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DOI
10.1111/1745-9125.12110

Publication date
2016

Document Version
Final published version

Published in
Criminology

CRIMINOLOGY

SPATIAL DIMENSIONS OF THE EFFECT OF NEIGHBORHOOD DISADVANTAGE ON DELINQUENCY*

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KEYWORDS: neighborhood disadvantage, spatial processes, delinquency

*Research examining the relationship between neighborhood socioeconomic disadvantage and adolescent offending typically examines only the influence of residential neighborhoods. This strategy may be problematic as 1) neighborhoods are rarely spatially independent of each other and 2) adolescents spend an appreciable portion of their time engaged in activities outside of their immediate neighborhood. Therefore, characteristics of neighborhoods outside of, but geographically proximate to, residential neighborhoods may affect adolescents' propensity to engage in delinquent behavior. We append a spatially lagged, distance-weighted measure of socioeconomic disadvantage in "extralocal" neighborhoods to the individual records of respondents participating in the first two waves of the National Longitudinal Survey of Youth, 1997 Cohort (*N = 6,491*). Results from negative binomial regression analyses indicate that the level of socioeconomic disadvantage in extralocal neighborhoods is inversely associated with youth offending, as theories of relative deprivation, structured opportunity, and routine activities would predict, and that the magnitude of this effect rivals that of the level of disadvantage in youths' own residential neighborhoods. Moreover, socioeconomic disadvantage in extralocal neighborhoods suppresses the criminogenic influence of socioeconomic disadvantage in youths' own neighborhoods, revealing stronger effects of local neighborhood disadvantage than would otherwise be observed.*

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* Additional supporting information can be found in the listing for this article in the Wiley Online Library at http://onlinelibrary.wiley.com/doi/10.1111/crim.2016.54.issue-3/issuetoc.

We are grateful to T. J. Taylor and Rick Rosenfeld for insightful comments on earlier drafts of this article. We are indebted to Timothy McCuddy and Chris McDaniel for their assistance in various aspects of this project. We would like to extend a special thanks to Jennifer Cassidy-Gilbert at the Bureau of Labor Statistics for her invaluable assistance in accessing the restricted data from the National Longitudinal Survey of Youth 1997. We acknowledge the important contribution of Kyle Crowder to the construction of the geographic indicators. All errors and omissions remain our own. This project was funded, in part, by a grant provided by the University of Missouri—St. Louis. The research leading to these results has received funding from the European Research Council under the European Union's Seventh Framework Programme (FP/2007-2013) / ERC Grant Agreement n. 615159 (ERC Consolidator Grant DEPRIVEDHOODS, Socio-spatial inequality, deprived neighbourhoods, and neighbourhood effects); and from the Marie Curie programme

doi: 10.1111/1745-9125.12110

A central aim of contemporary criminological research has been to identify the structural characteristics of communities associated with crime and violence. Much of this research has focused on the associations between community characteristics, such as the level of socioeconomic disadvantage, and aggregate crime rates. Although there has been some discussion over the functional form of this association, the general consensus is that economic deprivation and the social processes at work in disadvantaged communities contribute to higher rates of criminal behavior (Hannon and Knapp, 2003; Krivo and Peterson, 1996; McNulty, 2001). More recently, scholarly attention has shifted toward understanding how community characteristics influence individual behavior and whether these characteristics condition the association between individual risk factors and offending (Jones and Lynam, 2009; Lynam et al., 2000; Vazsonyi, Cleveland, and Wiebe, 2006; Zimmerman, 2010; Zimmerman and Messner, 2011). This research has indicated that neighborhood processes also increase risky behaviors at the individual level; however, when detected, these effect sizes are much smaller in magnitude than those reported in studies of aggregate crime rates (Kubrin and Weitzer, 2003). This finding is perplexing because indicators of structural disadvantage are among the most robust predictors of neighborhood crime rates.

Research linking neighborhood characteristics with individual behavior has typically relied on measures of neighborhood context derived from census data characterizing survey respondents' residential census tracts. A potential limitation of this approach is that the propensity to offend might be influenced not only by the characteristics of individuals' immediate neighborhoods but also by the characteristics of their surrounding neighborhoods. People often spend time in activity spaces in nearby communities (Jones and Pebley, 2014; Krivo et al., 2013). And indeed, prior research has shown that individuals often commit crimes outside of their neighborhoods of residence (Sampson, Morenoff, and Gannon-Rowley, 2002; Wikström et al., 2010). Accordingly, the criminogenic impulses of residents of a given neighborhood could be influenced by the characteristics of the residents, and the opportunities to offend, in surrounding neighborhoods.

Neighborhoods are embedded within larger communities and are rarely spatially independent of one another. Research on aggregate crime rates has demonstrated that criminogenic processes at work in one neighborhood are influenced by the characteristics of surrounding neighborhoods (Baller et al., 2001; Deane et al., 2008; Peterson and Krivo, 2009). It follows that characteristics of neighborhoods outside of, but geographically proximate to, individuals' residential neighborhoods—sometimes referred to as "extralocal" (Crowder and South, 2011) or "extended" (Graif, 2015) neighborhoods—may affect individuals' propensity to engage in criminal conduct. Indeed, emerging research has already indicated that the characteristics of extralocal neighborhoods, considered alongside the characteristics of residential neighborhood environments, help to explain variation in other high-risk youth behaviors such as premarital childbearing and dropping out of high school (Crowder and South, 2011; South and Crowder, 2010). Furthermore, residential proximity to economic disadvantage in the broader community may play a similar role in adolescent delinquency (Graif, 2015; Odgers et al., 2015). Accordingly, a

under the European Union's Seventh Framework Programme (FP/2007-2013) / Career Integration Grant n. PCIG10-GA-2011-303728 (CIG Grant NBHCHOICE, Neighbourhood choice, neighbourhood sorting, and neighbourhood effects). Direct correspondence to Matt Vogel, Department of Criminology and Criminal Justice, University of Missouri—St. Louis, 539 Lucas Hall, St. Louis, MO 63121-4400 (e-mail: vogelma@umsl.edu).

comprehensive understanding of environmental influences on offending may also require careful consideration of these spatial processes.

The present study examines the associations of residential neighborhood disadvantage and extralocal neighborhood disadvantage with self-reported criminal conduct among a nationally representative sample of adolescents. We begin by reviewing recent research on neighborhood disadvantage and self-reported criminal behavior. We then develop several hypotheses regarding the association between extralocal neighborhood disadvantage and offending. We empirically evaluate these hypotheses by appending spatially lagged, distance-weighted, tract-level data from two decennial censuses to self-report survey data from respondents participating in the National Longitudinal Survey of Youth, 1997 (NLSY97).

LITERATURE REVIEW

NEIGHBORHOOD DISADVANTAGE AND OFFENDING

A variety of criminological perspectives provide insight into how and why neighborhood socioeconomic disadvantage increases the risk of offending. For one, youths residing in economically disadvantaged neighborhoods are more likely to be exposed to models of behavior that promote violence and aggression over normative behaviors (Anderson, 1999; Zimmerman and Messner, 2011). For instance, Anderson (1999) argued that the decay of the traditional family in disadvantaged areas, coupled with the rising absence of males as a result of incarceration and early mortality, has led to a diminution of positive male role models. In turn, this deficit of role models has created a youth culture stressing hyper-masculinity and promoting violence as a means to establish and reaffirm one's social status. Adolescents in such areas perceive the rewards (e.g., "status" or "respect") garnered by the most violent of their peers and then attempt to model their peers' behavior. Moreover, given the higher risk of violence in disadvantaged communities, adolescents may posture or adopt "tough" attitudes as a form of protection against criminal victimization. Kirk and Papachristos (2011) contended that the higher rates of violence in disadvantaged, minority communities can be attributed to legal cynicism or to a "cultural frame through which the law and the agents of its enforcement are viewed as *illegitimate*, *unresponsive*, and *ill equipped* to ensure public safety" (p. 1191, emphasis in original). In the absence of legal recourse, residents may turn to extralegal means of conflict resolution, such as violence. In this sense, neighborhood disadvantage is thought to increase offending by exposing youth to cultural scripts and behavioral models that reinforce criminal behavior.

