yield appropriate results. Although utilizing the random probability of interaction assumption is well-known and underlies work using contingency tables (O'Brien, 1987; O'Brien, 1988), the importance of it has not been fully appreciated by scholars studying *rates* of inter- or intra-group crime (Jacobs and Wood, 1999; Parker, Stults, and Rice, 2005; Wadsworth and Kubrin, 2004). And whereas the effect of inappropriately computing these rates was less severe for our non-racial-composition measures, the estimated parameters of such measures will nonetheless be impacted to the extent that they are correlated with both the racial/ethnic composition measures and the outcome measure. The effect of inappropriately computing such rates for the estimated parameters of non-racial composition measures in other studies is an empirical question. In short, scholars must be cognizant of these issues when computing the rate of inter-group crime.

Although our use of a random mixing assumption between racial/ethnic groups is certainly plausible, it still raises the larger issue of considering how social interactions occur in general. We emphasize that our measure taps interaction *potential* and not actual interpersonal

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interactions. How to model this potential is an area of research that criminologists need to explore much more thoroughly. For instance, theoretical and empirical work is necessary for understanding the appropriate geographic size of the “neighborhood” that is used to measure such random mixing. Furthermore, a distance decay effect may be appropriate for modeling such social interaction. A distance decay would be impacted by the spatial distribution of racial/ethnic groups *within* the neighborhood, but could also be impacted by the spatial distribution of racial/ethnic groups in surrounding areas. Theoretical and empirical research also needs to consider salient social dimensions other than race/ethnicity. For instance, building on the notion of “Blau-space” (Blau, 1987; McPherson and Ranger-Moore, 1991), it is likely that individuals spend much of their social time with others who are similar to themselves on important dimensions. While this almost certainly occurs along the racial/ethnic dimension, the homophily literature suggests that this likely happens along other social dimensions as well, including similarity in economic resources, marital status, education level, occupation, religious identity, etc. (Blum, 1985; Erickson, 1996; Hipp and Perrin, Forthcoming). Thus, we can see that there are two components to this theoretical challenge for criminologists: 1) the extent to which certain types of individuals come into any contact; 2) the extent to which such contact is confrontational. Much more theoretical and empirical work has focused on the latter than has focused on the former, and sets forth an important agenda for future work.

We point out one additional interesting finding we observed: although there were generally strong in-group tendencies for committing violent acts, African-Americans exhibited no such tendency for robbery. We suggest that this finding may be explained by conceptualizing that two processes are at work in our study area: 1) a tendency to commit crimes against others in one’s own social space; 2) the attractiveness of Latinos as robbery targets. As to the first point, expressive violence such as assaults more likely stems from social interactions among

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individuals sharing the same “Blau-space” and research into assaults has, in fact, consistently demonstrated that these frequently involve participants who are non-strangers (United States Department of Justice, 2006). As to the second point, Latinos may be more attractive robbery targets for a variety of reasons. For instance, they may be hesitant to report their crimes (or fight back) due to a lack of familiarity with English; new immigrants (especially illegal immigrants) may distrust institutions such as local law enforcement and banks. The former would dissuade reporting the crime and the latter would increase the likelihood of carrying cash. Our findings are consistent with the simultaneous effect of these two processes: the tendency for victimizing Latinos is higher for aggravated assaults than for robberies for *both* Latinos and African-Americans (for Latinos, the within-group tendency is 50% greater for aggravated assaults, but fully 130% greater for robberies).

While this study has provided key insights into inter- and intra-group violent events, some limitations should be acknowledged. First, our study focused solely on relations between African-Americans and Latinos. While these are two groups of particular interest—both in terms of their mutual disadvantaged position in present U.S. society as well as the large influx of Latino immigrants—and yet have been relatively understudied, it is nonetheless the case that future studies will want to utilize our technique to estimate the rates of inter- and intra-group violence between other racial/ethnic groups. Second, we only had data from one area of one city. This area is quite unique in experiencing a transition from majority African American to majority Latino: of the 111 tracts in the U.S. that transitioned from majority African American in 1990 to majority Latino in 2000, 41.4% of them were in Los Angeles County, and 34 (30.6%) of them were in our study area. Only one other county had more than 7 such tracts (the Bronx, with 13). In light of recent demographic trends suggesting that Latinos, rather than white Americans, will comprise the single largest group within the next half-century, our study may provide insight

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into the potential for racial conflict as other neighborhoods undergo similar transitions. Third, although we have explored how certain structural characteristics are related to various inter- and intra-group violent crime rates and discovered some patterns consistent with theoretical expectations, it nonetheless needs to be emphasized that we cannot definitively determine *why* these patterns were observed given our lack of measures of the specific mechanisms involved.

Despite these limitations, this study extends our knowledge in this important area of criminology. Understanding the extent to which inter-group violence occurs is crucial. Indeed, Jacobs and Wood (1999) described interracial killings as “some of the most intense and violent conflicts between members of groups that have not been treated equally.” Despite the general scholarly interest in inter-group violent crime, it is also important to emphasize that in virtually all types of neighborhoods of our study the majority of violent crimes are committed *within* groups. Whereas O’Brien (1987) concluded the same using a national survey, he highlighted that his study was not able to discern between propinquity and preference effects. We have done so here using tract level data. Thus, despite the importance of inter-group violence, it should be emphasized that the majority of aggravated assaults occur between members of the same racial/ethnic group, *even controlling for propinquity effects*. This is the case even in racially/ethnically mixed neighborhoods, which foster the highest levels of inter-group violence. Such neighborhoods are undergoing a particularly unsettling process leading to higher rates of inter-group violence—particularly on the part of the previously numerically dominant group—but also higher rates of *intra*-group violence, suggesting a possible general breakdown in norms in such neighborhoods.

