NEIGHBORHOOD CORRELATES OF HOMICIDE TRENDS: An Analysis Using Growth-Curve Modeling

Charis E. Kubrin
George Washington University

Jerald R. Herting
University of Washington

This research blends ideas and concepts from social disorganization theory with recent development in growth-curve methodology to examine the association between neighborhood structure and homicide levels over time. Using fifteen years of sequential data, we estimate growth-curve models that emphasize the effects of neighborhood socioeconomic and demographic characteristics on longitudinal trajectories of three types of homicide—general altercation, felony, and domestic—in St. Louis from 1980–1994. The analyses reveal several important findings. First, initial levels of each homicide type are related in similar ways to the neighborhood characteristics. Second, trends for each subtype differ, with the shape of the trajectory depending on the type of homicide under consideration. Finally, the neighborhood factors associated with trends in general altercation, felony, and domestic killings vary for each type. The latter two points suggest the importance of disaggregating homicide rates and exploring the different factors that drive change in the patterns of these rates.

Cities across the United States have enjoyed decreasing violent crime rates in the last decade. While Uniform Crime Report (UCR) data show this to be true, other sources indicate that not all communities within cities have experienced this trend nor enjoyed the same degree of decline. In fact, some neighborhoods have increased in violent crime levels. This suggests that crime trends in local communities are likely quite varied. How variable are these trends, and what are the sources of this variation? Is the variance systematically related to differences in the distribution of economically disadvantaged families? Are trends across communities due, in part, to lesser or greater levels of residential mobility or family disruption? These questions typify a larger question often asked by scholars studying the correlates of violence: What neighborhood factors are associated with the rate of change in violent crime levels?

Research on the neighborhood correlates of violent crime has been, for the most
part, cross-sectional. Most studies find that economic disadvantage, racial composition, and residential mobility play a significant role in the production of criminal violence and in particular, of homicide (Sampson 1987; Williams and Flewelling 1988; Land, McCall, and Cohen 1990; Messner and Golden 1992; Kubrin 2000; 2003). What is less known is whether these same factors are associated with trends, or over-time changes, in homicide levels, a question Kenneth C. Land, Patricia L. McCall, and Lawrence E. Cohen (1990) pose in the conclusion of their study. As there is no guarantee that causal conclusions based on cross-sectional data will be supported when examined longitudinally, Land and his colleagues suggest that researchers consider the relationship between neighborhood structure and changes in homicide rates.

Land and his colleagues also raise the important point that different types of homicide may have different correlates, patterns, and causes; economic disadvantage, racial composition, and residential mobility are likely to be more strongly associated with certain types of killings than with others. Thus, they additionally suggest that researchers disaggregate homicide to better understand the relationship between neighborhood composition and the nature of violence.

This article addresses both of these areas of inquiry, focusing on trends in disaggregated homicide rates across neighborhoods in a U.S. city. In this study, we apply ideas and concepts from social disorganization theory and use recent developments in growth-curve methodology to examine the association between neighborhood structure, changes in neighborhood structure, and changes in different types of homicide, including general altercation, felony, and domestic killings. We use fifteen years of sequential data from the St. Louis Homicide Data Set to estimate growth-curve models that emphasize the effects of community characteristics on changing levels of homicide in St. Louis.

**CORRELATES OF CHANGE**

In much prior research, social disorganization theory provides the context for understanding the association between community characteristics and crime rates. The theory focuses on the relationships among neighborhood structure, social control, and crime, and posits that poverty, residential mobility, ethnic heterogeneity, and other features of urban communities decrease a neighborhood’s capacity to control the behavior of people in public, and hence increase the likelihood of crime. Yet prior research on the structural covariates of homicide rates that adopts a social disorganization framework has produced inconsistent findings (Land et al. 1990, p. 923). These inconsistencies have led some to question whether the effects of structural correlates on homicide rates are so context specific that they appear to be variable over different periods of time and at various levels of analysis. Land and his colleagues (1990), however, conclude that different research procedures in prior studies coupled with data-analysis and statistical inference problems account for the disparate findings. They created a model that estimates eleven structural covariates of homicide rates for cities, metropolitan areas, and states in 1960, 1970, and 1980, and found that three effects stand out in strength and invariance: resource deprivation/affluence index (which includes a measure for percentage black), population structure index, and the percentage divorced covariate, with the deprivation/affluence index having the strongest and most invariant effect.

Land and his colleagues raise an important question regarding the extent to which the invariances they found for covariate relationships to the homicide rate apply to
changes in homicide rates over time. That is, they ask whether the resource deprivation/affluence index as well as the population structure index and percentage divorced covariate would consistently predict trends in homicide. According to the authors, this question has not been adequately explored in the literature.

There are some notable exceptions. Drawing on social disorganization and social deregulation theories, Mitchell B. Chamlin (1989) used residual-change score analyses to examine the effects of structural dynamic measures on the change in homicide rates during the 1970s. His analyses reveal that changes in the level of homicide are affected by changes in the ecological structure of cities, such as changes in population size and in economic inequality. Chamlin contends that abrupt or unexpected shifts in the ecological structure of cities are likely to weaken and disrupt informal mechanisms of control and, in turn, increase crime rates.

A study by Terrance Miethe, Michael Hughes, and David McDowall (1991) assessed how changes in measures of social disorganization and routine activity patterns are associated with temporal changes in homicide rates in U.S. cities for 1960, 1970, and 1980. Although they found that the cross-sectional analyses provided support for both theoretical perspectives, the results were less theoretically compelling when explaining change in rates over time. Indeed, they found that only the unemployment rate, ethnic heterogeneity, and household crowding are associated with changes in homicide rates.

Gary LaFree, Kriss A. Drass, and Patrick O'Day (1992) used annual time-series data from 1957–1988 to examine the effects of economic well-being, educational attainment, and family stability on homicide rates. Their results show that these measures are important predictors yet have different effects on black and white rates during the period. For example, for whites, although growth in the percentage of female-headed families, higher family income, and increases in unemployment are not associated with homicide rates, improvements in educational attainment produce the expected declines in homicides. On the other hand, for blacks, higher family income is associated with higher homicide rates while increases in unemployment are associated with declining rates, contrary to expectations.

Considering the possibility that violent crime rates may affect neighborhood composition, Allen E. Liska and Paul E. Bellair (1995) examined the reciprocal effects of racial composition and violent crime over the last forty years in U.S. cities. Using three types of change models (difference-score method, cross-lag regression method, and residual score method), the authors found that while racial composition strongly affects the change in violent crime rates from 1980–1990, it only minimally affects changes in rates for the previous three decades. On the other hand, violent crime rates substantially affect the change in racial composition for all four decades, a finding also reported in Jeffrey D. Morenoff and Robert J. Sampson (1997). Liska and Bellair concluded that violent crime plays a significant role in white flight from central cities.