From a structural standpoint, neighborhood disadvantage may impede the formation of interpersonal networks among neighbors that would otherwise deter crime and violence. In more affluent areas, neighbors are likely to be acquaintances or friends and as such are more willing to watch over the properties and intervene in the affairs of each other, should trouble arise. Disadvantaged neighborhoods, then, can be understood to suffer from limited friendship, kinship, and acquaintanceship networks. Community residents may be unwilling to intervene on behalf of their neighbors, and neighborhoods may lack the collective capacity to monitor, regulate, and correct youth behavior (Bursik and Grasmick, 1993; Sampson and Groves, 1989; Sampson, Raudenbush, and Earls, 1997). In economically deprived communities, adolescents may recognize that delinquent behavior is unlikely to be noticed or, more to the point, unlikely to be punished if it is

noticed. Moreover, unstructured socialization has been consistently linked with delinquency (Osgood and Anderson, 2004; Osgood et al., 1996) and seems especially problematic when adolescents spend time outdoors with their friends (Hoeben and Weerman, 2014) and in areas characterized by low levels of collective efficacy (Maimon and Browning, 2010). From this standpoint, neighborhood disadvantage may diminish informal social control, creating greater opportunities to engage in criminal behavior.

Taken as a whole, adolescents living in impoverished neighborhoods may offend at a higher level as 1) there are greater cultural influences that promote deviance and 2) structural neighborhood characteristics provide greater opportunities to engage in rule-violating behavior. And consistent with these ideas, countless studies have demonstrated positive associations between indicators of neighborhood socioeconomic disadvantage and self-reported delinquency (e.g., Bellair and McNulty, 2009; Gorman-Smith, Tolan, and Henry, 2000; Kaufman, 2005; Kirk, 2008; Loeber and Wikström, 1993; Peeples and Loeber, 1994; Silver, 2000; Wikström and Loeber, 2000; Zimmerman and Messner, 2010; but see Lynam et al., 2000; Zimmerman, 2010; Zimmerman and Messner, 2011).

Two observations complicate the findings reported in prior studies in this area. First, adolescents spend an appreciable portion of their time engaged in activities away from home (Hoeben and Weerman, 2014; Wikström et al., 2010). Situational theories of offending posit that the proximate causes of crime are associated with the immediate social contexts in which behaviors manifest, and emerging research has suggested that most offending occurs when adolescents spend time with peers in public settings away from the watchful eyes of adult chaperones (Bernasco et al., 2013; Wikström and Butterworth, 2006). Thus, the characteristics of residential neighborhoods, in particular the indicators of situational opportunities to offend, may have little bearing on behavioral decisions if adolescents tend to engage in problem behaviors elsewhere. Moreover, conditions that youths are exposed to throughout their daily routines, such as the economic conditions in their broader communities, may influence criminal propensity above and beyond the characteristics of their residential neighborhoods, regardless of where offending occurs.

Second, individuals rarely engage in criminal conduct in their immediate neighborhoods. Instead, offending typically displays a distance decay function between offenders' homes and the places they offend. In other words, most people do not offend in their immediate neighborhoods, but they do typically commit crime close to home and the likelihood of offending diminishes the farther they travel from this comfort zone (Bernasco, 2010; Bernasco et al., 2013; Brantingham and Brantingham, 1984; Reid et al., 2014; Rengert, Piquero, and Jones, 1999). It stands to reason that not only do immediate neighborhood conditions structure exposure to criminogenic opportunities and socialization processes, but also the characteristics of neighborhoods that are geographically proximate to youths' neighborhoods influence behavioral choices.

These observations can be viewed as part of a broader concern with issues of space and place in neighborhood effects research more generally. Criminologists have long been aware of the role of spatial scale (e.g., the proper specification of "neighborhood effects") and spatial dependence (e.g., the role of proximate neighborhood influences) in community-based research. With regard to the former, the level of aggregation at which neighborhood characteristics are measured, often referred to as the modifiable areal unit problem, has been shown to provide significantly biased analyses of neighborhood crime rates (Hipp, 2007a). As a result, some have argued that conventional research relying on preconstructed, nonoverlapping neighborhood boundaries, such as census tracts, is

flawed. Instead, researchers would be better served by considering alternative measurement strategies, such as focusing on overlapping buffers drawn around all blocks within an urban area (e.g., "ego-hoods"; Hipp and Boessen, 2013) or accounting for multiple scales simultaneously (Boessen and Hipp, 2015). The role of spatial scale has received far less attention in the study of individual offending, with some arguing that small neighborhood units are preferred (Oberwittler and Wikström, 2009) and others arguing that larger aggregations may better capture the relevant adolescent activity spaces (Vogel, 2016).

The issue of spatial dependence, on the other hand, recognizes that neighborhoods are not isolated islands; rather, social interaction and access to community resources transcend neighborhood boundaries (Graif, Gladfelter, and Matthews, 2014; Krivo et al., 2015). As such, conditions in nearby neighborhoods may "spill over" and influence local crime rates. Spatial lags, or measures of extralocal community characteristics, have been a common way to empirically model these processes in the criminological literature. Such lags are usually constructed as either 1) characteristics of adjacent neighborhoods (queen's matrices), 2) characteristics of a predetermined number of proximate neighborhoods (nearest neighbor matrices), or 3) characteristics of all neighborhoods within a predefined radius, adjusted for their distance from the focal tract (distance decay matrices). On the whole, this research has indicated that crime rates are frequently higher in neighborhoods located near other high-crime neighborhoods and in neighborhoods characterized by higher levels of race/ethnic and socioeconomic segregation relative to the surrounding community (e.g., Browning, 2009; Deane et al., 2008; Krivo et al., 2015; Krivo and Peterson, 2009; Mears and Bhati, 2006).

Emerging research has indicated that the spatial patterning of neighborhood influences may operate differently at the individual level than is typically observed in ecological studies of neighborhood crime rates. By using data from the predominantly low-income participants in the Moving to Opportunity (MTO) experiment, Graif (2015) reported that impoverished boys who live in high-poverty areas surrounded by low-poverty neighborhoods engage in risk-taking and delinquent behavior at higher rates than those residing in neighborhoods surrounded by similarly high levels of poverty. This finding is surprising as prior research on aggregate crime rates has portended that the strongest neighborhood influences on offending should be observed in areas where criminogenic risk factors are most heavily concentrated. However, studies in this area remain scarce, and it is unclear how and why socioeconomic disadvantage in extralocal neighborhoods buffers against criminal conduct.

We build on this work by proposing that researchers interested in neighborhood influences on adolescent behavior need to consider not only the effects of residential neighborhood characteristics but also the more distal influences in the broader metropolitan community. Our analysis extends existing work on the influence of extralocal or extended neighborhoods on youth offending in several potentially significant ways. First, our analytical strategy specifies unique and separable effects of socioeconomic disadvantage in the local residential neighborhood and socioeconomic disadvantage in geographically proximate neighborhoods. This aspect of our analysis allows for 1) comparing the effects of local and extralocal neighborhood disadvantage on youth offending, 2) examining the degree to which socioeconomic disadvantage in extralocal areas might condition the effect of local neighborhood disadvantage, and 3) exploring the degree to which incorporating the influence of extralocal neighborhoods alters the observed influence of local neighborhood disadvantage.

