

Neighborhood Characteristics, Peer Networks, and Adolescent Violence

Dana L. Haynie · Eric Silver · Brent Teasdale

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Abstract Although ecological researchers consistently find high rates of crime and violence within socioeconomically disadvantaged neighborhoods, there is little consensus as to why this pattern exists. To address this question, we use data from the National Longitudinal Study of Adolescent Health ($n = 12,747$) to examine three related research questions. Are neighborhood characteristics associated with adolescent violence net of compositional and selection effects? Are neighborhood characteristics associated with adolescents' exposure to violent and prosocial peers? Does peer exposure mediate the neighborhood characteristics–violence association? Results indicate that across a wide range of neighborhoods, socioeconomic disadvantage is positively related to adolescent violence net of compositional and selection effects. Additionally, neighborhood disadvantage is associated with exposure to violent peers, and peer exposure mediates part of the neighborhood disadvantage–violence association. Joining structural and cultural explanations for violence, our findings suggest that neighborhood disadvantage influences adolescent

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D. L. Haynie (✉)
Department of Sociology, The Ohio State University, 300 Bricker Hall, 190 N. Oval Mall, Columbus,
OH 43210, USA
e-mail: haynie.7@osu.edu

E. Silver
The Pennsylvania State University, University Park, PA 16802, USA

B. Teasdale
University of Akron, Akron, OH 44325, USA

violence indirectly by increasing opportunities for youth to become involved in violent peer networks.

Keywords Neighborhood characteristics · Peer networks · Adolescent violence

Introduction

For almost a century, sociologists have been working to understand the causes and correlates of adolescence violence. In recent years this effort has gained considerable momentum in the U.S. due to the accumulation of empirical evidence indicating that youth commit a significant portion of all violent crime (Snyder 2000) and experience higher rates of criminal victimization than any other age group (Bureau of Justice Statistics 2001). Moreover, arrest, victimization and self-report data consistently show that violence is not randomly distributed in geographical space, but rather is concentrated in neighborhoods that have particular structural attributes, such as concentrated disadvantage and residential instability (Markowitz 2003). Therefore, it is not surprising that recent efforts to understand the causes of adolescent violence increasingly include the neighborhood as a key contextual variable (Sampson et al. 2002).

Despite the growing number of studies documenting neighborhood effects on violence, researchers have yet to pinpoint the mechanisms through which neighborhood effects occur. To fill this gap, we examine a much discussed but relatively understudied mechanism hypothesized to link neighborhood structure to adolescent violence: involvement in peer networks. Drawing on Wilson's (1987) seminal work linking concentrated levels of urban disadvantage to numerous social ills, the current study tests the idea that violence is more likely to occur among adolescents living in socioeconomically disadvantaged neighborhoods because it is in such neighborhoods that adolescents are most likely to become involved in violent peer networks.

Explaining neighborhood effects in terms of peer influence necessitates the joining of structural and cultural explanations of violence (Groves and Lynch 1990; Warner 2003). Specifically, we posit that structural characteristics of neighborhoods affect youth violence indirectly by facilitating the cultural transmission of attitudes and behaviors conducive to the use of violence among members of adolescent peer networks. Although ecological researchers have long acknowledged the importance of structural and cultural explanations for understanding youth violence, no prior studies have adequately examined the mediating role of peer networks in the association between neighborhood characteristics and adolescent involvement in violence across a wide range of neighborhoods.

Neighborhood structure, peer influence and adolescent violence

Since the early 20th century, criminologists have recognized that adolescent violence is a function of multiple social contexts, including the neighborhood, family, and peer group (Aber et al. 1997; Bellair 1997, 2000; Bursik 1988; Bursik and Grasmick 1993; LeBlanc 1997; Osgood and Anderson 2004; Reiss 1986; Sampson 1997a, b; Sampson and Groves 1989; Sampson and Lauritsen 1994; Shaw and McKay 1942; Tonry et al. 1991). Indeed, an

emphasis on multiple social contexts was clearly present in the pioneering work of Shaw and McKay (1942) in which it was hypothesized that neighborhood structural characteristics (i.e., poverty, ethnic heterogeneity, and residential instability) disrupted neighborhood and family-level social controls, which in turn, increased the risk of violence and delinquency among adolescents and their peers (Kornhauser 1978).

Despite recognition that multiple contexts influence adolescent behavior, researchers have had a difficult time identifying the specific mechanisms through which neighborhood effects occur. This has led some to suggest that neighborhood effects are artifactual, reflecting either individual-level compositional effects or self-selection by parents into particular neighborhoods (see Dietz 2002; Duncan and Aber 1997 for a discussion of this point). Therefore, a challenge for ecological researchers has been to show that neighborhood structure affects adolescent behaviors net of compositional and selection factors, and to demonstrate that such effects operate through measurable mediating processes.

Recognizing this challenge, researchers working in the ecological tradition have extended Shaw and McKay's (1942) social disorganization model by proposing specific social processes that may intervene between neighborhood structure and adolescent violence. In particular, the role of social networks within neighborhoods has been emphasized as a key intervening mechanism. Drawing on Kasarda and Janowitz's (1974) systemic model of neighborhood organization, this elaboration of social disorganization theory conceptualizes neighborhoods as complex systems of friendship and kinship networks and associational ties rooted in families and ongoing socialization processes (Bellair 1997, 2000; Bursik 1988; Bursik and Grasmick 1993; Sampson and Groves 1989). According to this model, residents living in neighborhoods with large and active social networks are better able to generate social trust and enforce shared community values including the desire to live in a crime-free neighborhood (Sampson et al. 1997). As a result, residents have an easier time supervising youth within the neighborhood, socializing them towards conventional values, and preventing them from becoming involved with delinquent peers (Elliott et al. 1996; Sampson et al. 1997; Sampson and Groves 1989; Wilson 1987, 1996).

More recently, research by Pattillo-McCoy (1999) suggests that a generic focus on the prevalence and density of social networks as the key to understanding neighborhood variation in crime may be misleading (see also, Bellair 1997). This is because in certain contexts densely organized neighborhood networks facilitate crime by fostering social ties between conventional and criminally inclined residents (also see Pattillo 1998; Wilson 1987). Thus, the mere presence of dense neighborhood networks does not prevent crime. Instead, it is the cultural content of those networks expressed in terms of the behaviors and attitudes of those involved that constitutes an important ecological force in the production of crime. This suggests that to understand youth violence it is necessary to look beyond the capacity of local adult networks to exert social control over youth to the behavioral influences that occur within peer networks (Akers 1977; Anderson 1990, 1999).