Finally, a recent study by Laura Dugan, Daniel S. Nagin, and Richard Rosenfeld (1999) explains the two-decades-long decline in America's intimate partner homicide rate in terms of three factors that reduce exposure to violent relationships: (1) shifts in marriage, divorce, and other factors associated with declining domesticity, (2) the improved economic status of women, and (3) increases in the availability of domestic violence services. Their explanation is based on a theory of exposure reduction that helps to account for the especially pronounced decline in the rate at which married women kill their husbands. Using a panel dataset of twenty-nine cities for four biannual

These studies reflect a renewed attention in criminology toward issues of continuity and change. While much groundwork has been laid in this area, much remains to be studied. First, most research has examined the structural correlates of homicide trends at the standard metropolitan statistical area and city levels, yet social disorganization theory operates at the neighborhood level of explanation as interaction between residents is a central component of the theory (Sampson 1986). Our analysis examines trends across neighborhoods within one city; thus, we are able to determine whether patterns found in the literature described above exist at smaller levels of analysis.

Second, in addition to asking whether the resource deprivation/affluence index, population structure index, and the percentage divorced covariate are associated with changes in homicide rates, Land and his colleagues (1990) also questioned whether these factors are associated with different types of killings. Key to this question is the realization that homicides vary in terms of motive, characteristics of victim and offender, setting, and circumstances. Moreover, findings from cross-sectional studies indicate that different neighborhood factors are related to different types of homicide (Williams and Flewelling 1988; Parker 1989; Kovandzik, Vieratis, and Yeisley 1998; Miles-Doan 1998; Maecmillan and Gartner 1999; Kubrin 2003; Kubrin and Wadsworth 2003). Despite this key finding, we are unaware of any study that assesses trends in disaggregated homicide rates. Therefore, in line with cross-sectional research, we examine the relationship between neighborhood structure and three types of homicide—general altercation, felony, and domestic—to determine whether trends in each of the subtypes are associated with different structural correlates.

Finally, the present study builds on the existing literature by employing an under-utilized yet effective methodological approach: growth-curve modeling. The majority of studies described above employ conventional methods such as the cross-lagged correlation approach and residual change analysis. Some researchers, however, believe that traditional models of change have limitations, the most notable of which is that they focus on the between-variable relations rather than the individual (or neighborhood) history (Bursik and Grasmick 1992, p. 251; Rogosa 1995, p. 60). The argument follows that one cannot draw complex conclusions about change over time without an examination of individual growth. Thus, we use growth-curve models to explore the relationships among neighborhood structure, changes in neighborhood structure, and changes in disaggregated homicide rates in St. Louis neighborhoods.

MODELING CHANGE

Methods traditionally used to examine changes in crime rates include the cross-lagged correlation approach and the residual change analysis. These approaches are relatively cumbersome when multiple waves of data are analyzed and, for this reason, applications of such techniques have generally focused on series of two-wave trends, providing a truncated sense of neighborhood change. While these methods provide a useful description of short-term ecological trends, they are limited as general indicators of community profiles. Moreover, traditional change analyses do not account for possible between-neighborhood variation in effects, treating the intercept and slope values for all cases
(neighborhoods) as equal. Traditional change analyses also cannot capture the possible nonlinear complexity in the overall trend.

These methodological shortcomings have direct consequences for theoretical development in the area of change, especially from a social disorganization framework. Changes in levels of crime, according to this perspective, are not uniform across neighborhoods; some neighborhoods will experience increases in crime, others will remain stable, and still others will experience decreases in crime. Given that a disorganization model of neighborhood profiles should identify the various patterns of longitudinal change that exist, traditional change models cannot address many questions of interest concerning growth and development in crime (Bursik and Grasmick 1992).

An attractive alternative for modeling crime trends originates from a diverse literature on trajectories of a variety of behaviors and abilities including functioning in the aged (McArdle and Hamagami 1992), alcohol and drug use (Duncan, Duncan, and Hops 1996; Herting, Eggert, and Thompson 1996), and the stabilization or desistance of deviant behavior (Nagin and Tremblay 1999). These studies profile behavior over time with an attempt to link individual characteristics and significant life events to change in behavior. Given the theoretical orientation and questions asked, researchers studying individual growth often employ growth-curve models, and while they have not been commonly used in criminology (see Horney, Osgood, and Marshall 1995 for exception), these models have considerable promise for the analysis of change at the neighborhood level (Bursik and Grasmick 1992, p. 252).

Conceptually, the growth-curve approach allows us to focus on neighborhood homicide trajectories and to determine the extent of variation in these trajectories—a strength especially attractive for social disorganization models that propose variation in profiles of community crime. Methodologically, growth-curve models enable us to advance beyond the typical autoregressive structural equation or covariance models that only parameterize the covariance as a gauge of change but ignore the fundamental changes in the means of variables. Finally, these models allow a characterization of the full temporal sequence under consideration as opposed to a single difference between two time points or a set of differences between pairs of time points. We therefore argue that growth-curve models facilitate a richer understanding of change in disaggregated homicide rates for St. Louis neighborhoods and ultimately help to determine the characteristics associated with homicide levels and changes in levels in urban areas.

DATA, TYPES OF HOMICIDE, AND ANALYTIC PROCEDURES

The St. Louis Homicide Data Set contains information on criminal homicides that occurred in St. Louis in 1979–1995. These murders were compiled from case files maintained by the St. Louis Police Department and the supplemental files submitted by investigating officers. All cases have detailed information about the suspect(s), victim(s), and event, which was hand coded by trained coders. Also available is a narrative of each killing that provides an account of the event describing what occurred, who was present, whether there were bystanders, and other important information. These narratives come from police reports (that include a description of the crime scene and surrounding location, any mention of physical evidence, a suspect interview, witness testimonies, and other pertinent information). While a potential limitation of these data is related to the completeness of information contained in police records, the St. Louis
Police Department clears a high percentage of cases and, as a consequence, has more complete records than in cities with lower clearance rates (Decker 1996, p. 431).

Three different types of homicide are examined—general altercation, felony, and domestic. These subtypes were derived in a previous analysis using cluster analysis (Kubrin 2003). Sixteen variables related to key aspects of the homicide were chosen as the cluster variables. Given the binary nature of the data, the hierarchical agglomerative clustering method was utilized, where clustering begins by finding the closest pair of cases according to a distance measure (in this case, Yule’s Q) and combines them to form a cluster. The algorithm continues one step at a time joining pairs of cases, pairs of clusters, or a case with a cluster until all of the data are in one cluster. The cluster analysis results identified three subtypes of homicide with unique victim, offender, and offense characteristics—general altercation, felony, and domestic. Although based on St. Louis data, these subtypes are discussed in the literature; each has appeared in a number of studies on disaggregated homicide rates (Williams and Flewelling 1988; Parker 1989; Miles-Doan 1998; Dugan et al. 1999; Macmillan and Gartner 1999). These studies guided our interpretation of the cluster analysis results.

“General altercation” homicides are public killings that occur between acquaintances because of an argument or fight that escalates into homicide. The suspect and victim are typically African American males, and witnesses are present. These killings tend to be alcohol- and drug-related meaning that the victim, offender, or both have been drinking or using drugs immediately prior to and/or during the event. Elijah Anderson (1999), Kenneth Polk (1994), David Luckenbill (1977), William Julius Wilson (1987; 1996), and Sampson and Wilson (1995) discuss argument-precipitated violence between friends or acquaintances and suggest that it is often the result of an unwillingness to back down from an altercation. Such a move to de-escalate an interpersonal conflict might be viewed by onlookers as weak, causing the participant to lose his reputation or integrity within the community. This unwillingness to engage in de-escalation, combined with easy access to lethal weapons (most of these deaths are from gunshot), may cause a confrontation that would usually end with a scuffle to end with a homicide. General altercation homicides (N = 1,599) are the most common type of homicide in St. Louis from 1979–1995.