Second, rather than (somewhat arbitrarily) specifying a priori which extralocal neighborhoods affect offending and which extralocal neighborhoods do not, as is the case with studies employing adjacency and nearest neighbor matrices (e.g., Krivo et al., 2015; Mears and Bhati, 2006), our analytic approach allows all neighborhoods within a reasonable geographic circumference to play a role, but it assigns less weight to more distant areas. Although such spatial lags are often incorporated into models of aggregate crime rates (e.g., Deane et al., 2009; Hipp 2007b), they are applied much less frequently to models of individual offending. As the results presented will indicate, this strategy allows us to capture significant effects of extralocal areas that would be missed if characteristics of only adjacent neighborhoods were considered.

Third, treating both the level of socioeconomic disadvantage in the local neighborhood and the level of socioeconomic disadvantage in extralocal neighborhoods as continuous variables obviates the need to employ arbitrary cut-offs to classify neighborhoods and their surrounding areas as either disadvantaged or not disadvantaged (cf. Graif, 2015; Vogel, 2016), which is an approach that likely sacrifices much valuable information. Our measurement strategy makes maximum use of the information available on both local and extralocal neighborhoods.

Although there are strong theoretical grounds for hypothesizing that characteristics of extralocal neighborhoods matter for youth offending, the geographic scope of this influence is theoretically indeterminate. Accordingly, although we rely mainly on a simple distance-decay measure of extralocal neighborhood disadvantage, we also explore alternative operationalizations by using other spatial lag functions. A comparison of these measurement strategies provides some leverage for determining whether and how the distance between focal and extralocal neighborhoods affects estimates of extralocal disadvantage on youth offending.

EXTRALOCAL NEIGHBORHOOD DISADVANTAGE

Positive Effects of Extralocal Disadvantage on Offending

Although the mechanisms linking residential neighborhood disadvantage and delinquency are well established in the literature, the effect of socioeconomic disadvantage in extralocal neighborhoods is more difficult to predict. One possibility is that socioeconomic disadvantage in extralocal neighborhoods may mimic the effects of disadvantage in the immediate neighborhood, translating into lower levels of informal social control, greater potential for the development of cynical attitudes toward the criminal justice system, and the internalization of non-normative behavioral codes. By the same token, low levels of economic disadvantage—that is, greater affluence—in surrounding areas may buffer against delinquency by limiting exposure to these crime-conducive influences. This effect may be pronounced for youth whose immediate residential neighborhood is characterized by high levels of disadvantage.

From an opportunity perspective, affluence in surrounding neighborhoods may lead to greater informal control of youth behavior (Sampson, Morenoff, and Earls, 1999). For instance, neighbors may be more willing to intervene at the first sign of trouble or call police if they become suspicious of youth behavior. Low levels of disadvantage in extralocal neighborhoods may diminish the geographic space in which offending can "safely" occur. Thus, we might expect extralocal neighborhood disadvantage to decrease informal social control, providing greater opportunities for youth to engage in criminal

conduct. Under this scenario, socioeconomic disadvantage in the surrounding community, like disadvantage in the immediate neighborhood, should exert a positive effect on offending.

From a socialization standpoint, levels of disadvantage in surrounding neighborhoods may translate into differential exposure to procrime or prosocial cultural orientations. For instance, local communities often serve as catchment areas for school districts. Students from disadvantaged areas who have frequent contact with youth from other similarly disadvantaged neighborhoods may disproportionately encounter cultural models stressing non-normative behaviors, further increasing the risk of delinquency as there are fewer alternative models of behavior. Furthermore, adolescents who have frequent contact with youth from more affluent areas may be exposed to prosocial models of behavior otherwise absent in their immediate residential neighborhoods. Thus, low levels of economic disadvantage in extralocal neighborhoods may spill over into the immediate neighborhood, having a positive influence on youth behavior, even after controlling for economic conditions in a youth's residential neighborhood. From a socialization perspective, we might also expect to observe a direct, positive association between indicators of extralocal neighborhood disadvantage and offending.

Negative Effects of Extralocal Disadvantage on Offending

Whereas the preceding arguments predict a positive effect of extralocal neighborhood disadvantage on offending, there are also reasons to hypothesize an inverse association. For example, criminal opportunity theories portend countervailing effects of economic disadvantage on offending (Hannon, 2002). Although serving to reduce informal social control, neighborhood economic disadvantage may also reduce opportunities to offend by limiting the supply of worthwhile targets in a community, be they homes with valued goods to burglarize, persons with disposable income to rob, or customers with expendable cash to purchase illicit drugs. That is, whereas concentrated disadvantage in extralocal neighborhoods may translate into lower levels of informal social control, thereby increasing criminal conduct, it may alternatively reduce criminal behavior by diminishing the availability of suitable targets. Under this scenario, we would expect to observe a negative association between extralocal neighborhood disadvantage and offending.

Similarly, relative deprivation models (Jasso, 1980) posit that youth evaluate their social and economic standing in relation to those around them. Greater exposure to successful, advantaged persons in surrounding neighborhoods may induce the formation of a subculture that further devalues normatively prescribed behaviors. Perceived inequality may give rise to criminal behavior as individuals attempt either to equalize the perceived injustice (through property crime) or to act out their frustrations (through violence; Hipp, 2007b). Consistent with this theme, recent research by Odgers and colleagues (2015) has shown that low-income boys in Great Britain who grew up close to affluent peers displayed higher levels of delinquency than did low-income boys who lived in areas characterized by concentrated poverty. Graif's (2015) finding that impoverished boys who live in high-poverty areas surrounded by low-poverty neighborhoods report higher levels of delinquency than those who live in areas of concentrated economic disadvantage also supports this contention. Thus, low levels of disadvantage in extralocal neighborhoods may increase delinquent behavior as adolescents are constantly reminded of their situation relative to nearby neighborhoods in the broader community.

Combined Influence of Local and Extralocal Disadvantage

From an analytical standpoint, controlling for the level of socioeconomic disadvantage in *extralocal* neighborhoods may have implications for the observed effect of *local* neighborhood disadvantage on delinquency. To the extent that socioeconomic disadvantage in extralocal neighborhoods matters and that the effect of extralocal neighborhood disadvantage mimics the effect of local neighborhood disadvantage, controlling for extralocal neighborhood disadvantage may diminish the observed effect of local disadvantage. Because neighborhood socioeconomic status exhibits spatial autocorrelation, with neighborhoods of similar status clustering near each other, it is possible that some of the typically observed effect of local neighborhood disadvantage is attributable to the level of socioeconomic disadvantage in extralocal neighborhoods. Alternatively, if the level of socioeconomic disadvantage in extralocal neighborhoods is inversely associated with delinquency—as relative deprivation and opportunity theories seem to imply—then controlling for the extralocal neighborhood disadvantage may strengthen the positive impact of local neighborhood disadvantage on delinquency. In this case, extralocal neighborhood disadvantage suppresses the effect of local neighborhood disadvantage.