Thus far, however, no prior studies have tested whether exposure to behavior in peer networks accounts for the link between neighborhood structure and adolescent violence. A significant barrier to such tests has been the compartmentalization of ecological theories into those that deal exclusively with structure (i.e., poverty, mobility, ethnic composition) and those that deal with culture (i.e., norms, values, beliefs) (Groves and Lynch 1990; Kornhauser 1978). This divide was articulated most strongly by Kornhauser (1978). She argued that the logic of the structural approach, with its emphasis on macro-level causal forces that operate independent of human agency, contradicts the core assumption of the cultural approach that human subjective interpretations exert substantial influence over behavior independent of the structural context. Most of the ecological studies that followed

Kornhauser's (1978) forceful explication focused on *either* structural *or* cultural explanations for violence.¹

We see this as an unproductive distinction and argue instead that a full understanding of the ecological forces that affect adolescent violence requires that attention be paid to both structural and cultural factors (Shaw and McKay 1942; Groves and Lynch 1990; Warner 2003). In our view, neighborhood structural characteristics are important because they affect the ability of neighborhood residents to collectively establish informal social control in the neighborhood by monitoring and supervising adolescent peer groups. When local social controls are weak, youth have greater opportunities to engage in violence and to become involved with violent peers in whose presence violence is experienced as highly rewarding (Anderson 1999). This perspective gives a cultural interpretation to the adolescent peer group and is consistent with Empey's (1982) view of friendship networks as serving as a "vehicle for perpetuating delinquent traditions" (p. 192). Thus, exposure to a violent youth culture is likely to contribute to the higher rates of adolescent violence typically found in socioeconomically disadvantaged neighborhoods (Akers 1998; Sutherland 1947; also see Hoffman 2003).

In contrast, adolescents residing in neighborhoods with a high degree of informal social control are likely to experience greater supervision over their behavior, thus reducing opportunities for delinquent peer groups to form and attract new participants (Osgood and Anderson 2004). Youth residing in these more advantaged neighborhoods are more likely to form friendships with conventional peers and to orient themselves toward conventional behavior such as academic achievement (Hirschi 1969; Liska and Reed 1985).

Our attempt to join structural and cultural elements into an explanation for youth violence is part of a revitalization of interest in cultural explanations that is occurring in the ecological literature on violence (Anderson 1999; Bernard 1990; Cao et al. 1997; Harer and Steffensmeier 1996; Heimer 1997; Kennedy and Forde 1996; Lukenbill and Doyle 1989; Markowitz 2001, 2003; Markowitz and Felson 1998; Sampson and Wilson 1995; Warner 1999; Warner and Rountree 1997, 2000). For example, Wilson (1996) suggests that structural changes in inner-city neighborhoods have resulted in the social isolation of poor minority youth from middle-class values and role models, and instead increased youths' exposure to unconventional role models and values.² Similarly, Anderson (1999) argues that due to structural changes in neighborhoods resulting in decreased employment opportunities and increased disadvantage, "the trust and perceptions of decency that once prevailed in the community are increasingly absent" (p. 145), and in their place a "code of the streets" has developed, which emphasizes toughness, risk-taking, and the use of violence to achieve status. As Anderson points out "violent solutions to problems in disadvantaged [neighborhoods are an] essential part of the local subculture, a means of defending one's honor and winning respect from residents. These cultural codes legitimate aggressive responses toward individuals who show disrespect, a rationale allowing those who are inclined to aggression to precipitate violent encounters in an approved way" (p. 33) (see also, Fagan and Wilkinson 1998). These arguments are consistent with

¹ Despite Shaw and McKay's (1969) formulation of social disorganization theory as including both structural and cultural aspects, research in this tradition has largely neglected the role of cultural influences (Warner 2003). Warner (2003) attributes this to the lack of theoretical clarity in Shaw and McKay's discussion of culture as well as the conflicting theoretical assumptions of cultural deviance and social control models pointed out by Kornhauser (1978; see also Bursik 1988, 1993).

² Other research on rural areas suggests that socio-economic disadvantage also has detrimental effects on youth living in non-metropolitan areas (for example, see Simons et al. 1996; Osgood and Chambers 2000).

Sampson and Wilson's (1995) contention that concentrated disadvantage diminishes opportunities for conventional values to take hold by inhibiting informal social controls and thereby increasing the opportunity for a culture of violence to operate.³

During adolescence, peers begin to occupy a central role in transmitting and modeling deviant and prosocial behaviors, and these peer networks may offer a potent context in which norms governing the use of violence may come to operate.⁴ This is because associating with delinquent peers enables the emergence of a pro-delinquent reference group (Glaser 1956; Shibutani 1955) that promotes delinquent conceptions of the self, as well as pro-delinquent attitudes, justifications and motives to engage in delinquent behavior (Heimer and Matsueda 1994). Therefore, involvement in delinquent peer networks is of great importance for understanding neighborhood variation in youth violence (Akers 1998; Elliott et al. 1985; Heimer 1997; Thornberry et al. 1993). This is consistent with research that finds that involvement with delinquent and violent peers occurs most frequently among youth living in structurally disadvantaged neighborhoods. For example, using data from a sample of African-American children aged 10–11 residing in Georgia and Iowa, Brody et al. (2001) found that neighborhood disadvantage (measured using census data for an aggregation of census blocks) was positively associated with children's perceptions of their friends' deviant behaviors.

Evidence that involvement with delinquent peers might explain the association between neighborhood context and youth violence was provided by Simons et al. (1996). Combining data on individual and neighborhood characteristics, Simons et al. (1996) examined the mediating effects of family and peer factors on the relationship between neighborhood disadvantage and adolescent problem behaviors. They found that delinquent peer associations and poor parenting mediated the effect of neighborhood disadvantage on boys' problem behaviors. However, because the study was based on a rather small sample of single-parent families living in only a few Iowa neighborhoods ($n = 207$), the generalizability of the results to other neighborhood contexts is uncertain.⁵

Although prior studies have established a connection between neighborhood characteristics, peer behaviors, and adolescent violence, several shortcomings limit their generalizability. First, few studies have examined the associations among neighborhood characteristics, peer networks, and adolescent violence across a wide range of neighborhood settings. Instead, most studies have focused solely on urban (e.g., Anderson 1999; Elliott et al. 1996; Fagan and Wilkinson 1998; Sampson et al. 1997) or rural settings

³ Note that a cultural approach to the study of violence does not necessarily assume that a single oppositional culture is in effect. Neighborhoods also may vary in the *strength of conventional values* and the ability of these values to support local efforts at maintaining informal social control over youth (see Warner 2003; Kornhauser 1978 for a discussion of this point).