“Felony” homicides are the second most common type (N = 443). These robbery or burglary killings, frequently recognized in the literature (Zahn and Sagi 1987; Parker 1989; 1995; Block and Block 1992), occur between strangers or acquaintances who are male, African American, and younger in age. Felony killings were often the result of a mugging, car jacking, or armed robbery gone awry. In those cases where the victim and offender knew each other, the offender often was attempting to steal drugs or the proceeds from illegitimate activity. Felony murders occur both in public and private locations, and the vast majority result from gunshot.

Finally, “domestic” killings (N = 391) are private in nature, occurring primarily in and around the home, between suspects and victims who are intimates. This category—the focus in a number of studies (Parker 1989; Macmillan and Gartner 1990; Miles-Doan 1998; Dugan et al. 1999)—includes murders between husbands and wives, ex-husbands and ex-wives, boyfriends and girlfriends, and ex-boyfriends and ex-girlfriends. While some of these killings result from domestic violence, the majority occur because of an argument. This type includes nearly all killings with a female offender, where, in many
cases, self-defense is given as the justification. Similar to general alteration killings, domestic murders tend to be alcohol-related.2

The dependent variables consist of the number of general alteration, felony, and domestic murders in St. Louis census tracts from 1979–1995.3 Although the rationale for choosing these years is based on data availability, there is nothing problematic with this time period for our research purposes. Given the fluctuation of homicide levels on a yearly basis and to better capture the overall trend, we smooth the data by utilizing three-year running averages. We additionally take the natural log of each time point to help normalize the overall distribution. We use EQS version 5.5a, following the general formulation of growth models presented by J. J. McArdle and David Epstein (1987), Anthony S. Bryk and Stephen W. Raudenbush (1987), and Duncan and her colleagues (1999), among others, in which we include time factors of time and time-squared and fix the parameters to capture this nonlinear formulation. In this application, the latent factor structure of time and time-squared models both the mean levels and variance/covariance structure for each year (over the fifteen year period) of observed values of general alteration, felony, and domestic levels. We then incorporate neighborhood factors to explain variability in the initial levels and trends of each homicide type. The neighborhood factors included in the models derive from social disorganization theory, as discussed below.

SOCIAL DISORGANIZATION THEORY AND TYPES OF HOMICIDE

Although social disorganization theory traditionally has been concerned with how community characteristics are related to the extent of violence within communities, recent theoretical development assesses how these characteristics may influence the nature of violence that neighborhoods produce. In this study, social disorganization theory provides the context for exploring the relationships among disadvantage, instability, and other factors, and general alteration, felony, and domestic homicides.

Recent research on the relationship between neighborhood structure and violent crime extends social disorganization theory by incorporating structurally based cultural adaptations to violence in their explanations. Sampson and Wilson (1995) argue that "concentration effects," or the effects of living in a neighborhood that is overwhelmingly impoverished and marked by family disruption and joblessness, contribute to structural social disorganization and cultural social isolation, defined as the lack of contact or of sustained interaction with individuals and institutions that represent mainstream society. Sampson and Wilson assert that social isolation deprives residents of resources, conventional role models, and cultural learning from mainstream social networks that facilitate social and economic advancement in society. As a result, concentrated disadvantage can give rise to the attenuation of larger cultural values, including values that prohibit the use of violence in certain situations.

Marino Bruce, Vincent Roscigno, and Patricia L. McCall (1998) further suggest that violence may be viewed, in part, as a cultural adaptation to the structural impediments that result from concentrated disadvantage in communities. As a means to cope with their bleak surroundings, some residents in disadvantaged neighborhoods incorporate alternative strategies, including violence, to accomplish goals such as gaining respect or admiration from peers. Support for this claim has been documented by Ruth Horowitz (1983) and Elijah Anderson (1999), whose ethnographic studies of poor communities in Chicago and Philadelphia provide evidence of a "code of the street" that legitimates
violence in certain situations. In line with Luckenbill (1977, p. 177), Horowitz and Anderson depict some violent behavior in disadvantaged communities as resulting from an escalating character contest, where participants develop a working agreement that violence is a useful tool for resolving questions of “face” and character (see also Kubrin and Weitzer 2003).

The processes by which disadvantage generates higher rates of violence are likely to influence some types of homicide but not others, as well as certain types of homicide more strongly than others. Altercation-based homicides, especially those that occur in public with bystanders, are most likely to result from a desire to maintain one’s reputation and gain respect from others, suggesting that disadvantage may be strongly related to general altercation killings. On the other hand, disadvantage is not likely to be strongly related to felony homicides, as these killings are motivated by financial gain and the location of potential targets is perhaps less relegated to economically disadvantaged neighborhoods. Thus, disadvantage may be relatively weakly associated with felony compared to general altercation killings.

Traditional social disorganization theory views residential instability as a key contributor to neighborhood disorganization and thus, to crime and violence. However, incorporating ideas from Sampson and Wilson (1995) and Bruce and his colleagues (1998) discussed above, instability may be more influential for certain types of homicide than others. When social relations are constantly in flux due to high rates of residential turnover, the development and maintenance of residents’ reputations becomes less essential in communities. Instability may be less influential for violence that stems from the maintenance of social hierarchies, such as altercation-based killings. Yet instability is likely to be strongly associated with felony killings because, according to social disorganization theory, neighborhoods with high rates of turnover are more likely to have residents who do not know one another or do not look out for each other. Indeed, nearly one-half of felony killings occur between strangers (a far greater percentage than general altercation and particularly domestic killings).

In line with recent research (Avakame 1998; Miles-Doan 1998), neither disadvantage nor instability is likely to be strongly related to domestic killings. Unlike the other subtypes, domestic homicides occur most often in the home and are more private. Thus, they are least likely to be influenced by surrounding community characteristics. A study by Ross Macmillan and Rosemary Gartner (1999) supports this hypothesis; they find that individual-level factors such as woman’s education level, man’s drinking behavior, length of the relationship, and household size, affect levels of spousal violence against women, more so than do contextual factors.

Social disorganization theory also predicts that changes in neighborhood ecological structures can influence changes in violent crime rates. Findings from a small but important literature discussed earlier illustrate the necessity of considering dynamic models of social disorganization (Chamlin 1989; Miethe et al. 1991; Bursik and Grasmick 1992; Morenoff and Sampson 1997; Kubrin 2000). According to social disorganization theory, ecological change lessens the ability of communities to regulate the behavior of their inhabitants, thereby increasing the rate of criminal behavior.