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Endnotes

¹ We also estimated similar models using all seven years of data; while the results were somewhat similar to those presented here, there were some differences. In particular, the ethnic churning measure in the tract actually had a negative effect on some of the types of crime. Of course, the meaning of this ethnic churning measure becomes quite unclear in these models when racial/ethnic transition from 1990 to 2000 is used to explain crime in 2006. Given the rapid change occurring in these neighborhoods, it is possible that by 2006 little churning is still occurring. Furthermore, we point out that whereas the main argument for using all seven years of data is for greater reliability of the estimates of inter- and intra-group violence, not much is gained by combining all seven years of crime data instead of just three years. We assessed this by estimating multilevel models clustered by census tract first for the three years of data and then for the seven years of data. From these models we obtained the intra-class correlation (ICC), and used this to compute reliability values. Focusing on the robbery rates given that robberies are less frequent than aggravated assaults, we find that whereas the reliability for seven years of data black intra-group robberies is .95, it is .92 using just three years of data. For Latino inter-group robberies these values are .57 and .36, for black inter-group robberies they are .96 and .91, and for Latino intra-group robberies they are .89 and .70. Thus, with the exception of Latino inter-group robberies, these reliability values when combining three years of data are all above .70. And even when combining seven years of data the Latino inter-group robbery reliability is still just .57, which hardly seems to justify combining all these years given the potential high cost of including crime data from later years that is more distal from our independent variables. If we instead create monthly measures of these crime events, the reliabilities are .91 for black intra-group robbery, .32 for Latino inter-group robbery, .94 for black inter-group robberies, and .81 for Latino intra-group robberies. These ancillary results are available from the first author upon request.

² Additional analyses showed the results to behave similarly when using block groups as proxies for neighborhoods.

³ Whereas scholars using crime rates for larger units of analysis to explore race-specific crime often use a minimum population value for cities for inclusion in the sample (to account for the possibility that cities with small populations can have extreme crime rate values), an advantage of the Poisson approach is that it does not suffer from such a limitation (Osgood, 2000). Nonetheless, it is possible that very low population values may exhibit influential effects for the results. We therefore explored the results when using different cutoffs. In the models using a cutoff of no population there were some instances in which the estimates showed some instability. However, models using 50, 100, 200, 400, and 500 population as a cutoff value all exhibited very similar results. We therefore present the results of the models using the cutoff of 50 since they include the highest proportion of tracts and therefore have the greatest statistical power and generalizability.

⁴ There are different views on how to treat missing data on an outcome measure. A challenge for prior research using city-level data on inter-group homicide is that some cities have systematic reporting error in which they underreport events or differentially report the race/ethnicity of the offender and victim, necessitating the use of an imputation procedure to obtain a “best guess” of the race/ethnicity of the offender and victim (Parker and McCall, 1999; Williams and Flewelling, 1987; Williams and Flewelling, 1988). In our study, no such systematic error is present given that our data come from a single reporting source. Furthermore, we do not adopt a multiple imputation approach (which would yield appropriate standard errors) as recent work by von Hippel (2007) shows that very little is generally gained by imputing observations for the

dependent variable in such an instance, and such an approach can introduce bias if the imputation model is not accurate. Given that missing data was not a problem for our predictor variables, we therefore follow von Hippel in not using imputed values of our outcome measures.

⁵ We do not study crimes involving whites or other racial/ethnic groups since the low residential population of these groups results in unstable estimates.

⁶ We also tried different specifications. We estimated models in which we also included the median income in the tract of the offender's race/ethnicity. This captures the income level of the offender's group in a more absolute sense to assess whether this level of disadvantage has important effects. No such effects were detected. Models substituting a measure of the percent in poverty for the median income of the tract explained less of the variance than our presented models. Given that the main results remained unchanged, we chose to present the results using the continuous measure of tract median income rather than the poverty measure. In additional models, we also tested for a quadratic effect of median income, and found no such effects.

⁷ Our decision to translate these into per capita population rates is based on a model assuming that there is a limit to the number of crimes an individual can commit in any day. Mayhew and Levinger (1977) illustrated that failing to make this constraining assumption would lead to a model in which as the number of persons increase in any given context (organization, neighborhood, city, etc) the number of social interactions would increase exponentially. It is clearly unreasonable to suppose that the residents of a large city such as New York City have the time to interact with (or rob) any more than a small proportion of their fellow residents. This theoretical assumption is implicit in all studies calculating crime rates per capita population.

⁸ All VIF values were less than 10, a commonly specified cutoff value (Gujarati, 1989; Kennedy, 1998; Neter, Kutner, Nachtsheim, and Wasserman, 1996). The highest values were for percent white (7.7). All VIF values were below 4 in a model not containing the spatially lagged measures. The two inequality measures actually had a -.27 correlation. Given that the substantive results were similar in the models not including the spatially lagged measures, there is no evidence of collinearity problems for these presented results. Furthermore, there were very low correlations between our two racial inequality measures in the tract and the same measures in the surrounding areas. And the correlation between ethnic churning in the focal tract and the surrounding tracts was a moderate .51. We nonetheless assessed the sensitivity of our results to these specifications by also estimating models without the various spatially lagged measures and the substantive results were unchanged.

⁹ We constrain the hypothetical neighborhood compositions to these particular values since these are most representative of the observed values for neighborhoods in South Bureau. We do not simulate the results for neighborhoods that are composed of entirely one group since inter-group crime would have no meaning in such a context.