⁴ Indeed, a vast body of research suggests that having delinquent friends is one of the most consistent and strongest correlates of delinquency (Agnew 1991; Elliott et al. 1985; Elliott and Menard 1996; Warr 1993a, b, 1996, 2002).

⁵ In addition, Simons et al. (1996) used a rather indirect measure of affiliation with deviant peers based on mothers' perceptions of the extent to which their children's friends were "a good influence" and the extent to which their children's friends tended to "get into trouble." In contrast, the current study is based on a nationally representative sample of adolescents and measures peer behaviors directly by asking peers themselves about their involvement in violent behavior.

Other studies have explored mechanisms linking disadvantage to delinquency and adolescent violence, but they too have been limited to data collected in one, two, or only a handful of cities, and have not involved data collected at multiple levels of analysis (e.g., Peeples and Loeber 1994). These limitations have resulted in restricted variation in the neighborhood disadvantage measures used, which likely accounts for the inconsistent findings across these works.

(e.g., Simons et al. 1996). Second, studies that have examined the role of peer networks have been limited in their reliance on adolescents' estimates of the proportion of their friends who are involved in illegal activities (Elliott et al. 1996), neighborhood residents' reports of how common it is for groups of teenagers to hang out in public and make a nuisance of themselves (Sampson 1997a; Sampson and Groves 1989), and on parents' estimates of the extent to which their children's friends "are a good influence" and "get into trouble" (Simons et al. 1996). No prior studies have used direct network-based measures of peer behavior to examine exposure to peer networks as a mediator of the association between neighborhood context and adolescent violence. An important contribution of the current study lies in filling these gaps using one of the best data sets currently available for this purpose.

In sum, we propose that adolescent violence is more likely to occur in structurally disadvantaged neighborhoods where adolescents experience opportunities to associate with violent peers. We argue that the relatively high concentration of antisocial youth in structurally disadvantaged neighborhoods increases the probability of exposure to violent peers, and facilitates the development and enforcement of informal street norms that may promote violence (Stark 1987). In contrast, in more advantaged neighborhoods, youth are likely to have less opportunity to associate with violent and academically unmotivated friends, resulting in less opportunity to learn norms, values and behaviors that promote violent behavior. Drawing on this conceptual framework we evaluate three specific hypotheses:

1. Neighborhood characteristics are associated with adolescent violence net of compositional and selection effects.
2. Neighborhood characteristics are associated with exposure to violent and prosocial peer networks.
3. Peer exposure will mediate some part of the neighborhood characteristics–violence association.

Data

This study uses data from the National Longitudinal Study of Adolescent Health (Add Health), a nationally representative sample of adolescents in grades 7–12 gathered between 1994 and 1996. To create this representative sample, Add Health researchers selected 80 high schools and 52 middle schools from the U.S. to be representative of U.S. schools with respect to region of country, state, urbanity, school type, ethnicity, and school size (see Bearman et al. 1997).⁶ Indeed, one of the strengths of the Add Health data is that it includes a lot of variation in neighborhood characteristics.⁷

Add Health is particularly well suited for the current study because it includes data on adolescents' self-reported involvement in violence, census-based measures of neighborhood

⁶ Of the 80 high schools comprising the sample, 17 were located in the northeast region of the U.S., 27 in the south, 19 in the midwest, and 17 in the west. Metropolitan status is represented by 24 high schools in urban areas, 42 in suburban areas, and 14 in rural areas of the United States.

⁷ Prior research has tended to focus almost exclusively on urban or rural samples without considering the role of neighborhood characteristics across a wide range of neighborhoods. Supplementary analyses examined whether associations among variables were dependent on metropolitan status. These analyses revealed associations similar to those presented for the full sample indicating that findings are not contingent upon metropolitan status.

structural characteristics, network measures of peer behaviors, and a wide-range of background and demographic variables that allow us to account for important selection factors (discussed below). In addition, drawing on a nationally representative sample of adolescents allows us to examine the effect of neighborhood characteristics on adolescent violence across a wide-range of neighborhood contexts.

Add Health consists of interviews with adolescents, their friends, and their parents that took place both in school and in the adolescent's home. Within each of the schools, brief in-school surveys were completed by every student in attendance on the day of the questionnaire administration (Bearman et al. 1997). In addition to answering a series of demographic, school, and health-related questions, students were asked to identify up to 5 of their closest friends of each sex from a school roster (for a total of 10 friends). The identification of school friends allow us to recreate respondents' peer networks in their schools and directly measure friends' involvement in fighting and academic orientations based on the *friends' own responses* to the survey questions (described below).

A second component of the Add Health study—the *in-home* surveys—consisted of two waves of interviews with a random sample of adolescents drawn from the school rosters of those completing the initial in-school survey. Specifically, adolescents were re-interviewed in their homes six (response rate of 78.9%) and 12 months (response rate of 88.2%) after the in-school interview.⁸ During the initial in-home survey, parents also were interviewed. The in-home sample was drawn randomly from school rosters stratified by grade and sex. Approximately 200 adolescents were selected from each of the 80 pairs of schools (pairs consisted of a high school and its feeder junior high school) (Bearman et al. 1997). The in-home survey was longer and gathered more sensitive information than the in-school survey, including adolescent involvement in violence.⁹

In-home interviewers recorded the home address of each adolescent in order to link the interview data to geographic data compiled at the state, county, tract, and block group levels (Billy et al. 1998). The current study uses 1990 census tracts to define respondents' neighborhoods and extracts variables from census data to measure the neighborhood characteristics associated with the adolescent's residence in 1995, when the initial in-home interviews were collected. Census tracts are formed by local committees made up of area residents and appointed by the Census Bureau to approximate locally perceived neighborhood boundaries (Brooks-Gunn et al. 1993). As a result, census tract boundaries are drawn to encompass relatively homogenous populations in terms of social and economic characteristics, and contain about 4000 people on average. Although census tracts are imperfect operationalizations of neighborhoods (Tienda 1991), they come closer than any commonly available spatial entity to representing the usual conception of a neighborhood. Moreover, census tracts have been widely used in previous research examining neighborhood effects (Elliot et al. 1996; Sampson and Raudenbush 1999; Silver 2000; South and Crowder 1997).¹⁰

⁸ Comparing the means for the variables included in the study across the two waves of data indicates that bias due to attrition is minimal.