Undetermined, however, is whether changes in disadvantage, instability, and other factors influence some types of killing, but not others, and some types of killing more strongly than others. Although disadvantage is likely to be strongly associated with general altercation homicides, changes in levels of disadvantage are not necessarily
likely to further increase levels. On the other hand, changes in levels of instability may influence trends in general altercation killings; neighborhoods with changing residential populations are less able to develop collective normative "codes" that legitimate, or at least provide a basis of tolerance for, violence in certain situations.

Changes in levels of instability may also be associated with trends in felony killings. High rates of turnover and community reorganization can be disruptive to the maintenance of social institutions, social networks, and informal social controls in communities. As a result, robberies that go awry and result in homicide are more likely to occur.

Finally, for the same reason described above, changes in disadvantage and instability are not likely to be related to trends in domestic killings. It may be the case, however, that changes in divorce rates are significantly associated with trends in domestic killings, as David F. Greenberg (2001) shows that divorce and homicide rates have paralleled each other over the last fifty years. Greenberg argues that divorce is an indicator of strain in the nuclear family that can lead individuals to kill. In this study, we determine whether and to what extent this is true at the neighborhood level.

**VARIATION IN HOMICIDE RATES AND IN RATES OF CHANGE**

As a first step in the growth-curve estimation procedure, we estimated both linear and curvilinear models for the three homicide types. In all cases, adding the time-squared term substantially improves the fit of the models to the data. The baseline models of each homicide type show significant variation across neighborhoods in the effect of time. Equation 1 presents the estimated baseline growth-curve models:

\[
(\ln)Y_{it} = \alpha_i + \beta_1i(\text{Time}) + \beta_2i(\text{Time})^2 + \epsilon_{it}
\]

where \((\ln)Y_{it}\) is the logged count of the number of homicides in neighborhood \(i\) at time \(t\), \(\alpha\) is the estimated average constant (which reflects the initial level of homicide at the beginning of the time series), \(\beta_1\) is the average effect of time on homicide (which reflects the overall or main linear trend in homicide levels), \(\beta_2\) is the average effect of time squared (which reflects the degree to which homicide levels in neighborhoods have a parabolic form, or the extent to which the trend accelerates or decelerates over time), and \(\epsilon\) corresponds to the error in each observation. The longitudinal profile of each neighborhood can be summarized by these three regression parameters.

In line with this equation, results on initial homicide levels and their nonlinear trend from the model are represented by the following for general altercation \((G)\), felony \((F)\), and domestic \((D)\) homicides: \((\ln)G = .168 - .063t + .005t^2\), \((\ln)F = -.314 - .046t + .0034t^2\), and \((\ln)D = -.376 - .010t + .0003t^2\). To illustrate, we focus on general altercation killings. According to this equation, the average intercept, .168, represents the mean level of these homicides across St. Louis tracts in 1980. There are two coefficients representing trends in levels: -.063 and .005. The first coefficient is the main effect of time, while the second is an expression of the quadratic form and acts to alter the main effect of time; taken together they represent the average trend. This model indicates that on average, general altercation homicides initially declined and then continued to decline at a diminishing rate to a point where, in the latter part of the time series, these homicides were, on average, increasing. Figure 1 illustrates the estimated average general altercation, felony, and domestic growth-curves for all neighborhoods.
FIGURE 1. PREDICTED AVERAGE GENERAL ALTERCATION, FELONY, AND DOMESTIC HOMICIDE LEVELS, 1980–1994, FROM BASELINE MODEL

Although we can produce an average curve for each subtype, it is important to determine the extent of variation in the growth curves. Not shown here, the variance components of each model indicate substantial and statistically significant variation across tracts, both in initial levels as well as in trends of each type of killing. That there is significant variation in these parameters suggests that neighborhoods vary in their trajectories and indicates a need to explore and explain why these trends differ.

Visually we can determine from the baseline models: (1) how the growth curves of each homicide type differ across neighborhoods and (2) how, within a neighborhood, the growth curves of the different homicide categories vary. Concerning the first issue, for each type of killing, initial levels and trends differ across neighborhoods. Figure 2 illustrates plotted baseline models of general altercation killings in five census tracts located in different parts of the city, compared to the average curve for all tracts. While the average curve for all neighborhoods reveals an initial decline, a leveling off, and then a resurgence in levels, individual neighborhoods vary in their trends of general altercation homicides.

For example, located in central St. Louis, tract 1192—which in 1980 had a population of 2,624, 85 percent of whom were black, 41 percent of whom were living in poverty, and 55 percent of whom had changed residences in the last five years—had very high initial levels and experienced a steep decline and eventual upswing in general altercation killings over the time period. On the other hand, located in the northwestern section of the city, tract 1065—which in 1980 had a population of 5,020, over 97 percent of whom were black, only 28 percent of whom were living in poverty, and 33 percent of whom had changed residences in the last five years—had higher than average initial general altercation levels but experienced only a very slight increase in levels through 1994. These
FIGURE 2. PREDICTED GENERAL ALTERCATION HOMICIDE TRENDS IN FIVE NEIGHBORHOODS

tracts' curves differ not only from the average curve for all tracts but from each other as well.

Concerning the second issue, within a particular neighborhood, the curves of the types of murder vary. Figure 3 shows the baseline model for trends of general altercation, felony and domestic homicides within a given neighborhood. Trends of each subtype vary in the neighborhood; while general altercation homicides decreased linearly over time, felony homicides increased gradually, and domestic killings dropped and then dramatically increased to their highest levels by 1994.

It is possible to summarize the variability in these patterns of growth by estimating the correlations among the parameters in the model—the intercept and slopes—across neighborhoods. These correlations are presented in Table 1. The correlations of the intercepts for general altercation, felony, and domestic homicides are moderately strongly correlated. Initial levels of general altercation and felony killings are more highly correlated ($r = .78$) than levels of either general altercation and domestic homicide ($r = .53$) or felony and domestic homicide ($r = .37$).

Table 1 also reports the correlation between 1980 homicide levels and the time and time-squared coefficients. For all murder types, the initial level of homicide is negatively correlated with the “main” effect of time. For example, the correlation between the general altercation intercept and time slope is $-.61$, indicating that tracts with higher initial general altercation levels tend to have steeper initial declines in levels compared to tracts with lower initial levels. While initial levels are negatively associated with the main effect of time, for each subtype, initial levels are positively correlated with the time-squared parameter. This indicates that those neighborhoods with high homicide levels experienced a corresponding stronger upswing in murders over the time period.
FIGURE 3. THREE PREDICTED HOMICIDE TRENDS IN A NEIGHBORHOOD

More central to the substantive focus here, the correlations in Table 1 indicate the level of joint movement in the trajectories across the categories, allowing us to ask: How correlated are the growth curves of the different homicide subtypes? Do they mirror one another? Did the trajectory for domestic murders move in the same way as the trajectory for felony murders? Of note is the comparatively weak and negative association between general altercation and domestic trends; the correlation between the two main effects of time is only -.16. The association between felony and domestic trends, while stronger at .22, is not significant. On the other hand, there is a moderately strong posi-

TABLE 1. CORRELATIONS AMONG GROWTH-CURVE COEFFICIENTS (BASELINE MODEL)