¹⁰ We created measures of total inequality and within-group inequality based on the income of the households in the tract or the particular racial/ethnic group respectively. The Gini coefficient is defined as: $G = \frac{2}{\mu n^2} \sum_{i=1}^n ix_i - \frac{n+1}{n}$ where x_i is the household's income for 1999 as reported in

the 2000 census, μ is the mean income value, the households are arranged in ascending values indexed by i , up to n households in the sample. We account for the binning of the data by utilizing the Pareto-linear procedure implemented in an algorithm created by Nielsen and Alderson (1997). We used the prln04.exe program provided by Francois Nielsen at the following website: <http://www.unc.edu/~nielsen/data/data.htm>.

¹¹ As another way of measuring this effect, we estimated models in which we included the percentage change of each racial/ethnic group separately (rather than our combined ethnic

churning measure). These results showed that an increase in the percent Latino over the prior decade led to higher rates of black on Latino assaults and robberies. Given the similarity in results, and that we prefer the parsimony of our ethnic churning measure rather than including separate measures of the change in each race/ethnicity, we simply present these results with the ethnic churning measure.

¹² When plotting these effects for hypothetical tracts in a fashion similar to that in Figures 3 and 4 these differences are apparent. For instance, whereas in our approach the highest rate of aggravated assaults in a nearly all black tract is for Latino intra-group violence, using the population of the offender's race/ethnicity as the denominator would lead to the conclusion that black intra-group violence is highest in such tracts. In those same tracts, our approach concludes that black on Latino aggravated assaults are the second most frequent crime, whereas using the offender's race/ethnicity as the denominator would imply that this is actually a much rarer type of crime. And whereas our approach concludes that Latino intra-group aggravated assaults are the least frequent type of crime in nearly all Latino tracts, using the total population of the tract as the denominator would lead to the incorrect conclusion that this is the most *frequent* type of crime (results available upon request).

Inter- and Intra-group violent crime

Tables and Figures

Table 1. Summary statistics of variables used in analyses, census tracts in Los Angeles South Bureau, 2000

	Mean	Std. Dev
<i>Aggravated assault rates (annual average over 2000-02)</i>		
Black on black	29.85	31.34
Latino on Latino	9.65	10.93
Black on Latino	6.02	8.54
Latino on black	2.41	3.70
<i>Robbery rates (annual average over 2000-02)</i>		
Black on black	14.40	16.98
Latino on Latino	6.31	7.80
Black on Latino	16.69	22.90
Latino on black	1.26	1.97
<i>Characteristics of focal tracts</i>		
Percent Latino	50.77	23.15
Percent white	9.46	16.91
Percent African-American	33.24	24.54
Percent Asian	4.38	7.81
Percent other race	2.14	1.72
Ethnic heterogeneity	44.65	13.24
Median income (in \$1,000s)	29.053	12.43
Absolute racial inequality	0.38	0.36
Relative racial inequality	0.18	0.50
Single parent households	24.65	9.36
Residential stability	10.39	3.02
Ethnic churning, 1990-2000	17.58	9.33
<i>Characteristics of surrounding tracts</i>		
Percent Latino	42.24	16.40
Percent white	9.67	15.20
Median income (in \$1,000s)	29.99	19.98
Absolute racial inequality	0.28	0.38
Relative racial inequality	0.12	0.46
Ethnic churning, 1990-2000	13.77	2.88

Note: Sample is 149 census tracts. Relative racial inequality is the difference in logged median income of Latinos and African-Americans, absolute racial inequality is the absolute value of this difference.

Inter- and Intra-group violent crime

Table 2. Negative binomial regression models of aggravated assault, given random mixing assumption, for census tracts in Los Angeles South Bureau, 2000

	(1)	(2)	(3)	(4)
	Black on black	Latino on Latino	Latino on black	Black on Latino
<i>Characteristics of tract</i>				
Percent Latino	0.038 ** (0.004)	-0.024 ** (0.005)	0.007 (0.009)	0.000 (0.008)
Percent white	-0.011 (0.019)	-0.001 (0.009)	0.018 (0.020)	0.046 ** (0.015)
Percent Asian	0.027 ** (0.009)	-0.002 (0.014)	-0.024 (0.026)	-0.022 (0.019)
Percent other race	0.032 (0.028)	-0.119 * (0.049)	-0.001 (0.051)	0.036 (0.046)
Ethnic heterogeneity	-0.010 † (0.006)	-0.011 † (0.006)	-0.014 (0.008)	-0.018 * (0.007)
Median income (in \$1,000s)	-0.044 ** (0.008)	-0.012 (0.010)	-0.006 (0.019)	-0.015 (0.015)
Absolute racial inequality	0.431 ** (0.149)	0.007 (0.118)		
Relative racial inequality			0.229 (0.223)	0.377 * (0.179)
Single parent households	0.004 (0.007)	0.026 ** (0.007)	0.011 (0.013)	0.034 ** (0.011)
Residential stability	0.067 ** (0.025)	0.042 (0.032)	-0.004 (0.044)	0.058 (0.047)
<i>Characteristics of surrounding tracts</i>				
Percent Latino	-0.023 ** (0.007)	0.007 (0.006)	0.022 * (0.010)	0.016 † (0.009)
Percent white	-0.064 ** (0.012)	0.010 (0.011)	-0.021 (0.020)	-0.050 ** (0.016)
Median income (in \$1,000s)	-0.009 (0.018)	0.005 (0.013)	0.062 ** (0.018)	0.017 (0.018)
Absolute racial inequality	1.339 † (0.717)	0.435 ** (0.075)		
Relative racial inequality			-0.694 ** (0.096)	0.057 (0.113)
Pseudo R-square	0.158	0.078	0.093	0.080
Tracts	104	141	141	141

** $p < .01$ (two-tail test), * $p < .05$ (two-tail test), † $p < .05$ (one-tail test). Standard errors in parentheses. Negative binomial regression models using conditional probability of interaction as offset measure. Outcomes are three years of pooled crime events from 2000-02. All models include an intercept. Tracts in models contain a normalized population of at least 50. Relative racial inequality is the difference in logged median income of Latinos and African-Americans, absolute racial inequality is the absolute value of this difference.