⁹ An additional advantage of these data is that they were gathered using laptop computers that queried respondents directly using pre-recorded questions. Respondents entered their answers directly into the laptop computers. This method was used to enhance honesty in reporting sensitive information (Bearman et al. 1997). In this way, interviewer and 3rd party (i.e., parental) effects on adolescent responses were minimized.

¹⁰ As a validity check, we replicated all of our analyses using neighborhood characteristics measured at the block-group level. These analyses (available from the authors) yielded virtually identical results to those reported below, suggesting that the block-group and census tract captured similar neighborhood-level dynamics with respect to adolescent violence.

The final sample for the current study includes 12,747 adolescents who completed the in-school survey and both waves of the in-home interview, had parents who completed the parent questionnaire, had friends who completed the in-school survey, and provided an address to which census tract data could be appended.¹¹ The sample of 12,747 adolescents was nested within 2449 census tracts. On average, seven adolescents were found in a census tract, with a range of 1–211 respondents.

Measures

Dependent measure

The dependent variable in this study is a dichotomous measure of serious violence based on adolescent reports of any involvement in a range of serious violent behaviors that were solicited during the second in-home survey (gathered in 1996). These behaviors included: “you pulled a knife or gun on someone,” “you shot or stabbed someone,” “you used a weapon in a fight,” and “you hurt someone badly enough to need bandages or care from a doctor or nurse.” If the adolescent reported engaging in any of the preceding acts of violence during the past 12 months they were coded as engaging in violence; otherwise they were coded as not engaging in violence.

Neighborhood structural characteristics

Drawing on research in the social disorganization tradition, we measured the following neighborhood characteristics using 1990 U.S. Census data: socioeconomic disadvantage, residential instability, immigrant concentration, and population size (Bursik and Grasmick 1993; Sampson and Groves 1989; Sampson et al. 1997; Shaw and McKay 1942). Poverty, joblessness, family structure, and racial segregation typically load highly on indices of disadvantage and constitute what Wilson (1987) referred to as “concentration effects” (also see Land et al. 1990). Neighborhood disadvantage appears to be a critical structural feature of neighborhoods influencing a wide range of child and adolescent outcomes (for an overview, see Brooks-Gunn et al. 1997). In addition to disadvantage, social disorganization theory conceptualizes residential turnover, immigrant concentration, and population size as undermining local social ties, thus weakening local social controls and giving rise to increased levels of crime and violence (Sampson and Groves 1989; Sampson 1997a; Shaw and McKay 1942). The extent to which involvement in delinquent peer networks mediates the effects of these structural characteristics on adolescent violence has not yet been tested using multi-level data across a range of U.S. localities.

The structural variables were operationalized based on a factor analysis of many of the same census tract measures used in prior studies. The following five variables loaded highly on the disadvantage factor (factor loadings are in parentheses): the proportion of

¹¹ Eight hundred and twenty-three cases were deleted due to missing data. Deleted cases were more likely to be non-white than those included in the study (44.6% vs. 54.3%) and were less likely to come from two-parent households (49.6% vs. 72%). Deleted cases also tended to engage in more violence during the follow-up period (14.7% vs. 10.9%). Due to these differences, results were replicated with missing values imputed. Because results using the full sample with imputed values did not differ from those for the subsample excluding cases with missing values, only the results for the subsample with complete data are presented.

family households that are female-headed with children under 18 years old (0.76), the unemployment rate (0.85), the proportion of family households receiving public assistance income (0.90), the proportion of non-elderly with income below the poverty line (0.89), and the proportion of the population that was African-American (0.74). Based on these results, a scale was created by first standardizing and then summing the standardized values of these variables ($\alpha=0.81$).¹² In addition, we measured neighborhood residential instability as the proportion of individuals aged 5 or older who lived in a different household 5 years earlier. We measured immigrant concentration as the proportion of the neighborhood that was foreign-born. Population size is measured as the number of individuals residing in the respondent's tract.¹³

Peer-level mediating variables

As mentioned earlier, a problem with prior attempts to measure peer effects is that the measures employed typically assume that respondents' perceptions of their friends' attitudes and behaviors accurately reflect the reality of those attitudes and behaviors, thus ignoring the powerful influence of same-source bias (Bauman and Fisher 1986; Billy et al. 1984; Gottfredson and Hirschi 1990; Jussim and Osgood 1989). Specifically, because of correlated error resulting from same-source bias, using respondent perceptions of peer behaviors tends to inflate the correlations between peer deviance and a respondent's own deviance. To avoid this problem, we rely on the actual responses of friends to questions about their involvement in fights, as well as information on their academic achievements and expectations.

Since almost every student of the schools selected by Add Health participated in the in-school survey (unless they were absent from school on the day the survey was administered), we were able to identify all of the friends nominated by each adolescent (as long as they attended one of the sampled schools), recreate adolescents' peer networks, and record friends' behavior based on friends' response to survey questions collected during the in-school survey (see also Haynie 2001, 2002). This approach allowed us to create a measure of peer violence calculated as the average response of all friends in each adolescent's network to a question inquiring about their involvement in

¹² We also ran our analyses without percent black included in the disadvantage index. Results were virtually identical to those obtained including percent black. We include percent black in the index *not* because we believe that race reflects disadvantage per se, but rather because we believe that race picks up aspects of disadvantage that are not easily measured using census data, such as social isolation resulting from racial segregation (Massey and Denton 1993).

In addition, because many of the items in this index were skewed across neighborhoods, we re-ran all of our analyses with a re-computed index derived from log-transformed versions of each item. The index based on the log-transformed items was correlated at 0.90 with the non-transformed index and yielded results identical to those produced using the non-transformed index. For the sake of simplicity, we present results using the non-transformed index.

¹³ In supplementary analyses we explored one additional neighborhood characteristic: neighborhood informal social control. This measure is based on responses that parents gave to a question that asked them: "if you saw a neighbor's child getting into trouble, would you tell your neighbor about it?" Responses ranged from 1 = definitely would not, to 5 = definitely would. Parents' response to this question were aggregated up to the census tract level to generate a measure of neighborhood informal social control. Supplementary analyses indicated that this measure was unassociated with either peer networks or adolescent violence. This lack of support for neighborhood social control in our study is inconclusive since data aggregation necessary to create the measure likely introduced error and the measure only captures one dynamic of collective efficacy as described by Sampson et al. (1997).

physical fights. Friends' fighting was measured by asking: "In the past year, how often have you gotten into a physical fight?" Responses ranged from 0 = never, to 4 = more than seven times.