<table>
<thead>
<tr>
<th>Coefficients</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. GA intercept</td>
<td>-.61</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. GA time</td>
<td></td>
<td>.55</td>
<td></td>
<td>-.89</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. GA time²</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. DM intercept</td>
<td>.53</td>
<td>.02</td>
<td></td>
<td>-.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. DM time</td>
<td></td>
<td>.05</td>
<td>-.16</td>
<td></td>
<td>.16</td>
<td>-.73</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. DM time²</td>
<td></td>
<td>.01</td>
<td>.15</td>
<td>-.13</td>
<td></td>
<td>.59</td>
<td>-.96</td>
<td></td>
</tr>
<tr>
<td>7. FL intercept</td>
<td>.78</td>
<td>-.40</td>
<td>.36</td>
<td>.37</td>
<td>.06</td>
<td>-.13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. FL time</td>
<td></td>
<td>.47</td>
<td>.43</td>
<td>.38</td>
<td>.01</td>
<td>-.22</td>
<td>.26</td>
<td>-.72</td>
</tr>
<tr>
<td>9. FL time²</td>
<td></td>
<td>.48</td>
<td>.48</td>
<td>-.01</td>
<td></td>
<td>.29</td>
<td>.32</td>
<td>.62</td>
</tr>
</tbody>
</table>

ns = not significant at $p < .10$. 
tive correlation of .43 between general altercation and felony trends indicating that declines in general altercation killings are more likely to be matched by similar declines in felony killings. Clearly, the trajectories for general altercation and felony homicides are more alike than for that of either of these and domestic homicides, suggesting that domestic killings may not react in similar ways to neighborhood socioeconomic and demographic characteristics.

To summarize the key findings thus far, the illustrative Figures and Table show that (1) initial levels and trends in each homicide type differ across neighborhoods, (2) within a particular neighborhood, the growth curves of each murder type vary, and (3) the subtype trends move somewhat differently, especially with respect to trends in domestic homicides that do not closely mirror trends in the other two subtypes. The latter point is consistent with social disorganization theory and findings from prior studies that show that domestic killings respond somewhat differently to community characteristics (Avakame 1998; Miles-Doan 1998). This discussion underscores the variation in levels and temporal patterns that exist both across neighborhoods within a homicide type and across types within a neighborhood. Far more central to the development of an ecological approach, however, is the determination of the relationship between these patterns and the community structure. We now turn our attention to accounting for this variation in light of neighborhood characteristics.

**NEIGHBORHOOD MODEL**

Nine variables were constructed from the 1980 census to reflect neighborhood differences in poverty, race, the labor market, age composition, family structure, and residential stability. The list of independent variables encompasses key correlates of homicide rates found in the existing literature, and in particular, in the work of Land and his colleagues (1990). The independent variables include (1) percent black, (2) median family income, (3) percent poverty, defined as the percentage of persons living below the poverty level, (4) percent young males, defined as the percentage of young males, ages 14–24, (5) percent residential mobility, defined as the percentage of persons ages 5 and over who have changed residences in the last five years, (6) percent children not living with both parents, defined as the percentage of children 18 years and under not living with both parents, (7) percent unemployed, defined as the percentage of unemployed persons ages 16 years and over, (8) percent divorced, defined as the percentage of divorced persons ages 15 years and over, and (9) population size, defined as the total resident population.

In line with Land and his colleagues (1990), we conducted factor analysis (a principal components analysis using the varimax rotation method). The results yield two factors with eigenvalues above the conventional threshold of 1.00 that explain 80 percent of the cumulative variance. Consistent with existing research, the poverty-related variables are highly associated and load on the same factor. The first factor, "neighborhood disadvantage," exhibits high loadings for the poverty (.94), percent children not living with both parents (.93), median family income (.91), unemployment (.87), and percent black (.84) measures.

Percent residential mobility (.89) and percent divorced (.83) are the measures with appreciable loadings on the second factor, "neighborhood instability." The clear emergence of a residential instability factor is consistent with past research (Miles-Doan
1998). The two factor scores, "disadvantage" and "instability," are used along with percent young male and population size, as well as variables representing changes in these four characteristics between 1980 and 1990, to capture the various dimensions of community context. While dynamic measures are included to determine the extent to which changes in disadvantage, instability, and other factors are related to trends in the different homicide types, we point out that St. Louis neighborhoods experienced only modest changes in these measures over the ten-year period. For example, the average change in poverty and unemployment across tracts was only 3 percent and −5 percent (suggesting an overall decrease in unemployment over the time period), respectively, and the correlation between 1980 and 1990 values of poverty \((r = .85)\) and unemployment \((r = .70)\) were high. Likewise, the average change in residential mobility and divorce was only −2 percent and 2 percent, respectively, and the correlation between 1980 and 1990 values of mobility \((r = .77)\) and divorce \((r = .86)\) were also high. On the other hand, St. Louis communities witnessed greater changes in the percentage of young male residents; average change in this measure across tracts was nearly −11 percent. Despite modest change, we use these variables in the growth-curve formulation to explain the variability in the parameters of the baseline model.

We confront two problems in the estimation of these models: the effects of spatial autocorrelation and of serial correlation. For the latter, in the models we include correlated error between successive time points (i.e., correlated error between 1980–1981, then 1981–1982, and so forth). Adding these correlated error parameters significantly improves the fit over a baseline model in which these correlated errors are absent (e.g., set to 0).

Spatial autocorrelation is accounted for by including a spatial lag model that stipulates an effect of neighbors' homicide levels on each tract's level. We calculate a Moran's I coefficient for each subtype (Baller, Anselin, Messner, Deane, and Hawkins 2000) and include this coefficient in the equation predicting the initial level, time, and time-squared coefficients. The results of the neighborhood model adjusted for spatial autocorrelation are presented in Table 2.

Looking first at general altercation homicides, as expected, disadvantage and population size are significantly positively associated with initial levels of these killings \((\beta = .48; \ p < .01; \ \beta = .26; \ p < .01)\). Neighborhoods with higher levels of disadvantage and greater population sizes were more likely to have higher initial levels of general altercation homicides in 1980 and also experienced more rapid declines in levels, as evidenced by the significant negative coefficient for the time parameter \((\beta = −.04; \ p < .05)\). The upswing in general altercation killings (as captured by the time-squared coefficient) was sharper in areas of greatest initial disadvantage \((\beta = .003; \ p < .05)\). Also as predicted, changes in the neighborhood measures are not significantly related to trends in general altercation homicides. Overall, we account for 57 percent of the cross-sectional variation in general altercation homicides and about 5 percent in the effects of time and time-squared.