Furthermore, extralocal neighborhood disadvantage may *moderate* the association between residential neighborhood disadvantage and offending. Two contrasting scenarios are possible here. On the one hand, extralocal disadvantage may exacerbate the effect of local neighborhood disadvantage on offending. Adolescents who live in disadvantaged communities surrounded by other disadvantaged communities will have limited exposure to alternative models of behavior, amplifying the risk that they will embrace cultural scripts promoting violence. Likewise, the lack of affluence in surrounding neighborhoods means that fewer community resources might spill over into an adolescent's residential neighborhood. Therefore, poorer schools, fewer extracurricular activities, limited employment opportunities, and a diminished likelihood of upward mobility might result. And if nearby neighborhoods are rich with opportunities to offend, youth may opt to commit offenses in those neighborhoods, where detection and apprehension are unlikely, rather than in their residential neighborhoods, where the risk of apprehension is higher. High levels of affluence, and thus greater criminal opportunities, in extralocal neighborhoods may siphon offenders away from their residential neighborhoods. In contrast, when opportunities to offend in surrounding neighborhoods are limited, youth may be more apt to select targets from their immediate neighborhoods. Under this scenario, we would expect to observe a positive interaction between local and extralocal neighborhood disadvantage on offending, with the detrimental effect of local disadvantage strengthened by high levels of disadvantage in surrounding areas.

On the other hand, the social comparison processes assumed by relative deprivation theory suggest that the (positive) impact of local neighborhood disadvantage might weaken as the level of disadvantage in surrounding neighborhoods increases. We might expect the effect of local disadvantage on offending to be stronger when youths' residential neighborhoods are surrounded not by other disadvantaged neighborhoods but by more affluent communities. When conditions in their neighborhoods compare unfavorably with those in surrounding communities, youth residing in disadvantaged neighborhoods may view their social and economic opportunities to be limited, and this perception of restricted opportunities for success in normative endeavors may generate criminal or

delinquent behavior. Under this scenario, we would expect a negative interaction between local and extralocal neighborhood disadvantage on youth offending.

CURRENT STUDY

When drawing on the theoretical models outlined earlier, several possibilities emerge regarding the associations among local disadvantage, extralocal disadvantage, and self-reported offending. First, extralocal disadvantage may translate into lower levels of informal social control and into greater exposure to models of behavior favoring crime and deviance over normative behaviors. As a result, extralocal disadvantage should have a positive effect on self-reported offending (hypothesis 1a). On the other hand, disadvantage in the surrounding community may mean fewer suitable targets for youth who venture outside their communities, thus, decreasing opportunities for criminal behavior. Moreover, the relative deprivation processes suggest that extralocal neighborhood affluence will translate into higher levels of offending as adolescents act out their frustrations from observing others from more nearby, advantaged communities. From this standpoint, extralocal disadvantage should have a negative effect on youth offending (hypothesis 1b).

To the extent that the effect of socioeconomic disadvantage in surrounding neighborhoods is capturing effects typically attributed to local neighborhood disadvantage, we would expect that controlling for the extralocal neighborhood disadvantage will reduce the observed effect of local neighborhood disadvantage (hypothesis 2a). Alternatively, socioeconomic disadvantage in extralocal neighborhoods may act as a suppressor, masking the effect of local neighborhood disadvantage on self-reported offending. Thus, we may expect the effect of local neighborhood disadvantage on self-reported offending to emerge or strengthen once extralocal neighborhood disadvantage is included as a predictor in the empirical models (hypothesis 2b). Finally, we expect extralocal disadvantage to moderate the association between local disadvantage and offending by either exacerbating (hypothesis 3a) or diminishing (hypothesis 3b) this effect.

METHODS

DATA

Our main source of data for this analysis is the first two waves of the National Longitudinal Survey of Youth, 1997 (NLSY97). The NLSY97 consists of a nationally representative sample of approximately 9,000 youth who were between 12 and 16 years of age as of December 31, 1996. The first round of surveys was administered during 1997. In the first wave, both the eligible youth and one caregiver participated in an hour-long interview. Youth respondents have been interviewed on an annual basis since 1997 (with data collection ongoing). The NLSY97 has been used extensively to study a variety of crime-related topics (e.g., Apel and Kaukinen, 2008; Gasper, DeLuca, and Estacion, 2010; Sweeten, Bushway, and Paternoster, 2009). As we will discuss, by using the NLSY97 geocodes, we appended tract-level data derived from the U.S. decennial census to the NLSY97 individual records to capture the level of socioeconomic disadvantage in the respondents' immediate and geographically proximate neighborhoods.

SAMPLE SELECTION

We restrict our analytic sample to respondents with valid geocoded home addresses ($N = 8{,}809$), who participated in both survey waves (8,211), and who are not missing data on any variables included in the multivariate models (7,562). To preserve the hypothesized temporal ordering of the key variables, all covariates in the model are measured at wave 1 and the dependent variable is measured at wave 2 (1 year later). Respondents who moved out of their wave 1 census tract are excluded because it cannot be determined whether they were residing in the current or former neighborhood when they engaged in delinquent acts. These restrictions result in a total sample of 6,491 respondents or 72.6 percent of the full sample available at wave 1. As is true in most longitudinal studies of youth offending, our analytic sample differs slightly from the full sample on some of the demographic characteristics (Esbensen et al., 1999). Relative to the full sample of respondents, those included in the analytic sample were slightly younger, displayed more favorable views of their school climate, reported lower levels of peer deviance, were more likely to be non-Hispanic White (relative to any other race), and were more likely to live with both biological parents. However, we detected no significant differences in self-reported offending, local neighborhood disadvantage, or extralocal neighborhood disadvantage between the full and the analytic sample for which complete information was available. As a result, it is unlikely that any bias introduced by sample attrition and the removal of cases with missing data substantially impairs the parameter estimates from our analysis.

MEASURES

Delinquency

By following other recent work using the NLSY97 (e.g., Apel and Kauiken, 2008; Gasper, DeLuca, and Estacion, 2010), we measure self-reported delinquency as a variety score by using questionnaire items asked at the wave 2 interview. Respondents were asked whether they had engaged in each of the following delinquent activities since the wave 1 interview: 1) stolen something from a store, person, or house, or something that did not belong to you worth $50 or more including stealing a car; 2) sold or helped to sell marijuana (pot, grass), hashish (hash), or other hard drugs such as heroin, cocaine, or LSD; 3) carried a handgun; 4) attacked someone with the idea of seriously hurting him or her or have had a situation end up in a serious fight or assault of some kind; 5) purposely damaged or destroyed property; and 6) committed other property crimes such as fencing, receiving, possessing, or selling stolen property, or cheated someone by selling him or her something that was worthless or worth much less than what you said it was. The variety scale was created by summing across items and reflects the number of delinquent behaviors a respondent endorsed. Higher values are considered to reflect greater levels of self-reported delinquency.[1]

1. A limitation with variety scores is that respondents who engage in high levels of a single form of delinquency are considered less delinquent than respondents who engage in multiple forms of delinquency at low rates. As a sensitivity analysis, we reestimated our regression models by substituting an offending frequency scale for the variety score. This alternative measure was generated by summing the number of times respondents engaged in each measure of delinquency. Given a handful of unusually high counts, we trimmed the variable at the top 1 percent, thus, removing around

Neighborhood Disadvantage

We use census tracts as our approximation of neighborhoods as the census tract is the geographic aggregation that most closely approximates neighborhood boundaries and is used most frequently in studies of neighborhood effects on crime and delinquency (Sampson, 2002). Tract-level census data are drawn from the Neighborhood Change Data Base (NCDB), in which data from earlier censuses have been normalized to 2000 tract boundaries, allowing us to produce consistent measures of neighborhood disadvantage over time (GeoLytics, 2008). Our index of neighborhood disadvantage, drawn from Crowder and South (2011), combines five common indicators: 1) the percentage of families below the poverty line, 2) the percentage of households receiving public assistance, 3) the percentage of households headed by women, 4) the percentage of the population that is unemployed, and 5) the percentage of the population older than 25 years of age lacking a high-school diploma. These variables are highly intercorrelated, and all load on a single factor (alpha = .924). We combine the variables into a single scale by using a weighted factor regression score such that high scores indicate high levels of neighborhood *disadvantage*. These scales are generated with data from the 1990 and 2000 decennial censuses, and the level of neighborhood disadvantage in 1997 (the first wave of data collection) is estimated through linear interpolation.