Ideally, we would have liked to incorporate a measure of friends' *violence* that included acts similar in seriousness to those measured by our dependent variable. Unfortunately, unlike the in-home survey, the in-school survey from which the friendship network data were derived, did not include questions assessing friends' involvement in serious violence.¹⁴ Nonetheless, it is reasonable to assume that friends' fighting is associated with their tacit approval of a variety of deviant behaviors, including more serious acts of violence (Salts et al. 1995; Sampson and Lauritsen 1990; Sommers and Baskin 1994).

In addition to exposure to violent friends, we include a measure of exposure to prosocial friends by measuring the academic achievement and future educational expectations of friends. Friends' academic achievement is indexed by their mean grade point average and incorporates grades in Math, Science, English, and History. Friends' educational expectations consist of friends' mean response to a question asking them to estimate the likelihood that they will graduate from college. Responses ranged from 0=no chance it will happen, to, 8 = it will happen. Because the two measures of peer academic orientation were highly correlated, we standardized the items and summed them to create an overall scale of peer school orientation.

Although the current study uses exceptionally detailed social network data, the networks themselves include only friends who attended one of the sampled schools. While adolescents could nominate out-of-school friends (and we can measure the number of these nominations), we do not have any information on the out-of-school friends' behaviors. To the extent that adolescents living in disadvantaged neighborhoods are more likely to nominate out-of-school friends, our measure of friends' behaviors could underrepresent the extent of deviance that exists in the friendship networks of adolescents residing in disadvantaged neighborhoods.

To address this concern, we compared the number of out-of-school nominations made by adolescents under different conditions of neighborhood disadvantage. We found that the average number of out-of-school nominations for adolescents living in highly disadvantaged neighborhoods (at or above the 3rd quartile for the disadvantage distribution) was 1.44, compared to 1.38 for adolescents living in neighborhoods with low levels of disadvantage (at or below the 1st quartile). This non-significant difference suggests that by limiting friendship nominations to those currently in school, the Add Health study did not systematically under-sample the friendship networks of adolescents in more disadvantaged neighborhoods and, therefore, the use of these data should not invalidate our comparison of peer effects across neighborhoods.

An additional concern is that we cannot ensure that respondents' friends live in the same census tracts as the respondent because peer networks were created in schools rather than neighborhoods. However, it is important to keep in mind that neighborhood boundaries largely determine the schools to which adolescents are assigned. Since the vast majority of adolescent friendships are bounded by schools, which in turn, are limited in the number of neighborhoods they contain, there is likely to be a good amount of overlap in the kinds of neighborhoods that adolescents from the same schools reside in (Osgood and Anderson 2004; see also Blythe et al. 1982; Coleman 1961).

¹⁴ Recall that only a portion of the in-school sample was interviewed during the in-home surveys. Thus, many of the nominated friends did not have the opportunity to report on serious violence involvement.

Control variables

A major concern in analyzing neighborhood-level effects is the possibility that such effects are spurious due to the composition differences among the individuals within neighborhoods. This concern is particularly relevant when neighborhood variables (e.g., disadvantage) are constructed based on aggregations of individual traits (e.g., race, single-parent families, social class). In such situations, it is necessary to control for the relevant individual-level traits in order to ensure that a neighborhood-level effect is not due to compositional differences among the individuals within neighborhoods. If neighborhood effects on adolescent violence are observed net of the individual characteristics on which the neighborhood measure is based, we can be more confident that a *neighborhood-level effect* has indeed been observed. Therefore, we incorporate controls for background demographic characteristics, parental resources, and parenting practices that were measured using the initial in-home and in-school surveys.

To control for compositional effects, we include a measure of family socioeconomic status. This measure combines the highest level of schooling achieved by each parent (ranging from 0=no formal education to 9=professional training beyond a 4-year college or university) with each parent's occupation status as reported by the adolescent.¹⁵ These items were standardized and averaged to obtain the family SES measure. Family structure is measured by a set of four dummy variables distinguishing among adolescents that live with both biological parents (the reference category), those that live in a single-parent family, those that live in a step-family (blended family), and a residual category combining all other family types (other family structure). Race is measured with two dummy variables, the first coded 1 for African-Americans and the second coded 1 for other minorities, with non-Hispanic whites as the reference category. We also include controls for gender (1=male, 0=female), and age (measured in years).

In addition to the above mentioned controls we include a measure assessing the quality of the parent–child relationship incorporating several dimensions of parenting including attachment, involvement, communication, and the frequency of family members eating dinner together. Attachment is based on adolescents' reports of how close they felt to their mother or father and how much they thought that their mother or father cared about them. Involvement is based on adolescents' participation in the following activities during the prior 4 weeks with their mother or father: shopping, playing a sport, going to a religious service, attending a movie, play, museum, concert or sports event, or working on a project for school. Parent–child communication is based on adolescents' reports of whether they discuss the following with their mom or dad during the prior 4 weeks: "Someone you are dating or a party you went to," "personal problem you are having," "school work or grades," and "things you are doing in school." Lastly, stability in family life was measured by the number of days of the week during which the adolescent reported having dinner together with parents. Responses to all parenting items were standardized and summed to form an overall index of parent–child relationship quality. The items comprising the parent–child relationship quality index had moderate internal validity (Cronbach alpha=0.68). The last family factor we control for is a measure of mother's age (in years) to capture any additional family processes that may be related to neighborhood selection or the ability of parents to monitor children.

¹⁵ Family income was not included in our SES measure because of a high level of missing data on this item. However, results incorporating family income (based on a subsample of adolescents whose parents provided income data) revealed similar results to those found for the larger sample of adolescents.

To establish that peer behaviors have an independent effect in models and do not simply reflect a respondents' own orientation and self-selection into peer groups (see Cairns et al. 1988; Hirschi 1969), we control for the adolescents' own responses to the fighting and academic orientation items measured in the initial in-school survey. The inclusion of respondents' own fighting and academic orientation at time 1 also allows us to rule out the possibility that our models are simply picking up the association between time 1 violence and other time 1 variables. Finally, since peer networks are an integral component of our conceptual framework linking neighborhood characteristics to adolescent violence we include a control for adolescents who are isolated from their peer networks and do not nominate anyone as a friend ($\text{loner}=1$).