Similar to general altercation killings, disadvantage is significantly positively associated with initial levels of felony murder \((\beta = .18; \ p < .01)\). More importantly, as anticipated, instability is also significantly positively related to felony homicide \((\beta = .06; \ p < .10)\), suggesting that neighborhoods with greater levels of residential mobility and divorce have greater levels of this type of killing. This finding is relatively weak, however. We expected a stronger relation given that strangers commit a larger percentage of felony killings and neighborhoods with high levels of residential instability are likely to
TABLE 2. GROWTH-CURVE MODEL RESULTS FOR GENERAL ALTERCATION, FELONY, AND DOMESTIC HOMICIDES AND NEIGHBORHOOD CHARACTERISTICS, 1980–1994

<table>
<thead>
<tr>
<th></th>
<th>General Altercation</th>
<th></th>
<th>Felony</th>
<th></th>
<th>Domestic</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate</td>
<td>s.e.</td>
<td>Estimate</td>
<td>s.e.</td>
<td>Estimate</td>
<td>s.e.</td>
</tr>
<tr>
<td><strong>Initial level</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>-2.3705</td>
<td>(.565)**</td>
<td>-1.1674</td>
<td>(.501)**</td>
<td>-3.3870</td>
<td>(.494)**</td>
</tr>
<tr>
<td>Spatial correlation</td>
<td>.0484</td>
<td>(.017)**</td>
<td>.1070</td>
<td>(.064)*</td>
<td>.3801</td>
<td>(.187)**</td>
</tr>
<tr>
<td>Disadvantage</td>
<td>.4755</td>
<td>(.052)**</td>
<td>.1845</td>
<td>(.046)**</td>
<td>.0915</td>
<td>(.043)**</td>
</tr>
<tr>
<td>Instability</td>
<td>-.0063</td>
<td>(.038)</td>
<td>.0616</td>
<td>(.034)*</td>
<td>.0557</td>
<td>(.032)*</td>
</tr>
<tr>
<td>Population</td>
<td>.2646</td>
<td>(.063)**</td>
<td>.0775</td>
<td>(.056)</td>
<td>.3025</td>
<td>(.052)**</td>
</tr>
<tr>
<td>% Young male</td>
<td>-.0058</td>
<td>(.008)</td>
<td>-.0021</td>
<td>(.007)</td>
<td>.0024</td>
<td>(.007)</td>
</tr>
<tr>
<td><strong>Time</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>-.1065</td>
<td>(.159)</td>
<td>-.0667</td>
<td>(.147)</td>
<td>.5329</td>
<td>(.151)**</td>
</tr>
<tr>
<td>Spatial correlation</td>
<td>.0029</td>
<td>(.004)</td>
<td>.0101</td>
<td>(.018)</td>
<td>-.0942</td>
<td>(.057)*</td>
</tr>
<tr>
<td>Disadvantage</td>
<td>-.0385</td>
<td>(.015)**</td>
<td>-.0289</td>
<td>(.014)**</td>
<td>.0196</td>
<td>(.013)</td>
</tr>
<tr>
<td>Instability</td>
<td>.0152</td>
<td>(.011)</td>
<td>-.0198</td>
<td>(.010)**</td>
<td>-.0165</td>
<td>(.009)*</td>
</tr>
<tr>
<td>Population</td>
<td>-.0031</td>
<td>(.018)</td>
<td>.0037</td>
<td>(.016)</td>
<td>-.0509</td>
<td>(.016)**</td>
</tr>
<tr>
<td>% Young male</td>
<td>.0022</td>
<td>(.002)</td>
<td>-.0011</td>
<td>(.002)</td>
<td>-.0010</td>
<td>(.002)</td>
</tr>
<tr>
<td>Δ Disadvantage</td>
<td>.0113</td>
<td>(.017)</td>
<td>-.0238</td>
<td>(.014)*</td>
<td>.0015</td>
<td>(.013)</td>
</tr>
<tr>
<td>Δ Instability</td>
<td>.0158</td>
<td>(.012)</td>
<td>.0136</td>
<td>(.010)</td>
<td>.0067</td>
<td>(.010)</td>
</tr>
<tr>
<td>Δ Population</td>
<td>.0275</td>
<td>(.049)</td>
<td>.0027</td>
<td>(.041)</td>
<td>-.0095</td>
<td>(.041)</td>
</tr>
<tr>
<td>Δ % Young male</td>
<td>-.0006</td>
<td>(.002)</td>
<td>.0016</td>
<td>(.002)</td>
<td>-.0010</td>
<td>(.002)</td>
</tr>
<tr>
<td><strong>Time squared</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>.0028</td>
<td>(.011)</td>
<td>-.0018</td>
<td>(.010)</td>
<td>-.0306</td>
<td>(.011)**</td>
</tr>
<tr>
<td>Spatial correlation</td>
<td>-.0003</td>
<td>(.0004)</td>
<td>-.0008</td>
<td>(.001)</td>
<td>.0041</td>
<td>(.004)</td>
</tr>
<tr>
<td>Disadvantage</td>
<td>.0032</td>
<td>(.001)**</td>
<td>.0021</td>
<td>(.001)**</td>
<td>-.0009</td>
<td>(.001)</td>
</tr>
<tr>
<td>Instability</td>
<td>-.0012</td>
<td>(.0008)</td>
<td>.0012</td>
<td>(.001)*</td>
<td>.0012</td>
<td>(.0007)*</td>
</tr>
<tr>
<td>Population</td>
<td>.0008</td>
<td>(.001)</td>
<td>.0005</td>
<td>(.001)</td>
<td>.0033</td>
<td>(.001)**</td>
</tr>
<tr>
<td>% Young male</td>
<td>-.0001</td>
<td>(.0002)</td>
<td>.0001</td>
<td>(.0002)</td>
<td>.0000</td>
<td>(.0001)</td>
</tr>
<tr>
<td>Δ Disadvantage</td>
<td>.0009</td>
<td>(.001)</td>
<td>.0034</td>
<td>(.001)**</td>
<td>-.0001</td>
<td>(.001)</td>
</tr>
<tr>
<td>Δ Instability</td>
<td>-.0012</td>
<td>(.001)</td>
<td>-.0011</td>
<td>(.0008)</td>
<td>-.0009</td>
<td>(.001)</td>
</tr>
<tr>
<td>Δ Population</td>
<td>.0039</td>
<td>(.004)</td>
<td>.0019</td>
<td>(.003)</td>
<td>.0018</td>
<td>(.003)</td>
</tr>
<tr>
<td>Δ % Young male</td>
<td>-.0001</td>
<td>(.0002)</td>
<td>-.0001</td>
<td>(.0001)</td>
<td>.0001</td>
<td>(.0001)</td>
</tr>
</tbody>
</table>

Initial level: \( R^2 = .57 \)  \( .37 \)  \( .32 \)
Time: \( R^2 = .06 \)  \( .02 \)  \( .01 \)
Time\(^2\): \( R^2 = .05 \)  \( .04 \)  \( .01 \)

\* p < .10; ** p < .05; *** p < .01.

have fewer residents who know one another. The findings for trends in felony homicide suggest that communities with higher levels of disadvantage and instability experienced more rapid declines in these homicides (\( \beta = -.03; p < .05; \beta = -.02; p < .05 \)) yet greater upswings in levels toward the end of the time series (\( \beta = .002; p < .05; \beta = .001; p < .10 \)). Unlike with general alteration homicide, changes in levels of disadvantage from 1980–1990 are significantly associated with over-time changes in felony murders (\( \beta = -.02; p < .10 \) for time coefficient; \( \beta = .003; p < .01 \) for time-squared coefficient).
The latter coefficient suggests a fairly strong resurgence over time in felony murders associated with neighborhoods experiencing increases in disadvantage in 1980–1990.