Extralocal Neighborhood Disadvantage

To measure the level of disadvantage in extralocal neighborhoods, we construct a spatially lagged, distance-weighted index capturing the average level of socioeconomic disadvantage in all census tracts within 100 miles of each respondent's tract of residence. This variable is based on the application of spatial weights to the 1997 estimated level of disadvantage in these "extralocal" areas. The strategy used here assumes that the influence of surrounding tracts on the behavior of individuals in a focal tract is inversely related to the distance of the surrounding tract from the individual's tract of residence. Under this distance-decay strategy, we construct a row-standardized matrix of spatial weights defined as $w_{ij} = 1/d^2_{ij}$, where d^2_{ij} is the squared geographic distance between the centroid of the tract of residence (i) and the centroid of the extralocal tract, j. [The characteristics of the focal tract (w_{ij}) are not included in the calculation of extralocal disadvantage.] Although we include information on census tracts within 100 miles of each respondent's tract, as a practical matter, tracts beyond 10 miles exert little influence on this spatially lagged measure. The spatial weights are applied to the interpolated values of each of the five indicators of tract socioeconomic conditions in 1997, and these weighted components are then combined to create an indicator of extralocal neighborhood disadvantage ($\alpha = .801$).[2]

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60 respondents. The general findings from these supplemental models are consistent with the results presented in the following discussion (parameter estimates are presented in table S.1 of the online supporting information). Additional supporting information can be found in the listing for this article in the Wiley Online Library at http://onlinelibrary.wiley.com/doi/10.1111/crim.2016.54.issue-3/issuetoc.

2. As will be described in greater detail, we also construct several alternative measures of extralocal disadvantage to examine whether the effect of economic disadvantage in extralocal neighborhoods is sensitive to the specification of the spatial weighting scheme.

As noted earlier, a key advantage of this spatially lagged, distance-weighted measure of extralocal neighborhood disadvantage is that we can specify separate effects of local and extralocal neighborhood socioeconomic conditions; the spatially lagged index is treated as a separate contextual characteristic with possible additive and interactive effects on the risk of engaging in criminal behavior. For sake of clarity, we refer to the levels of disadvantage in respondents' residential neighborhoods as "local" disadvantage and to the spatially weighted measure of disadvantage in the surrounding community as "extralocal" disadvantage in the empirical models.

Control Variables

The regression models control for several individual, family, and neighborhood characteristics that might be associated with both neighborhood socioeconomic status and delinquency. Respondent's age is measured in years at the time of the wave 1 interview. The variable *race* differentiates respondents who self-identified as non-Hispanic Black, non-Hispanic White, Hispanic, and non-Hispanic other race. Gender is scored 1 for males and 0 for females. As neighborhood processes in urban areas often differ from neighborhood processes in rural areas, the empirical models control for whether the respondent resided within a metropolitan statistical area (MSA = 1). Finally, given the association between residential mobility and both neighborhood selection and offending (Haynie and South, 2005), the models control for the number of residential moves a respondent experienced between his or her 12th birthday and the wave 1 interview.

Family-level controls include indicators of socioeconomic status and family structure. Family socioeconomic status is captured through three measures: 1) home ownership, 2) family receipt of public assistance, and 3) parent's educational status. Home ownership is measured as a dichotomous variable, differentiating respondents who reside with families in which the parents own the residence from respondents who reside with families in which the parents rent the home. Receipt of public assistance is measured as a dichotomous variable indicating whether any member of the respondent's family received food stamps, supplemental security income, or aid to families with dependent children in the 12 months prior to the wave 1 interview. Parents' education is measured as the highest level of education completed by a parental figure in a respondent's home. Family structure differentiates respondents who lived with both biological parents from respondents who lived in single-parent households, step-families, and other family arrangements (e.g., foster families).

The models also include measures of racial heterogeneity and population turnover measured at the tract level. Racial heterogeneity is computed as an index of diversity, measured as one minus the sum of the squared proportion of the population in each racial/ethnic group. The measure is bound between zero and one, with values approaching one indicating a greater degree of heterogeneity. Population turnover is measured as the proportion of the tract population that lived in a different tract 5 years prior to the enumeration of the decennial census.

Individual Risk Factors

In the final stage of the analyses, we examine whether individual risk factors help explain the effects of local and extralocal neighborhood disadvantage on offending. These risk factors include indicators of school climate, exposure to deviant peers, victimization

experiences, and the quality of the respondent's relationship with his or her family. During the wave 1 interview, respondents were asked how strongly they agreed with a series of statements regarding their school. A measure of school climate was generated by averaging the scores to the following items: 1) Teachers are good, 2) teachers are interested in students, 3) students are graded fairly, 4) discipline is fair, and 5) I feel safe at this school. The items coalesce into one factor, and the resulting scale has a moderate degree of reliability ($\alpha = .71$). Higher values reflect a negative opinion of school climate and are expected to be associated with higher levels of delinquency. Exposure to peer deviance is measured as the respondent's perception of the percentage of his or her classmates who engaged in the following behaviors: 1) smoke, 2) get drunk at least once a month, 3) have ever used drugs, and 4) have skipped school. Responses ranged from almost none to almost all. A measure of exposure to peer deviance was generated by averaging across these four items ($\alpha = .83$), and higher values indicate a higher level of exposure to deviant peers. Victimization experience is measured by whether the respondent reports having been threatened with violence in school during the 12 months preceding the wave 1 interview (yes = 1).

The quality of the parent–child relationship was measured on two domains—perceived support and parental involvement. Respondents were asked to rank on a three-point scale how supportive each of their parents was in general. For respondents living in two-parent homes, we generate a composite measure by averaging the level of perceived support from both parents. For respondents living with a single parent, we use the level of perceived support of the primary residential caregiver. This measure is coded such that higher values indicate a greater degree of parental support. Parental involvement is measured by whether the respondent's parent(s) participated in school activities or served in a parent–teacher organization in the 12 months prior to the wave 1 interview (yes = 1). We expect that children of supportive and involved parents offend at lower levels than do children of unsupportive, disengaged parents and that these family processes may partially mediate the effects of neighborhood disadvantage on youth offending.

ANALYTIC STRATEGY

The empirical analysis unfolds through a series of survey-adjusted negative binomial regression models. All empirical models are adjusted for the complex survey design of the NLSY97 survey by using the SVY suite of commands in Stata 13 (StataCorp, College Station, TX).[3] The first model establishes the effect of the individual and family control variables on self-reported delinquency. The second model incorporates the local neighborhood measures of economic disadvantage, racial heterogeneity, and population turnover. The third model introduces the measure of extralocal neighborhood disadvantage. The fourth model adds the product term between local and extralocal disadvantage. The fifth model incorporates the endogenous risk factors. The metric for the coefficients

3. The clustering of respondents within census tracts is modest. More than 60 percent of respondents in the analytic sample lived in census tracts with fewer than five other NLSY97 respondents, and roughly 90 percent lived in census tracts with fewer than 10 other respondents. To examine the implications of this clustering for significance tests, we reestimated the models specifying the tract, rather than the primary sampling unit (PSU), in the survey adjustment commands. The substantive results were nearly identical to those reported in the subsequent discussion. (Full models are available in table S.2 of the online supporting information.)