An additional concern in analyzing neighborhood-level effects is the possibility of selection bias. That is, parents may choose to reside in a particular neighborhood in part because of the level of crime or delinquency occurring in the area. Selection bias may produce spurious neighborhood effects because more conscientious parents (an unmeasured trait) may be more likely to select neighborhoods that are less violent. If left unaccounted for, observed neighborhood effects would simply reflect the decision making of conscientious parents, rather than a true neighborhood effect. To help reduce the possibility of selection effects operating in our analysis, we incorporate a dummy variable indicating parents' reasons for moving to their current neighborhood (gathered during the initial in-home interview). Responses included: the availability of good schools, to be near family/friends, or because of low crime in the neighborhood. Adolescents whose parents endorsed any of these reasons were coded as 1 on the "selection" variable; all others were coded 0.¹⁶ Incorporating this neighborhood selection measure, as well as the numerous individual- and family-level controls, should help to minimize potential selection bias that would otherwise remain unaccounted for in our model.

Statistical models and analysis

An important statistical issue that arises in multilevel analyses such as this is that regression residuals within macro-level units may be correlated, thereby violating the assumption of independent observations that underlies standard regression-based techniques. To handle this problem, we used hierarchical linear models (HLM; Bryk and Raudenbush 1992) to correct for the lack of independence among nested observations (see also Chantala and Tabor 1999). This is done by separating the residual variance (σ^2) into two components: a residual variance at the individual-level ($\sigma\epsilon^2$); and a residual variance that is constant across individuals within a neighborhood but random across neighborhoods ($\sigma\mu^2$). The standard errors produced by this approach allow for valid tests of statistical significance at both the neighborhood- and individual-levels (for computational details, see Bryk and Raudenbush 1992). The general form of the two level model is as follows:

$$Y_{ij} = \beta_{0j} + \beta_{1j}(X_{1ij} - \bar{X}_1) + \cdots + \beta_{kj}(X_{kij} - \bar{X}_k) + r_{ij}, \quad (1)$$

$$\beta_{0j} = \gamma_{00} + \gamma_{01}W_1 + \cdots + \gamma_{0m}W_m + \mu_{0j}, \quad (2)$$

¹⁶ Respondents who were coded as 0 include those parents who said that this was not a reason for their living in their present neighborhood.

$$\beta_{1j} = \gamma_{10}. \quad (3)$$

$$\beta_{kj} = \gamma_{k0}. \quad (4)$$

The first equation specifies the person level model. Given that violence was measured as a dichotomous variable, the assumption of normality is violated. Therefore, we estimate the generalized hierarchical linear model with the specification of a Bernoulli distribution for the level 1 outcome (see Bryk et al. 1996 or Guo and Zhao 2000). This model is similar to a logistic regression, in that it examines the log odds of violence $\log[P/(1 - P)]$ for person i in neighborhood j . Each of the individual-level covariates was grand mean centered ($X_{1ij} - \bar{X}_1$) prior to estimating the HLM equations. This was done so that the neighborhood coefficients would represent contextual effects and not be confounded with compositional effects (see Britt 2000). The second through fourth equations specify the neighborhood model. The intercept (β_{0j}) or the average likelihood of violence in neighborhood j is predicted by neighborhood variables W (in our case disadvantage, residential mobility and immigrant concentration) and a level 2 error term (μ_0).

Interpretation of the level 1 coefficient is substantively similar to that of a logistic regression. Each coefficient is interpreted as a linear effect on the link function, such that a one unit increase in the explanatory variable x results in a β_x additive increase in the log-odds of violent behavior, controlling for the other variables in the model (see Liao 1994). Alternatively, if we take the exponent of the coefficient, the interpretation is in terms of the multiplicative increase in the odds. The level two coefficients represent the relationship between the level of violence in the neighborhood and the predictor, controlling for compositional effects and other neighborhood-level predictors.

Results

Examining descriptive statistics (available on request from the authors) indicates that while not common, a substantial proportion of adolescents (11%) report participating in serious violence. In terms of demographics, the sample is comprised of 53% Caucasian, 21% African American, and 26% of adolescents identifying themselves as another race. The average adolescent is 15.8 years old, 67% of the sample lives with two biological parents, 24% live with a single parent, and 5% live with a blended family. In addition, there is considerable variation in family SES, adolescent school orientation, adolescent reports of fighting in the previous year, and adolescent reports of parent–child relationship quality. In terms of peer networks, the typical adolescent has friends that participated in few fights, although there is considerable variation in friends' report of fighting. Much like the adolescent subjects themselves, the average respondent has friends who reported moderately high levels of academic orientation, but again there is considerable variation around this mean. Finally, 34% of adolescents have parents who moved to their current neighborhood because of the availability of good schools, to be near family/friends, or because of low crime in the neighborhood.

Most adolescents resided in neighborhoods with low levels of disadvantage; however, there is considerable variation around the mean. The typical adolescent also resided in a neighborhood in which there is moderate residential instability (on average, 44% of the population has changed residences in the prior 5 years) and in which 11% of neighborhood

residents are foreign-born. There is also considerable variation in neighborhood population size. Before turning to multivariate analyses to determine whether these associations hold net of individual-level and family-level factors, we examine whether there is significant variation between neighborhoods in adolescent violence and exposure to particular types of peer networks. We address this question by running “null” HLM models that do not attempt to explain variation in the dependent variable, but rather partition the overall variance into the two levels of analysis. Results from these models (not presented but available from the authors) indicate that although variation within neighborhoods is greater than variation between neighborhoods (as is virtually always the case in contextual analyses) there is significant variation between neighborhoods in adolescent violence. In addition, there is significant variation between neighborhoods in exposure to violent peers and exposure to academically oriented peers. For example, variation across neighborhoods in mean levels of exposure to peer fighting accounts for 8.5% of the total individual-level variance in peer violence. Between-level variation is even greater when the focus is on exposure to academically oriented peers. Here, variation across neighborhoods accounts for 20.5% of the total individual-level variance. In sum, these null models provide substantial evidence that there is significant variation across neighborhoods in exposure to particular types of peer networks and in involvement in violent behavior.