Inter- and Intra-group violent crime

Table 3. Negative binomial regression models of robbery, given random mixing assumption, for census tracts in Los Angeles South Bureau, 2000

	(1)	(2)	(3)	(4)
	Black on black	Latino on Latino	Latino on black	Black on Latino
<i>Characteristics of tract</i>				
Percent Latino	0.033 ** (0.007)	-0.031 ** (0.009)	0.006 (0.010)	0.003 (0.007)
Percent white	-0.013 (0.025)	0.032 † (0.017)	0.027 (0.018)	0.019 (0.014)
Percent Asian	0.059 ** (0.013)	-0.013 (0.016)	0.057 ** (0.017)	0.047 ** (0.013)
Percent other race	0.038 (0.064)	-0.156 ** (0.049)	0.076 (0.062)	-0.042 (0.052)
Ethnic heterogeneity	-0.014 † (0.008)	-0.034 ** (0.011)	-0.044 ** (0.011)	-0.026 ** (0.008)
Median income (in \$1,000s)	-0.039 ** (0.012)	-0.039 * (0.015)	-0.019 (0.017)	-0.028 * (0.014)
Absolute racial inequality	0.257 (0.193)	0.034 (0.325)		
Relative racial inequality			0.775 ** (0.254)	0.322 † (0.171)
Single parent households	0.025 † (0.013)	-0.001 (0.013)	-0.002 (0.014)	0.041 ** (0.010)
Residential stability	0.068 (0.042)	0.052 (0.048)	-0.020 (0.048)	0.074 † (0.042)
<i>Characteristics of surrounding tracts</i>				
Percent Latino	-0.026 * (0.011)	0.000 (0.009)	-0.001 (0.012)	-0.010 (0.008)
Percent white	-0.077 ** (0.017)	-0.001 (0.014)	-0.014 (0.020)	-0.030 * (0.015)
Median income (in \$1,000s)	-0.020 (0.024)	-0.013 (0.020)	0.012 (0.025)	-0.022 (0.017)
Absolute racial inequality	0.909 (1.079)	0.158 (0.127)		
Relative racial inequality			-0.408 † (0.240)	0.188 * (0.082)
Pseudo R-square	0.100	0.080	0.084	0.086
Tracts	104	141	141	141

** $p < .01$ (two-tail test), * $p < .05$ (two-tail test), † $p < .05$ (one-tail test). Standard errors in parentheses. Negative binomial regression models using conditional probability of interaction as offset measure. Outcomes are three years of pooled crime events from 2000-02. All models include an intercept. Tracts in models contain a normalized population of at least 50. Relative racial inequality is the difference in logged median income of Latinos and African-Americans, absolute racial inequality is the absolute value of this difference.

Inter- and Intra-group violent crime

Table 4. Negative binomial regression models of effect of ethnic churning on aggravated assault and robbery, given random mixing assumption, for census tracts in Los Angeles South Bureau, 2000

	(1)	(2)	(3)	(4)
	Black on	Latino on	Latino on	Black on
<i>Specification 1: Aggravated Assault as outcome</i>				
Ethnic churning in tract	-0.004 (0.005)	-0.011 † (0.006)	-0.005 (0.009)	0.000 (0.009)
Ethnic churning in surrounding tracts	0.010 (0.015)	0.044 ** (0.014)	0.049 ** (0.019)	0.053 ** (0.019)
<i>Specification 2: Robbery as outcome</i>				
Ethnic churning in tract	-0.005 (0.007)	-0.013 † (0.007)	-0.005 (0.012)	-0.006 (0.008)
Ethnic churning in surrounding tracts	0.010 (0.021)	0.053 * (0.021)	0.013 (0.029)	0.038 † (0.020)

** $p < .01$ (two-tail test), * $p < .05$ (two-tail test), † $p < .05$ (one-tail test). Standard errors in parentheses. Negative binomial regression models using conditional probability of interaction as offset measure. Outcomes are three years of pooled crime events from 2000-02. Models also include all variables listed in models in Tables 2 and 3. $N = 104$ tracts in black on black models, 141 tracts in all other models. Tracts in models contain a normalized population of at least 50.

Inter- and Intra-group violent crime

Table 5. Negative binomial regression models of African-American intra- and inter-group aggravated assault, using different denominators to calculate rates, for census tracts in Los Angeles South Bureau, 2000

	Black on black aggravated assault			Black on Latino aggravated assault		
	(1)	(2)	(3)	(4)	(5)	(6)
	Offset is random probability of interaction	Offset is population of offender's race/ethnicity	Offset is total population	Offset is random probability of interaction	Offset is population of offender's race/ethnicity	Offset is total population
<i>Characteristics of tract</i>						
Percent Latino	0.038 ** (0.004)	0.013 ** (0.005)	-0.012 * (0.005)	0.000 (0.008)	0.031 ** (0.007)	0.000 (0.007)
Percent white	-0.011 (0.019)	-0.058 ** (0.018)	-0.104 ** (0.018)	0.046 ** (0.015)	0.049 ** (0.014)	0.002 (0.016)
Percent Asian	0.027 ** (0.009)	0.006 (0.010)	-0.026 * (0.011)	-0.022 (0.019)	-0.023 (0.019)	-0.070 ** (0.021)
Percent other race	0.032 (0.028)	0.015 (0.028)	-0.013 (0.028)	0.036 (0.046)	0.013 (0.044)	-0.071 † (0.042)
Ethnic heterogeneity	-0.010 † (0.006)	0.002 (0.006)	0.014 * (0.007)	-0.018 * (0.007)	0.003 (0.006)	0.028 ** (0.008)
Median income (in \$1,000s)	-0.044 ** (0.008)	-0.040 ** (0.008)	-0.037 ** (0.008)	-0.015 (0.015)	-0.024 (0.015)	-0.023 (0.016)
Absolute racial inequality	0.431 ** (0.149)	0.467 ** (0.144)	0.500 ** (0.142)			
Relative racial inequality				0.377 * (0.179)	0.324 † (0.177)	0.390 * (0.192)
Single parent households	0.004 (0.007)	0.003 (0.007)	0.002 (0.008)	0.034 ** (0.011)	0.033 ** (0.010)	0.034 ** (0.011)
Residential stability	0.067 ** (0.025)	0.059 * (0.027)	0.051 † (0.029)	0.058 (0.047)	0.094 * (0.044)	0.085 † (0.050)