Table 1. Sample Descriptive Statistics: Means, Standard Deviations, and Ranges ($N = 6,491$)[a]

Variables	Mean	SD	Min	Max
Dependent Variable				
Delinquency	.407	(.832)	.00	6.00
Demographic Characteristics				
Male	.510	—	.00	1.00
Age	14.299	(1.483)	12.00	18.00
Non-Hispanic Black	.262	—	.00	1.00
Non-Hispanic White	.522	—	.00	1.00
Hispanic	.185	—	.00	1.00
Non-Hispanic other race	.031	—	.00	1.00
Mobility history	.522	(1.059)	.00	20.00
Neighborhood in MSA	.804	—	.00	1.00
Family Environment				
Family receipt of welfare	.214	—	.00	1.00
Live with both biological parents	.510	—	.00	1.00
Live with step-parents	.136	—	.00	1.00
Live with single parent	.313	—	.00	1.00
Live with other family arrangement	.038	—	.00	1.00
Family owns home	.626	—	.00	1.00
Parent education	13.393	(2.935)	1.00	20.00
Neighborhood Characteristics				
Neighborhood turnover	56.341	(11.079)	4.27	85.00
Neighborhood heterogeneity	.303	(.199)	.00	.75
Local disadvantage	−.055	(1.911)	−3.29	8.82
Extralocal disadvantage	−.034	(1.895)	−4.34	7.51
Individual Risk Factors				
School climate	1.975	(.483)	1.00	4.00
Peer delinquency	1.875	(.847)	.80	4.00
Victimization	.208	—	.00	1.00
Parental involvement	.791	—	.00	1.00
Parental support	1.708	(.448)	.00	2.00

ABBREVIATIONS: Max = maximum; Min = minimum; MSA = metropolitan statistical area; SD = standard deviation.

[a]Means for dummies variables can be interpreted as the proportion of the sample coded 1 on that indicator.

Source: Data derived from the National Longitudinal Survey of Youth, 1997; 1990 Decennial Census; and the 2000 Decennial Census.

presented in the multivariate models are log-odds. An exponential transformation of the log-odds yields the incident-rate ratio, which can be interpreted as the percent change in the expected count of unique self-reported delinquent activities given a one-unit increase in the predictor variable.

RESULTS

Table 1 presents descriptive statistics for all variables included in the analysis. The average number of offense types committed by this sample of youth is .407 [standard deviation (SD) = .832]. Slightly more than 27 percent of respondents committed at least one of the six delinquent acts (statistic not shown). Overall, 51 percent of respondents are male, the average age of respondents at the wave 1 interview is 14.3 years, and 52 percent identified as non-Hispanic White. Approximately 80 percent of respondents reside within a metropolitan statistical area, and prior mobility experiences range between 0 and

20 times (mean = .52). In terms of family background, 21 percent live in families who received some form of public assistance, 51 percent live with both biological parents, 63 percent live in homes owned by their parents, and the average educational status of parents is 13.39 years of schooling. In terms of individual risk factors, the average perception of school climate is 1.975 on a four-point scale, most respondents report exposure to some delinquent peers (mean = 1.875), 20.8 percent of respondents report being victimized at school in the previous year, the average level of parental involvement is 0.791, and the average level of parental support is 1.708.

Table 2 presents the results of the negative binomial regression analysis. The first model presents the baseline effect of the control variables on self-reported offending. The expected rate of self-reported delinquency for males is almost twice the expected rate for females ($100 \times [e^{.686}] - 1$). The expected rate of self-reported delinquency is 27.2 percent lower among non-Hispanic Blacks relative to non-Hispanic Whites. Each additional residential move a respondent experienced between age 12 and the wave 1 interview is associated with a 33.6 percent increase in the expected rate of self-reported delinquency. Relative to respondents living with both biological parents, those who live with a step-family have expected rates of offending 32.7 percent higher, whereas those living in single-parent households have expected rates of offending 53.9 percent higher.

Model 2 introduces the measures of local neighborhood characteristics to the baseline model. We detect no significant effect of neighborhood turnover, racial heterogeneity, or socioeconomic disadvantage in this model.

Model 3 of table 2 introduces the measure of extralocal disadvantage. Consistent with hypothesis 1b—but disconfirming hypothesis 1a—the coefficient for extralocal neighborhood socioeconomic disadvantage is negative and statistically significant. Net of their own sociodemographic characteristics and the level of socioeconomic disadvantage in their neighborhoods, youth are less likely to offend when their neighborhood is surrounded by disadvantaged neighborhoods; hence, they are more likely to offend when their neighborhood is surrounded by comparatively affluent neighborhoods. This effect is consistent with the hypothesis derived from relative deprivation and criminal opportunity theories and with recent research on the influence of extended neighborhood disadvantage on offending using non-nationally representative samples of youth and different analytical strategies (e.g., Graif, 2015)

Moreover, consistent with hypothesis 2b, but disconfirming hypothesis 2a, the positive effect of local disadvantage on self-reported delinquency grows substantially larger and now achieves statistical significance once extralocal neighborhood disadvantaged is controlled. Thus, the negative effect of extralocal neighborhood disadvantage, which is often ignored in studies of neighborhood socioeconomic status on crime and delinquency, suppresses a positive effect of local neighborhood disadvantage. A 1 standard deviation increase in local neighborhood disadvantage is associated with a 9.6 percent ($100 \times [e^{.048 \times 1.91}] - 1$) *increase* in the expected rate of self-reported delinquency, whereas a 1 standard deviation increase in extralocal disadvantage is associated with a 13.3 percent ($100 \times [e^{-.075 \times 1.90}] - 1$) *decrease* in the expected rate of self-reported delinquency. It is important to note that although the correlation between local and extralocal disadvantage is not positive and strong ($r = .68$), it is not so high as to prohibit estimating separately the effects of local and extralocal neighborhood disadvantage on delinquency. The standard error for the coefficient for local neighborhood disadvantage changes only slightly when

Table 2. Negative Binomial Regression of Self-Reported Delinquency on Measures of Local and Extralocal Neighborhood Disadvantage ($N = 6,491$)