Multivariate results

Turning to our initial research question, Table 1 presents results examining the extent to which neighborhood characteristics are associated with deviant and prosocial peer

Table 1 HLM models predicting exposure to peer networks

	Model 1 Peer school orientation	Model 2 Peer fighting
<i>Neighborhood level (n = 1828)</i>		
Intercept	-0.003 (0.009)	0.059 (0.010)***
Neighborhood disadvantage	-0.035 (0.010)***	0.032 (0.013)**
Residential instability	0.011 (0.008)	0.019 (0.009)*
Immigrant concentration	-0.037 (0.010)***	-0.103 (0.010)***
Population size	-0.006 (0.009)	-0.005 (0.009)
<i>Person level (n = 12,747)</i>		
Age	-0.316 (0.068)***	-0.194 (0.100)
Age squared	0.008 (0.002)***	0.002 (0.003)
Male	0.026 (0.011)**	0.079 (0.016)***
African American	-0.027 (0.021)	-0.027 (0.027)
Other race	-0.015 (0.018)	0.016 (0.024)
Blended family (two parents)	-0.066 (0.025)**	0.079 (0.036)*
Single-parent family	-0.051 (0.015)***	0.063 (0.019)***
Other family structure	0.024 (0.034)	0.025 (0.047)
Family SES	0.124 (0.007)***	-0.050 (0.009)***
Parent-child relationship quality	0.005 (0.001)***	-0.004 (0.002)*
Mother's age	0.005 (0.001)***	-0.003 (0.002)*
Loner	0.008 (0.024)	0.082 (0.046)
Neighborhood selection factor	0.014 (0.012)	-0.013 (0.017)
Subject school orientation	0.333 (0.008)***	-0.186 (0.011)***
Subject fighting	-0.084 (0.008)***	0.143 (0.012)***
Level-1 error	0.342	0.645
R ² (level 1)	0.222	0.098

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$ (two-tailed)

exposure. Model 1 examines the effect of neighborhood variables on peer school orientation net of control variables, while model 2 examines the effect of neighborhood variables on peer fighting. Consistent with our theoretical framework, model 1 shows that adolescents residing in more disadvantaged neighborhoods are more likely to associate with friends who have lower academic orientations. Immigrant concentration is also associated with a lower likelihood of having friends with greater academic orientations. In contrast to the findings for disadvantage and immigration, residential instability, and population size are not associated with peer school orientation.

Focusing on peer fighting, model 2 shows that neighborhood disadvantage is associated with greater exposure to friends who fight. Similarly, high levels of residential instability are associated with greater likelihood of associating with friends who fight. In contrast, adolescents residing in neighborhoods with higher levels of immigrant concentration are less likely to be exposed to peer fighting than are adolescents residing in neighborhoods with fewer immigrants. Population size remains unassociated with exposure to peer violence. Overall, results in Table 1 are consistent with our theoretical framework indicating that neighborhood disadvantage is associated with greater exposure to violent peer networks and reduced exposure to prosocial peers.

To evaluate the ability of these peer network measures to account for neighborhood effects on violence, we turn to Table 2. Four models are examined in Table 2: model 1 examines the effect of neighborhood characteristics on adolescent violence, net of controls, while model 2 incorporates our network-based measures of peer fighting and peer school orientation to determine whether they account for any observed neighborhood effects. Models 3 and 4 duplicate models 1 and 2, and include an additional control for adolescent self-reports of fighting at time 1. Controlling for adolescent fighting at time 1 produces a more conservative test of our model by partialing out spurious associations between our predictor variables and prior levels of respondent violence.

Beginning with model 1, consistent with expectations, neighborhood disadvantage is associated with increased violence at time two net of control variables. Specifically, a one standard deviation increase in disadvantage translates into a 0.10 increase in the expected log odds of engaging in violence (or increases the odds of participating in violence by 10% ($1.097=e^{0.093}$)).

In contrast to the results for disadvantage, we find that immigrant concentration is associated with lower levels of violence net of control variables. A one standard deviation increase in immigrant concentration is associated with a 0.08 reduction in the log odds of violence (or decreases the odds by 8%). Although the negative effect of immigrant concentration is inconsistent with our expectations it is consistent with Lee's recent work (2003) that suggests that after moving into neighborhoods, immigrants often revitalize neighborhoods by increasing social networks and establishing informal social control, therefore reducing crime. Overall, these neighborhood effects, while small, are noteworthy because they persist despite substantial controls for individual demographic and family characteristics and the inclusion of our neighborhood selection measure. Similar to the bivariate results, population size is unrelated to adolescent violence.

The effects of the control variables are consistent with prior research indicating that the effect of age on violence is curvilinear (Farrington 1986; Hirschi and Gottfredson 1983; Moffitt 1993; Steffensmeier et al. 1989).¹⁷ Males, racial minorities, and adolescents from single parent families have higher involvement in violence compared to females, whites,

¹⁷ Preliminary analyses indicated this curvilinear effect of age on violence but not on exposure to peer behaviors reported in Table 1.

Table 2 Binary HLM model predicting adolescent violence at time 2

	Model 1	Model 2	Model 3	Model 4
Intercept	-2.351 (0.038)***	-2.387 (0.038)***	-2.520 (0.038)***	-2.537 (0.039)***
<i>Neighborhood level (n = 1828)</i>				
Neighborhood disadvantage	0.093 (0.040)*	0.078 (0.040)	0.089 (0.043)*	0.082 (0.042)
Residential instability	-0.003 (0.035)	-0.006 (0.035)	-0.022 (0.035)	-0.024 (0.035)
Immigrant concentration	-0.084 (0.035)*	-0.062 (0.036)	-0.056 (0.036)	-0.040 (0.036)
Population size	0.015 (0.027)	0.019 (0.026)	0.024 (0.028)	0.026 (0.027)
<i>Person level (n = 12,747)</i>				
Peer networks				
Peer fighting	-	0.256 (0.031)***	-	0.178 (0.034)***
Peer school orientation	-	-0.228 (0.046)***	-	-0.146 (0.050)**
Control variables				
Age	0.801 (0.368)*	0.789 (0.373)*	0.876 (0.410)*	0.863 (0.411)*
Age squared	-0.028 (0.012)*	-0.026 (0.012)*	-0.029 (0.013)*	-0.028 (0.013)**
Male	1.093 (0.064)***	1.074 (0.065)***	0.869 (0.070)***	0.871 (0.069)***
African American	0.273 (0.095)**	0.284 (0.094)**	0.182 (0.094)	0.193 (0.092)**
Other race	0.334 (0.086)***	0.318 (0.086)***	0.233 (0.094)*	0.225 (0.093)*
Blended family (two parents)	0.208 (0.119)	0.179 (0.119)	0.193 (0.129)	0.173 (0.128)
Single parent family	0.248 (0.073)***	0.213 (0.073)**	0.175 (0.079)*	0.150 (0.077)
Other family structure	0.497 (0.139)**	0.483 (0.139)***	0.393 (0.155)*	0.384 (0.155)*
Family SES	0.052 (0.039)	0.100 (0.040)*	0.081 (0.041)*	0.112 (0.042)**
Parent-child relationship	-0.026 (0.008)***	-0.024 (0.008)**	-0.020 (0.008)*	-0.020 (0.008)*
Mother's age	-0.021 (0.005)***	-0.019 (0.005)***	-0.019 (0.005)***	-0.018 (0.006)**
Loner	-0.028 (0.172)	-0.062 (0.171)	-0.053 (0.177)	-0.073 (0.177)
Neighborhood selection	0.060 (0.064)	0.070 (0.064)	0.021 (0.069)	0.029 (0.068)
Subject school orientation	-0.533 (0.036)***	-0.407 (0.038)***	-0.387 (0.037)***	-0.308 (0.040)***
Subject fighting (time 1)	-	-	0.859 (0.034)***	0.827 (0.034)***