Inter- and Intra-group violent crime

Characteristics of surrounding tracts

Percent Latino	-0.023 ** (0.007)	-0.021 ** (0.008)	-0.019 * (0.008)	0.016 † (0.009)	0.016 † (0.009)	0.008 (0.010)
Percent white	-0.064 ** (0.012)	-0.066 ** (0.013)	-0.067 ** (0.014)	-0.050 ** (0.016)	-0.052 ** (0.015)	-0.049 ** (0.016)
Median income (in \$1,000s)	-0.009 (0.018)	-0.010 (0.019)	-0.011 (0.020)	0.017 (0.018)	0.024 (0.017)	0.006 (0.019)
Absolute racial inequality	1.339 † (0.717)	1.283 † (0.747)	1.218 (0.789)			
Relative racial inequality				0.057 (0.113)	0.015 (0.113)	0.129 (0.133)

*** p < .01 (two-tail test), * p < .05 (two-tail test), † p < .05 (one-tail test). Standard errors in parentheses. Negative binomial regression models using different offset measures. Outcomes are three years of pooled crime events from 2000-02. All models include intercept. Tracts in models contain a normalized population of at least 50. Relative racial inequality is the difference in logged median income of Latinos and African-Americans, absolute racial inequality is the absolute value of this difference.*

Figure 1. Intra- and inter-group aggravated assault rates, Los Angeles city tracts, South Bureau, 2000-06