	Model 1		Model 2		Model 3		Model 4		Model 5	
Variables	**β**	**SE**	**β**	**SE**	**β**	**SE**	**β**	**SE**	**β**	**SE**
Intercept	−.959**	(.337)	−1.048**	(.383)	−1.260**	(.377)	−1.256**	(.377)	−1.836**	(.422)
Demographic Characteristics										
Male	.686***	(.055)	.686***	(.055)	.690***	(.055)	.690***	(.055)	.818***	(.055)
Age	−.025	(.020)	−.025	(.020)	−.023	(.020)	−.023	(.020)	−.117	(.020)
Non-Hispanic Black	−.317**	(.085)	−.351**	(.100)	−.313**	(.101)	−.313**	(.101)	−.304**	(.098)
Hispanic	−.043	(.094)	−.080	(.099)	−.049	(.103)	−.049	(.103)	.031	(.092)
Non-Hispanic other race	−.156	(.117)	−.189	(.119)	−.207†	(.121)	−.207†	(.121)	−.194†	(.110)
Mobility history	.291***	(.076)	.292***	(.075)	.293***	(.074)	.293***	(.074)	.226***	(.070)
Neighborhood in MSA	.021	(.023)	.021	(.023)	.021	(.023)	.021	(.023)	.021	(.023)
Family Environment										
Family receipt of welfare	.142	(.085)	.141	(.083)	.145†	(.083)	.145†	(.083)	.128†	(.085)
Live with step-parents	.283**	(.086)	.284**	(.087)	.284***	(.087)	.284***	(.087)	.123	(.082)
Live with single parent	.431***	(.066)	.428***	(.066)	.423***	(.066)	.423***	(.066)	.309***	(.068)
Other family arrangement	.134	(.201)	.137	(.201)	.122	(.200)	.122	(.200)	−.008	(.181)
Family owns home	−.105	(.071)	−.097	(.070)	−.096	(.070)	−.096	(.070)	−.053	(.065)
Parent education	−.005	(.012)	−.006	(.013)	−.006	(.013)	−.006	(.013)	.004	(.014)
Neighborhood Characteristics										
Neighborhood turnover	—	—	.000	(.003)	.003	(.003)	.003	(.003)	.003	(.003)
Neighborhood heterogeneity	—	—	.243	(.146)	.250†	(.142)	.250†	(.142)	.155	(.150)
Local disadvantage	—	—	.004	(.020)	.048*	(.020)	.045*	(.022)	.029	(.023)
Extralocal disadvantage	—	—	—	—	−.075***	(.018)	−.074***	(.018)	−.075***	(.018)
Local × Extralocal disadvantage	—	—	—	—	—	—	.002	(.009)	—	—
Individual Risk Factors										
School climate	—	—	—	—	—	—	—	—	.288***	(.054)
Peer delinquency	—	—	—	—	—	—	—	—	.288***	(.026)
Victimization	—	—	—	—	—	—	—	—	.386***	(.058)
Parental involvement	—	—	—	—	—	—	—	—	.002	(.043)
Parental support	—	—	—	—	—	—	—	—	−.404***	(.058)
Log Likelihood	−7,258.04		−7,259.33		−7,233.66		−7,232.91		−6,644.12	
χ^2 (df)	—		−1.29 (3)		51.34 (1)		1.53 (1)		1,177.58 (5)	

ABBREVIATIONS: df = degrees of freedom; MSA = metropolitan statistical area; SE = standard error.
†$p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$.
Source: Data derived from the National Longitudinal Survey of Youth, 1997; 1990 Decennial Census; and the 2000 Decennial Census.

extralocal disadvantage is added to the model (from model 2 to model 3), which also suggests that collinearity is not impairing the parameter estimates.

Model 4 introduces the product term testing for an interaction between local neighborhood disadvantage and extralocal neighborhood disadvantage. The coefficient for this product term is nonsignificant, indicating that extralocal disadvantage does not moderate the association between local neighborhood disadvantage and self-reported offending. This finding fails to support either hypothesis 3a or hypothesis 3b.

Model 5 introduces the individual-level risk factors. As might be expected, respondent perceptions of poor school climate, prior victimization experiences, and exposure to peer deviance are all positively and significantly associated with self-reported offending, whereas parental support is inversely associated with offending. A one-unit increase in the indicator of poor school climate is associated with a 33.4 percent increase in the expected rate of offending. A one-unit increase in exposure to peer deviance is associated with a 33.4 percent increase in the expected rate of self-reported offending. Respondents who report being victimized in school have an expected rate of offending 47.1 percent higher than respondents who reported that they have not been victimized. A one-unit increase in parental support is associated with a 33.2 percent decrease in the expected rate of offending. The inclusion of the endogenous risk factors substantially reduces the strength of the association between local neighborhood disadvantage and self-reported offending and drives this coefficient to statistical nonsignificance. Importantly, however, the inclusion of these factors has little discernible effect on the association between extralocal disadvantage and offending, which remains negative and statistically significant.

SUPPLEMENTAL MODELS

In addition to the models described earlier, we also estimate a series of supplementary regression models to examine whether the estimation of the extralocal effect is sensitive to the specification of the spatial weighting scheme. To assess this, we reestimate the regression models with five alternative lag structures—the inverse distance between tract centroids, the inverse of the logged distance between centroids, a constant weight for all tracts within the metropolitan area, a queen's matrix, and a weighting scheme based on the size of the extralocal tract population over the distance between centroids. The queen's matrix and the two alternative decay functions provide a means to determine how the geographic distance between local and surrounding tracts influences the effect of extralocal disadvantage on offending. For instance, the queen's matrix only considers census tracts immediately contiguous to a respondent's residential tract but not residentially proximate, noncontiguous tracts. In this sense, a queen's matrix imposes the narrowest measure of distance-based influence. The inverse distance lag and inverse of the logged distance also treat contiguous tracts as most influential, but they incorporate the effects of increasingly distal census tracts, in this case, those roughly 25 and 75 miles away, respectively. The MSA constant lag provides some leverage to determine whether we are capturing an urban-wide effect or a true extralocal neighborhood effect.

The results of these models are presented in table 3. The panels correspond to the regression models where each alternative lag was substituted for the inverse distance-squared lag. The models control for all covariate variables presented in table 2, but these coefficients have been suppressed for the sake of parsimony. To summarize the results briefly, the model in which extralocal disadvantage was estimated with a queen's matrix

Table 3. Negative Binomial Regression of Self-Reported Offending Regressed on Alternative Measures of Extralocal Neighborhood Disadvantage ($N = 6,491$)

	Inverse Distance		Inverse Log Distance		Queen's Matrix		Population / Distance		MSA Constant Lag	
Variables	β	**SE**	β	**SE**	β	**SE**	β	**SE**	β	**SE**
Intercept	−1.127**	(.383)	−1.175**	(.382)	−.903**	(.386)	−1.123**	(.382)	−.954**	(.345)
Neighborhood Characteristics										
Neighborhood turnover	.001	(.002)	.002	(.003)	−.001	(.002)	.001	(.002)	.001	(.002)
Neighborhood heterogeneity	.229	(.141)	.256	(.145)	.135	(.156)	.248	(.143)	.105	(.151)
Local disadvantage	.045	(.027)	.018	(.020)	.002	(.002)	.041	(.025)	.016	(.016)
Extralocal disadvantage	−.054*	(.026)	−.048*	(.014)	.015	(.022)	−.048	(.027)	.027	(.015)

NOTE: Models control for demographic characteristics and family environment variables.
ABBREVIATIONS: MSA = metropolitan statistical area; SE = standard error.
*$p < .05$; **$p < .01$.
Source: Data derived from the National Longitudinal Survey of Youth, 1997; 1990 Decennial Census; and the 2000 Decennial Census.

provides no evidence of an extralocal effect or suppression of the local neighborhood effect. The measures using inverse distance weights and inverse logged distance weights provide evidence of a negative effect of extralocal disadvantage but no evidence of suppression. Neither the population over distance lag nor the constant lag within the MSA generates evidence of an extralocal effect of neighborhood disadvantage on delinquency.

DISCUSSION

This study examines spatial dimensions of the effect of neighborhood disadvantage on adolescent offending. We move beyond existing research on neighborhood effects by considering whether and how the level of socioeconomic disadvantage in neighborhoods outside of but nearby youths' residential neighborhoods influence self-reported delinquency and whether such "extralocal" neighborhood disadvantage alters or conditions the observed effect of local neighborhood disadvantage on offending. Although such spatial effects are frequently incorporated into ecological studies of aggregate crime rates, they are rarely considered in models of individual offending. The analyses are motivated by the observation that most prior research examining neighborhood effects on individual outcomes has implicitly assumed that offending is influenced solely by the neighborhoods in which adolescents reside, rather than by where they might spend time and where they might offend. Our approach is consistent with a broader, emerging view suggesting that officially defined neighborhoods may capture only roughly salient environmental influences on youth behavior (Browning and Soller, 2014; Graif, 2015). By drawing from situational opportunity, socialization, and relative deprivation perspectives, we argue that characteristics of neighborhoods that are outside of, but geographically proximate to, youths' neighborhoods should also contribute to adolescent offending.