Turning to the domestic subtype, at odds with Edem F. Avakame (1998) and Rebecca Miles-Doan (1998), the findings indicate that disadvantage, instability, and population size are all positively associated with initial levels of domestic killings ($\beta = .09; p < .05$; $\beta = .06; p < .10; \beta = .30; p < .01$). Likewise, instability and population size (but not disadvantage) are negatively related to declines and eventual upswings in domestic homicides over the fifteen-year period, a finding in line with Greenberg (2001). Surprisingly, however, none of the change variables is significantly related to trends in domestic killings in St. Louis.

Collectively, the results suggest that different neighborhood characteristics are associated with initial levels and trends in different types of homicide, as anticipated. Although disadvantage is related to each subtype (but not to trends in domestic killings), instability is related only to felony and domestic killings. Likewise, changes in disadvantage are only related to trends in felony homicide. The findings also reveal that the size of the coefficient of these neighborhood characteristics varies across the categories. For example, although disadvantage is associated with all types of homicide, the strength of the association between this characteristic and homicide varies significantly by subtype. We applied the formula for the standard test for coefficient differences across equations, $t = b_1 - b_2 / \sqrt{(SEb_1^2 + SEb_2^2)}$ (Paternoster, Brame, Mazerolle, and Piquero 1998; see also McNulty 2001; Kubrin and Weitzer 2003), to formally test the extent to which the effects of disadvantage and instability differ across the subtypes. The results indicate that there are statistically significant differences in the effects of these variables across the equations ($p < .05$, two-tailed test).²

**DISCUSSION**

This research has explored the relationship between neighborhood socioeconomic and demographic characteristics and homicide trends in St. Louis from 1980–1994. Unlike past studies that assess change over time using residual change scores, the present study employs a relatively new method—growth-curve modeling—to examine change at the neighborhood level. The strength of this approach lies in its ability to model individual histories and to explore neighborhood variation in homicide trajectories.

The findings from the analyses indicate that the trends for general altercation, felony, and domestic homicides are varied, with domestic trends correlating weakly with the trends of other subtypes. The results also show that initial levels and trends in each homicide subtype vary across neighborhoods. That is, while the average growth curve for general altercation homicides, for example, indicates an initial decline followed by a gradual upswing in levels, communities across St. Louis experienced significantly different general altercation trajectories. This was true for felony and domestic killings as well.

More importantly, having documented variation across communities in the trajectories, we turned our attention to determining which neighborhood characteristics are associated with this variation. Our findings suggest that (1) both the growth and decline in each type of murder are associated with the socioeconomic and demographic composition of the neighborhood, (2) initial levels of all three types of murders are associated with disadvantaged socioeconomic structure, (3) for general altercation and felony homicides, disadvantage (and change in disadvantage for felony murder) is a significant
predictor of the rate of change in levels during the fifteen-year period, and (4) instability is related to initial levels and changes in levels of only felony and domestic homicides.

These findings have implications for social disorganization theory. First, the theory traditionally has been concerned with explaining how community characteristics are related to the extent of violence within communities; most studies examine how poverty, residential instability, and other factors increase crime by reducing social control, assuming that all types of crime will be equally influenced. Often no comment is made regarding how these factors might influence certain types of crimes and not others and certain types of crime more strongly than others. Likewise, social disorganization theory offers very little about how poverty or residential instability may influence the nature of crime and violence that neighborhoods produce. Our findings suggest that not all homicide types are affected by neighborhood structure and that some types are influenced more strongly by poverty and instability than others. For example, while disadvantage is associated (albeit in varying degrees) with all three subtypes, instability is related only to felony and domestic killings. These findings warrant further consideration in future research and underscore the importance of considering the nature (and not simply the amount) of crime in social disorganization explanations.

The findings also reiterate the importance of examining the correlates of change in crime and violence over time. Social disorganization research has not adequately considered change, adaptation, and long-term processes of urban development, yet the full set of dynamics that may lead to disorganization can only be discerned when long-term processes of development are assessed. The findings from this study suggest that understanding what drives change in neighborhood homicide rates is more difficult and complex than anticipated. While disadvantage is associated with initial levels of domestic killings, it is not associated with over-time changes in this type of homicide. Likewise, changes in levels of disadvantage from 1980–1990 are not related to changes in domestic killings. This was true for the other subtypes as well. While this may be due, in part, to the relatively small changes in poverty and unemployment over the ten-year period, it is evident that the neighborhood characteristics identified by social disorganization theory appear better able to predict cross-sectional differences in homicide types than differences in the trajectories of growth and decline across neighborhoods. This underscores our general lack of understanding concerning what drives variation in individual neighborhood trajectories of change and what accounts for the variation. Future research should focus on trying to better understand these patterns.

In conclusion, we return to the original question posed by Land and his colleagues (1990)—whether the invariances they found apply to changes in homicide rates. Our findings indicate that, despite minor exceptions, disadvantage plays a significant role in explaining initial levels and trends in different types of homicide; however, disadvantage is significantly more associated with general alteration and felony than with domestic trajectories, while instability is more strongly associated with trends in domestic murders. On the other hand, changes in levels of disadvantage, instability, and other community characteristics, in general, are not associated with initial levels or trends in homicide. These results suggest that certain neighborhood characteristics are associated with changes in just certain types of homicide, a finding that buttresses results from cross-sectional analyses of disaggregated homicide rates (Williams and Flewelling 1988; Parker 1989; Kovandzic et al. 1998; Miles-Doan 1998; Macmillan and Gartner 1999; Kubrin 2003). This point underscores the importance of disaggregating homicides when studying
the relationships among neighborhood structure, changes in neighborhood structure, and changes in homicide levels over time.

ACKNOWLEDGMENTS

The data used in this research come from the St. Louis Homicide Project and were collected as part of research funded by grants from the National Science Foundation, the National Institute of Justice, and the National Consortium on Violence Research. We thank Richard Rosenfeld, Scott Decker, Carol Kohfeld, and John Sprague for providing us with the data. We are grateful to Tim Bray, Kevin Leicht, and anonymous reviewers for help on an earlier version of this article.

APPENDIX

GROWTH-CURVE MODEL RESULTS FOR GENERAL ALTERCATION HOMICIDES AND NEIGHBORHOOD CHARACTERISTICS, 1980–1994, USING A CUBIC FUNCTION OF TIME

We presented results of fitting the quadratic forms of the growth equation for three homicide types in our analysis even though the cubic function presented a better fit of the model for general altercation homicides. In this appendix, we present the results from fitting the cubic term for this homicide type.

The average growth curve for the cubic term is \( \ln(Y) = .217 - .142t + .020t^2 + -.0007t^3 \). The quadratic form reported in the text was \( \ln(Y) = .168 - .063t + .005t^2 \). By taking the first derivative of each equation, it is apparent that the change in the rate of growth for the quadratic is a linear function, and the change in the rate of growth for the cubic equation is a quadratic function. This has three implications. First, the initial decline in general altercation killings observed is steeper in the cubic form. Second, the point at which these killings begin to once again increase is 1985 for the cubic equation, while the quadratic equation shows that growth in these killings reemerges in 1987. Third, while both equations show a return to growth during the late 1980s, the cubic equation accurately portrays a slowing of the rate of growth in the last three years of the time series. In fact, if we remove the last three time points in the series, there is very little difference between fitting the quadratic versus the cubic equation to the truncated time series. Overall the correlation of predicted values based on the average quadratic equation and the average cubic equation is high at .91.