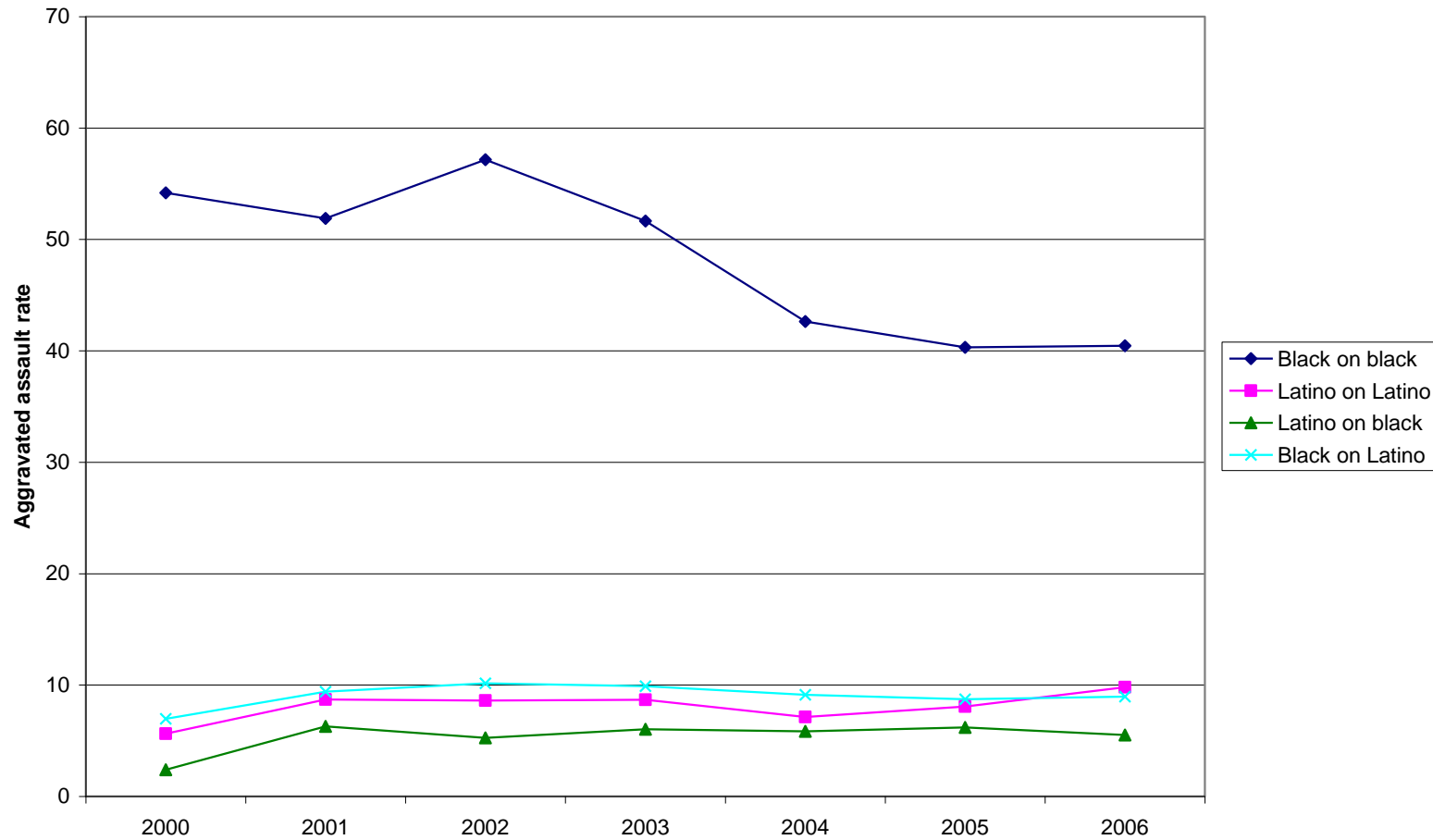
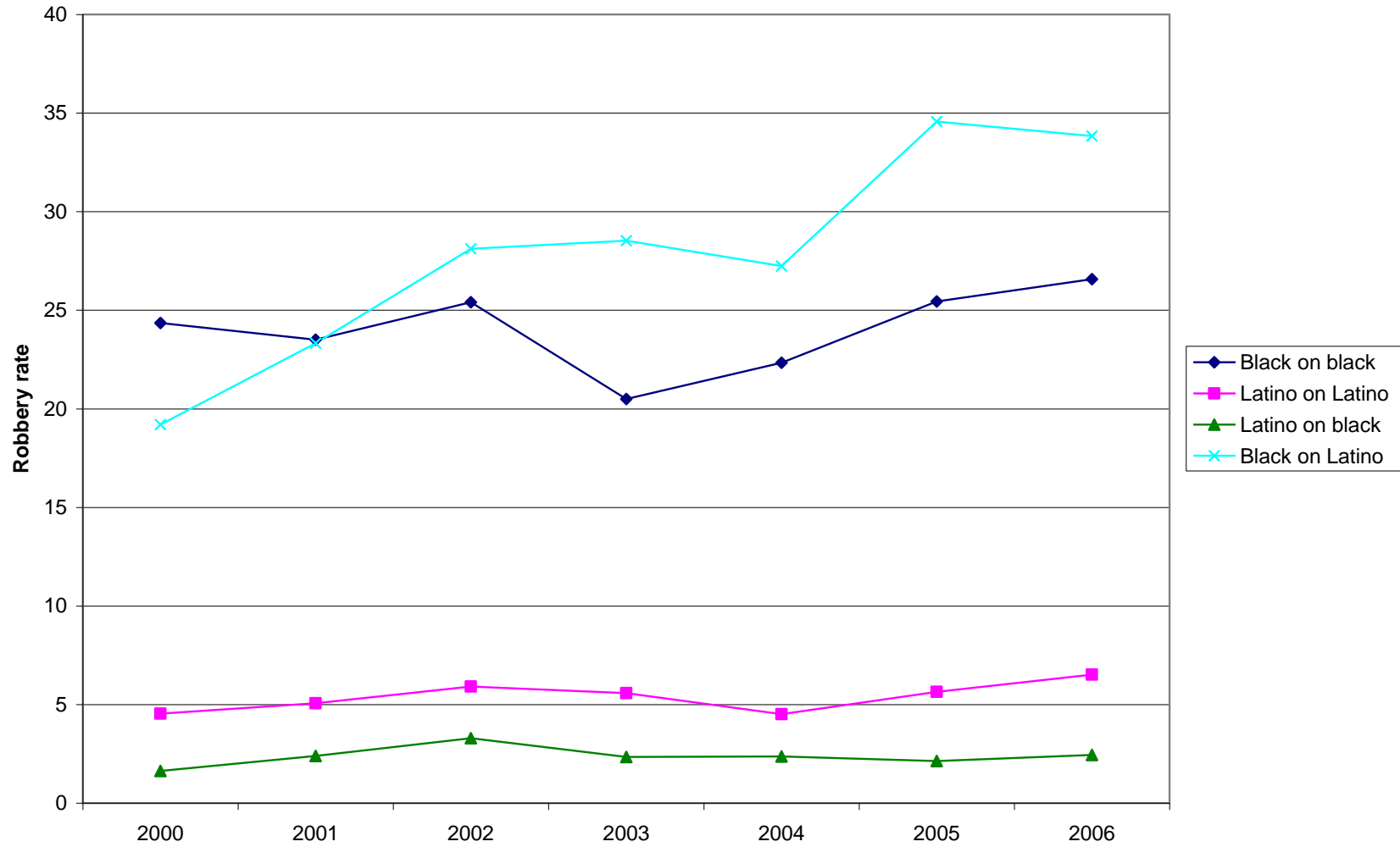
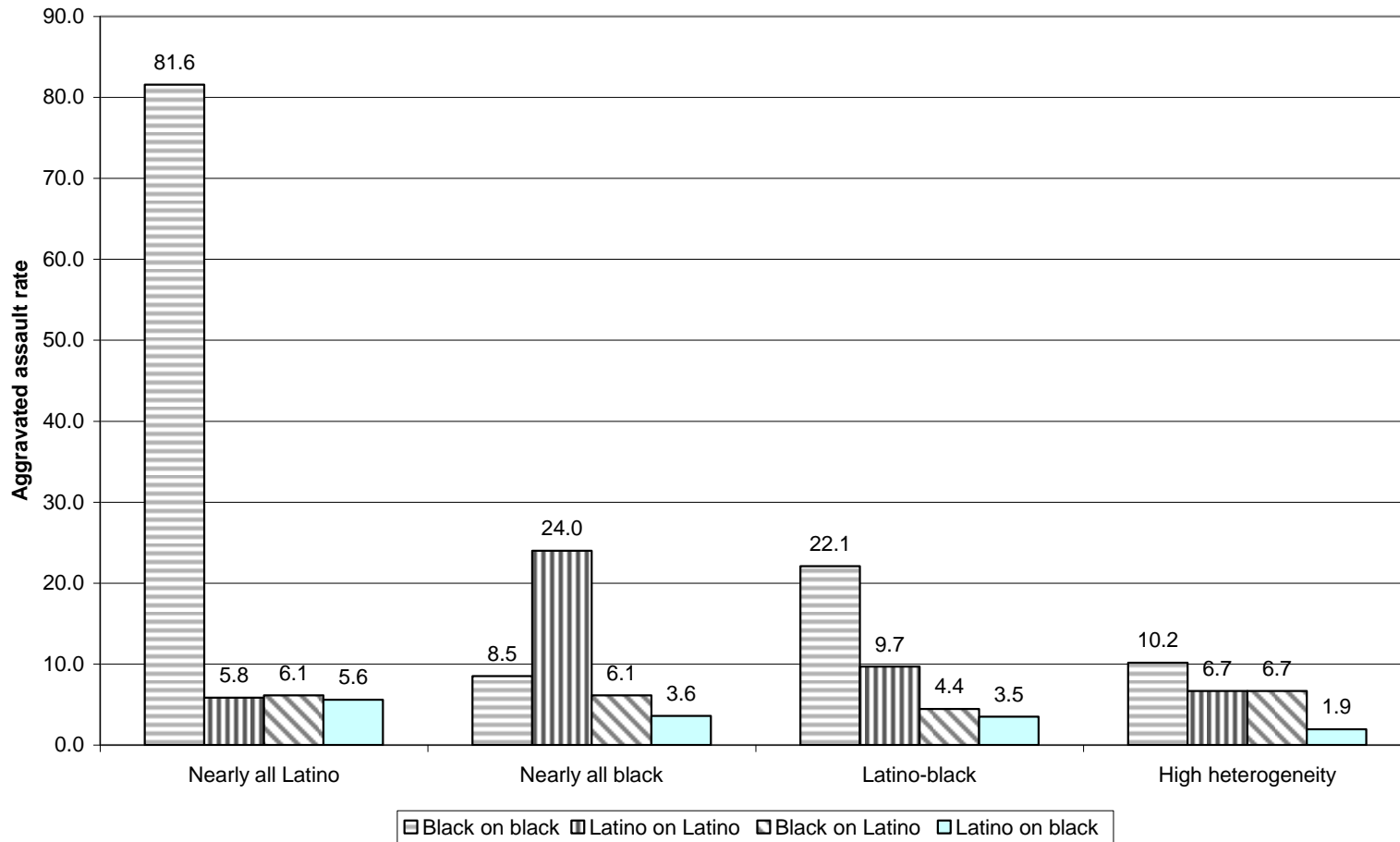