Several important findings emerge from our empirical models. Consistent with one of our hypotheses, we find evidence that, net of the effect of local neighborhood disadvantage and other controls, the level of socioeconomic disadvantage in extralocal neighborhoods is negatively associated with self-reported offending. The size of this effect rivals

that of local neighborhood disadvantage. This finding is consistent with recent work by Graif (2015) and by Odgers et al. (2015), indicating that residential proximity to relative affluence, rather than proximity to socioeconomic disadvantage, increases criminal offending. From a relative deprivation perspective, this finding may indicate that affluence in surrounding communities contributes to feelings of frustration as youths compare their life circumstances with individuals living in nearby neighborhoods. These perceptions of deprivation may increase the likelihood of criminal behavior as adolescents either 1) attempt to alleviate the perceived inequality or 2) act out their frustrations. Such frustrations could be targeted at the source of comparison—relatively affluent neighborhoods in the surrounding community—or they could be redirected to targets in youths' neighborhoods. Alternatively, by drawing from routine activities theory (Cohen and Felson, 1979), the positive association between extralocal disadvantage and offending may indicate that relative affluence in surrounding communities translates into an abundance of valuable targets.

Consistent with another hypothesis, the empirical models reveal evidence of a suppression effect such that the level of economic disadvantage in the local neighborhood emerges as a significant predictor of offending only after controlling for indicators of extralocal disadvantage. As noted earlier, studies of neighborhood effects on individual outcomes typically have revealed much weaker associations than have studies examining neighborhood effects on aggregate crime rates (Kubrin and Weitzer, 2003). The suppression effect reported here may in part explain the weak and/or nonsignificant effect of neighborhood socioeconomic status on offending occasionally reported in prior work in this area (e.g., Lynam et al., 2000; Zimmerman and Messner, 2011). Our results suggest that empirical studies that fail to account for extralocal neighborhood characteristics, or that inadvertently combine the effects of extralocal neighborhood socioeconomic status with those of local neighborhood socioeconomic status, will generate downwardly biased estimates of the effect of residential neighborhood disadvantage on delinquency. However, contrary to a third hypothesis, we find no evidence of a moderating effect of extralocal disadvantage on the association between local disadvantage and self-reported offending, which suggests that although extralocal neighborhood processes matter, the influence of immediate neighborhood processes on offending are not contingent on broader community influences.

The results in table 3 underscore the importance of distance between focal and proximate neighborhoods in shaping the effect of extralocal influences on crime causation. For instance, our models reveal that the level of disadvantage in adjacent neighborhoods has little influence on self-reported behavior among respondents in our sample. This finding diverges somewhat from recent research by Graif (2015), who found that the level of disadvantage in contiguous neighborhoods is inversely associated with self-reported offending among low-income youth. This difference between our result and that of Graif (2015) might indicate that the activity spaces of low-income youth are constrained to more proximate neighborhoods, whereas the activity spaces of the general population of youth encompass a larger geographic area.

The effect of the inverse distance-squared measure suggests that levels of disadvantage in geographically proximate, albeit not necessarily adjacent, neighborhoods exert a negative effect on offending and suppress the effect of local disadvantage. The lags using the inverse distance and inverse logged distance allow us to consider the influence of increasingly distant neighborhoods on offending. These models both reveal a negative extralocal

effect but fail to provide evidence of suppression. It seems that the most relevant "extralocal" neighborhood influences do not necessarily occur in the immediate area outside of where respondents live but within the small geographic span that adolescents encounter on a regular basis. As we allow the influence of more distal tracts to increase, we see the suppression effect disappear and the extralocal effects weaken. The use of distance-decay lags, although commonplace in the ecological study of neighborhood crime rates, remains rare in studies of neighborhood effects on youth offending. The results presented here suggest that the use of lags encompassing more distal neighborhoods allows us to capture significant effects of extralocal areas that would otherwise be missed.

The inclusion of the individual risk factors in the empirical models attenuates the effect of local neighborhood disadvantage on offending. This may suggest that the effect of residential neighborhood disadvantage on offending operates through factors like family support, peer deviance, and school climate. The inclusion of these risk factors has no discernible influence on the observed association between extralocal disadvantage and offending. This finding is noteworthy because it suggests that the influence of broader community characteristics on offending is largely independent of family factors, exposure to delinquent peers, victimization experiences, and perceptions of school climate. Consequently, the mechanisms linking extralocal disadvantage to offending warrant careful consideration in future research.

Although this study advances our understanding of neighborhood effects on offending, we acknowledge several limitations to our analysis. Some—but not all—of the theoretical arguments linking extralocal neighborhood characteristics to offending assume that youth are engaging in criminal conduct in areas closest to their residential neighborhoods and that the risk of offending decreases the farther an adolescent moves away from his or her home. Although this is assumption is supported in the empirical literature (e.g., Bernasco, 2010; Bernasco et al., 2013; Brantingham and Brantingham, 1984; Reid et al., 2014; Rengert, Piquero, and Jones, 1999), the data available in the NLSY97 preclude a direct assessment of the locations where offending occurs. This data limitation is problematic as the situational opportunity explanation of the negative effect of extralocal disadvantage assumes that behaviors are occurring nearby. On a related note, the effect of extralocal neighborhood disadvantage on self-reported offending is sensitive to the specification of the spatial weighting scheme. Although we interpret the differences in findings across lag structures to underscore the importance of distance between local and extralocal neighborhoods for adolescent offending, it is imperative that future researchers examine whether a similar spatial patterning of extralocal influence emerges in other data sets.

Although we were better able to account for spatial processes than earlier studies in this area, our empirical models still rely on survey data linked to home addresses. Future research would be well served to improve on linking urban geographies with situational causes of delinquency, in essence, blending the neighborhood effects literature with Osgood's individual routine activities theory. Situational theories of offending indicate that time spent with peers engaged in unstructured activities in public spaces provide the key ingredients for offending. As such, future research might consider 1) how these spaces are geographically distributed and 2) whether residential proximity to such "risky" environments contributes to offending. Any effort to link individuals with their broader social ecologies will require more detailed information on where crimes occur. For example, survey-based research should probe not only for whether respondents have engaged in criminal behavior within a given time frame but also for where the behaviors took place.

Likewise, the utilization of space–time budget (or diary) methodologies that prompt respondents to report where they were and what they were doing at a given time of day may help to achieve this goal (Hoeben et al., 2014).

Despite these limitations, our findings strongly suggest that indicators of economic disadvantage in extralocal neighborhoods exert a strong, negative effect on self-reported offending. Thus, it seems that residential proximity to relative affluence, rather than to relative disadvantage, is more consequential for problematic adolescent behaviors. Furthermore, the countervailing effects of local and extralocal disadvantage suggest that studies failing to account for broader community characteristics may generate downwardly biased estimates of residential neighborhood characteristics on offending. Finally, the effect of local neighborhood disadvantage was sharply attenuated when indicators of individual risk factors were included in the models. These factors had little influence on the association between extralocal disadvantage and offending, which suggests that the more proximate mechanisms of crime causation in extralocal neighborhoods differ from those in the immediate residential environment. Insofar as research in this area will continue to rely on survey data linked to residential home addresses, we encourage researchers to consider carefully the role of broader community factors, in addition to residential neighborhood characteristics, when developing and empirically assessing theoretical models of neighborhood effects on adolescent behavior.

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SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article at the publisher's web site:

Table S.1. Negative Binomial Regression of Self-Reported Offending Frequency Scale Regressed on Local and Extralocal Neighborhood Disadvantage
Table S.2. Negative Binomial Regression of Self-Reported Delinquency on Measures of Local and Extralocal Neighborhood Disadvantage, Adjusting for Clustering on Tract ID