The table below shows the results of our analysis using neighborhood characteristics to predict variation in the four terms of the cubic equation. Variation in the initial level of general altercation homicides across tracts is explained by the same variables as in the quadratic form; the spatial correlation, population, and disadvantage variables are significant. Effects of neighborhood characteristics on the time and time-squared term differ from the quadratic results in that disadvantage is no longer significant at the .05 level. The effect of disadvantage is similar across the quadratic and cubic equations for the time term just no longer significant. The cubic term is significantly related to percent young males and to the change in instability between 1980 and 1990. This suggests some differences in what may predict variation in growth in general altercation murders between the cubic and quadratic model.
TABLE A1

<table>
<thead>
<tr>
<th></th>
<th>Initial Level Estimate (se)</th>
<th>Time Estimate (se)</th>
<th>Time² Estimate (se)</th>
<th>Time³ Estimate (se)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-2.6475 (.642)**</td>
<td>.3614 (.349)</td>
<td>-.0921 (.057)</td>
<td>.0004 (.002)*</td>
</tr>
<tr>
<td>Spatial correlation</td>
<td>.0515 (.019)***</td>
<td>-.0026 (.011)</td>
<td>.0009 (.002)</td>
<td>-.0001 (.0001)</td>
</tr>
<tr>
<td>Disadvantage</td>
<td>.4688 (.058)***</td>
<td>-.0528 (.032)*</td>
<td>.0055 (.005)</td>
<td>-.0001 (.0002)</td>
</tr>
<tr>
<td>Instability</td>
<td>-.0089 (.044)</td>
<td>.0096 (.023)</td>
<td>.0000 (.004)</td>
<td>-.0001 (.0002)</td>
</tr>
<tr>
<td>Population</td>
<td>.2799 (.072)***</td>
<td>-.0361 (.039)</td>
<td>.0074 (.006)</td>
<td>-.0003 (.0003)</td>
</tr>
<tr>
<td>% Young male</td>
<td>.0048 (.009)</td>
<td>-.0101 (.005)*</td>
<td>.0023 (.001)**</td>
<td>-.0001 (.0000)**</td>
</tr>
<tr>
<td>Δ Disadvantage</td>
<td></td>
<td>.0669 (.036)*</td>
<td>-.0109 (.007)</td>
<td>.0006 (.0003)*</td>
</tr>
<tr>
<td>Δ Instability</td>
<td></td>
<td>-.0331 (.027)</td>
<td>.0096 (.005)*</td>
<td>-.0005 (.0002)**</td>
</tr>
<tr>
<td>Δ Population</td>
<td></td>
<td>.0554 (.107)</td>
<td>.0206 (.021)</td>
<td>-.0008 (.0010)</td>
</tr>
<tr>
<td>Δ % Young male</td>
<td></td>
<td>.0005 (.004)</td>
<td>-.0003 (.001)</td>
<td>.0000 (.0000)</td>
</tr>
</tbody>
</table>

*p < .10; **p < .05; ***p < .01.

NOTES

1. The clustering variables include motives (“heat of anger,” robbery, drugs, retaliation), facilitating factors (whether the homicide was drug-, alcohol-, gang-related), victim-offender relationships (strangers, friends/acquaintances, family members), characteristics of the victim and offender (victim’s and suspect’s gender, suspect’s status as a juvenile), and causes of death (shot, stabbed, beaten).

2. See Kubrin (2003) for further description of the subtypes as well as more specific information about the cluster analysis method and results.

3. In St. Louis there are 114 tracts, three of which are excluded from the analyses because they do not have adequate size residential populations (i.e., they have populations of less than 200 compared to a tract average of 3,572). This minimum population size requirement allows us to construct reliable rates; other studies that have utilized these data also have excluded these tracts from their analyses (Rosenfeld, Bray, and Egley 1999).

4. We explored a higher order cubic function of time for all three homicide types. For general altercation killings the cubic term improved the fit of the data, while for felony murders the improvement was slight, and for domestic murders there was no statistically significant improvement. Inspection of the time series plots for general altercation killings indicated most of the improvement in fit was in the latter part of the time series where there was a leveling off of the upward trend. Because the cubic term complicates the discussion of the “main effect” of time and only provided a substantial gain in fit for general altercation murders (and only in the latter part of the series), we present the results for fitting the quadratic functional form of time. The results for fitting the cubic functional form of time for general altercation homicides are presented in the Appendix.

5. Unlike Land and his colleagues (1990), we do not include a South dummy variable or the Gini index of income concentration because the analyses are performed at the census tract level and these variables operate at the city or SMSA level (e.g., the Gini index is best measured at a level of aggregation higher than the tract because most tracts are relatively homogeneous with respect to economic status and living conditions). Similar to Land and his colleagues, we included neighborhood density as a predictor. However, neither this measure nor the change in density from 1980-1990 provided any additional information net of the factors already included in the equations. Moreover, density is strongly correlated with population size at .69, and change in density and change in population are correlated at .82. Thus, adding the additional variables did not seem warranted. Finally, we included one variable not studied by Land and his colleagues—residential...
mobility—because it has been shown to be strongly linked to homicide rates in prior neighborhood-level research (Miles-Doan 1998; Kubrin 2003).

6. Moran’s I was computed using a first power inverse distance weights matrix (row standardized) based on the distance between census tract centroids for all tracts excluding the one under consideration so that greater weight is given to tracts that are closer than to those that are farther away. We then multiplied the spatial weights matrix by the values of each dependent variable. This product indicates the influence of neighboring homicide, with the influence decaying as the distance between tracts increases (Baller et al. 2001).

7. The data available had calculated Moran’s I separately for domestic murders in which females and males were the victims. We used the former in the results presented here. There were not substantial differences in the results regardless of which spatial correction we employed; the two are correlated at .91.

8. Given that we are exploring results of key factors derived from social disorganization theory rather than testing specific hypotheses, we used a liberal p-value of .10 to indicate possible albeit weak associations that may exist in the data. This is particularly true of equations predicting the effect of time and time squared where there is no strong a priori indication of how certain factors will act to influence the curvilinear change in the overall time trend.

9. The coefficient for disadvantage was significantly different in the general altercation versus felony, general altercation versus domestic (initial level), general altercation versus domestic, domestic versus felony (time), general altercation versus domestic, and domestic versus felony (time-squared) equations. Comparisons for instability show a significant difference in the general altercation versus felony, general altercation versus domestic (time), general altercation versus felony (p < .10), and general altercation versus domestic (time-squared) equations.

REFERENCES


Reproduced with permission of the copyright owner. Further unauthorized reproduction is prohibited without permission or in accordance with the U.S. Copyright Act of 1976. Copyright of Sociological Quarterly is the property of Midwest Sociological Society and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.