Figure 2. Intra- and inter-group robbery rates, Los Angeles city tracts, South Bureau, 2000-06



Inter- and Intra-group violent crime

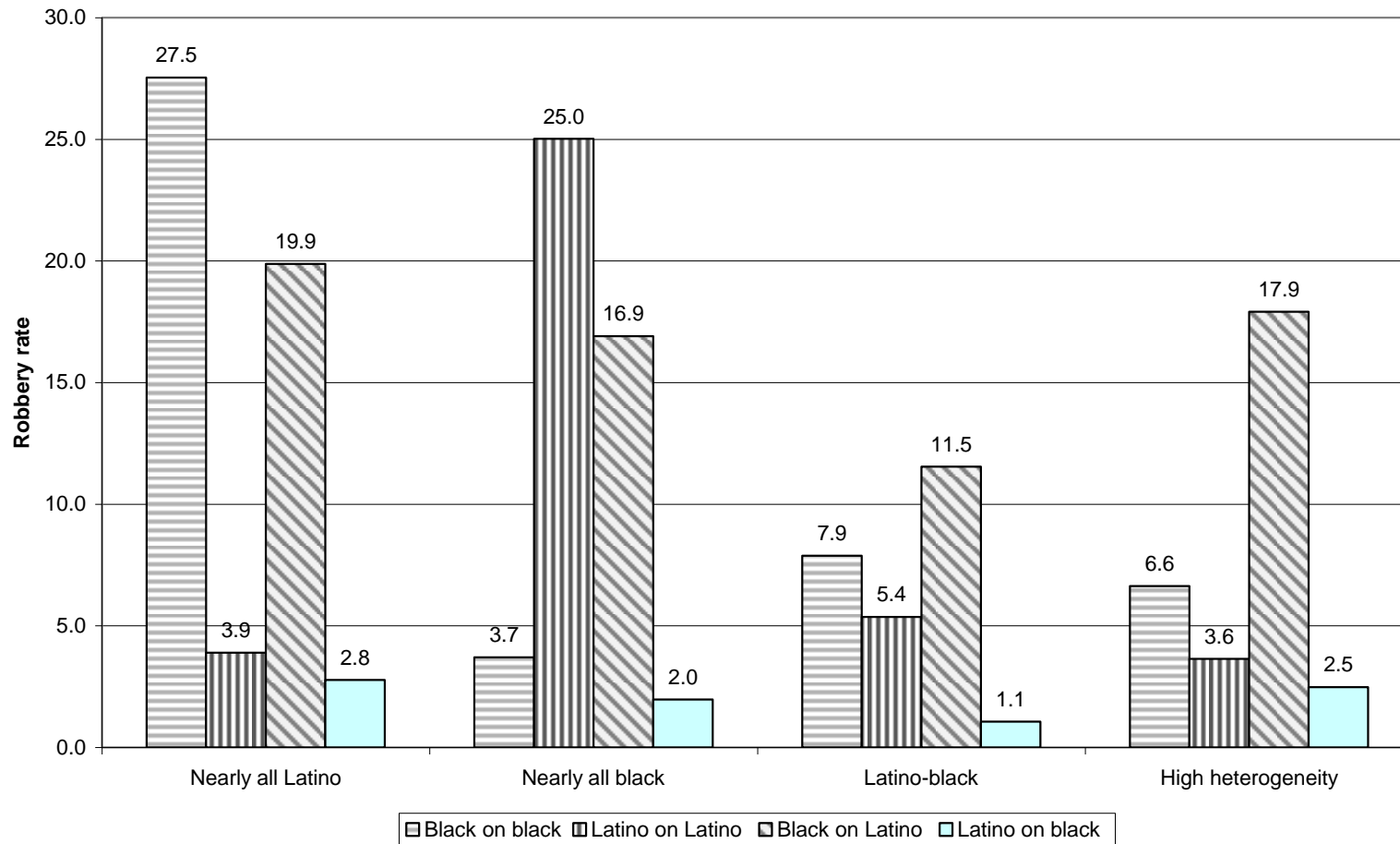
Figure 3. Inter- and intra-group aggravated assault rates for various tract racial/ethnic compositions, Los Angeles 2000-02



Note: Description of tract compositions: 1) nearly all Latino: tract is 80% Latino, 20% African-American; 2) nearly all African-American: tract is 80% African-American, 20% Latino; 3) Latino-black: tract is 50% Latino and 50% African-American; 4) high heterogeneity: tract is 20% Asian, 5% other race, and 25% of the other three groups.

Inter- and Intra-group violent crime

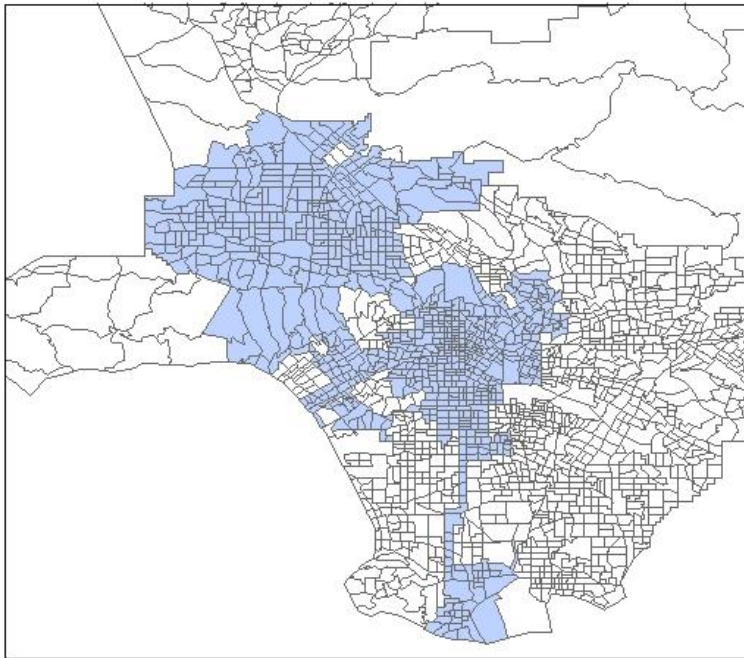
Figure 4. Inter- and intra-group robbery rates for various tract racial/ethnic compositions, Los Angeles 2000-02



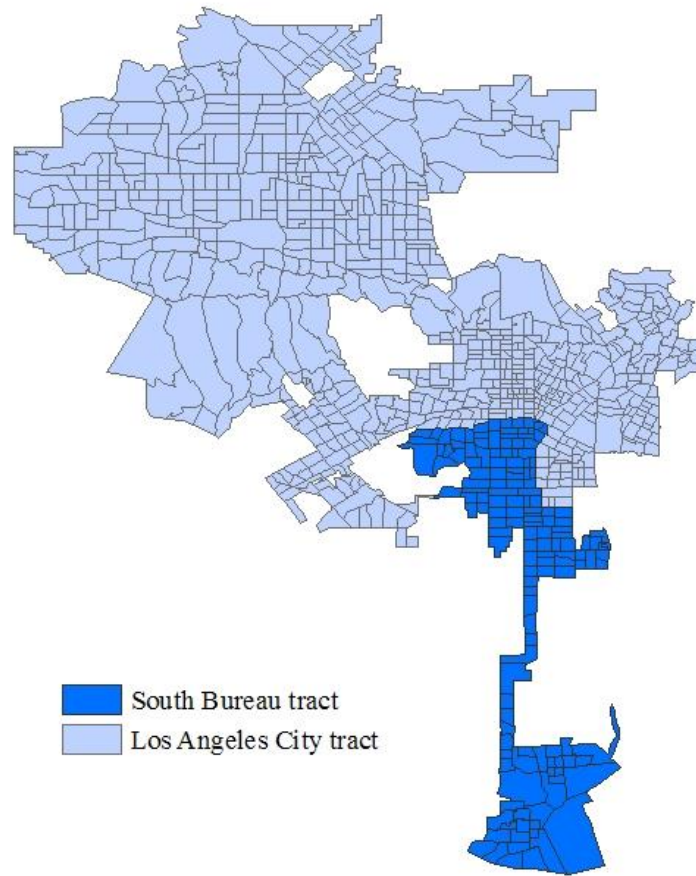
Note: Description of tract compositions: 1) nearly all Latino: tract is 80% Latino, 20% African-American; 2) nearly all African-American: tract is 80% African-American, 20% Latino; 3) Latino-black: tract is 50% Latino and 50% African-American; 4) high heterogeneity: tract is 20% Asian, 5% other race, and 25% of the other three groups.

Appendix

Map 1: Location of Los Angeles City and South Los Angeles



Location of Los Angeles City within Los Angeles County



Location of South (Bureau) Los Angeles within the City