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$ (two-tailed)

and adolescents residing in two-parent families. In addition, parent-child relationship quality, youth with older mothers, and youth with higher academic orientations have lower risks of violence. Again, we find no evidence that parents' selection of their neighborhood for a particular reason is associated with adolescent reports of violence net of other individual- and family-level factors.

Importantly, incorporating our measures of peer behaviors in model 2 reduce the effect of neighborhood disadvantage and immigrant concentration to non-significance. In substantive terms, incorporating peer behaviors reduces the size of the disadvantage coefficient by 16% (0.093–0.078/0.093) and the immigration coefficient by 26% (-0.084–0.062/-0.084). This result supports the idea that neighborhood disadvantage is associated with adolescent violence, in part, because it provides greater opportunities for youth to associate with more violent and academically unmotivated friends. Consistent with prior research, peer fighting and peer school orientation have moderately strong associations with adolescents' involvement in violence. Indeed, each standard deviation increase in exposure to peer violence translates into a 0.26 increase in the log odds of adolescent violence (which equals a 29% increase in the odds of participating in violence ($1.29 = e^{0.256}$)), whereas a standard deviation increase in exposure to academically oriented peers translates into a 0.23 reduction in the expected log odds of violence (which equals a 20% reduction in the odds of engaging in violence).

Because respondents with a tendency to engage in violence and who are academically unmotivated may select friends with similar qualities, models 3 and 4 control for respondents' own reports of fighting at time one. The results of models 3 and 4 are

generally consistent with the pattern of findings reported in models 1 and 2. Net of respondents' own fighting, neighborhood disadvantage is significantly associated with violence, and incorporating peer fighting and academic orientation in model 4 reduces the effect of neighborhood disadvantage to non-significance. In these more rigorous models, neighborhood residential instability and immigrant concentration are not significantly associated with violence.¹⁸

Overall, these results suggest that neighborhood disadvantage is associated with adolescent violence across a range of neighborhoods and that this association is in part mediated by exposure to violent and academically unmotivated peers. In supplementary analyses we examined path models in MPLUS to determine whether the effect of disadvantage on adolescent violence was mediated by exposure to peer networks. Results from these path models suggest that a small but significant portion of the total effect of disadvantage is mediated through peer networks. Indeed the best fitting solution (as measured by changes in the χ^2 test of model fit) was a model that contained only an indirect effect of disadvantage through peer networks, but no direct effect of disadvantage on violence.¹⁹

Discussion

Based on a conceptual framework that emphasized the role of both structural and cultural factors for understanding youth violence, we examined whether exposure to violent and academically motivated peers mediated the relationship between neighborhood characteristics and adolescent violence. Several of our findings should be highlighted in particular. First, of the neighborhood characteristics we examine, neighborhood disadvantage emerged as the most important correlate of adolescent violence. This is an important finding because our results provide evidence of the disadvantage–violence association across a wide range of neighborhoods representing urban, suburban, and rural contexts and the association holds net of a large number of individual- and family-level controls. Most importantly, this finding continues to emphasize the importance of socio-economic resources in the neighborhood for shaping youth behavior and outcomes.

Second, we found evidence that neighborhood disadvantage and residential instability were associated with an increased likelihood of exposure to violent peers as manifested in friends' fighting behavior, whereas neighborhood disadvantage and immigrant concentration were associated with a reduction in the likelihood of exposure to academically oriented peers. These findings support our hypothesis that neighborhood structural characteristics increase opportunities for youth to associate with particular types of peers. This is an important finding because exposure to peer behaviors has serious implications for youths' own behavior. This plays out in our study where we found that exposure to peer fighting had a moderately strong association with adolescents' subsequent participation in

¹⁸ The lack of a significant association between residential instability and violence is consistent with recent research by Silver (2000) and Warner and Pierce (1993) who note that residential instability may no longer operate as a structural factor that increases violence in disorganized neighborhoods because such neighborhoods have become places of last resort where residents reside for long periods of time, not because they choose to, but because they are unable to relocate elsewhere.

¹⁹ We conducted these supplementary analyses since an appropriate test of the difference between coefficients (for instance, comparing the disadvantage coefficient in model 1 vs. model 2) is not currently available for survey data (see Allison 1995). We believe that our supplementary path analyses and our moderate interpretation of the mediation results suggests that peer networks are playing an important if modest role in the disadvantage–violence association.

serious violence, whereas exposure to academically oriented peers was associated with a reduction in violence.

We believe that peer behaviors signal entry into delinquent subcultures in which peer-based social controls against violence are weak. Moreover, the significant positive association between friends' violence and neighborhood disadvantage (shown in Table 1) is consistent with the notion that in such neighborhoods, weak social controls may impede the regulation and supervision of youth, thereby facilitating the development of deviant behaviors and norms among adolescent peer groups (Bursik 1988; Bursik and Grasmick 1993; Osgood and Anderson 2004; Sampson 1993; Sampson and Groves 1989).

Finally, our study provides evidence that neighborhood characteristics, in particular, neighborhood disadvantage and immigrant concentration, are mediated in part by youths' exposure to peer networks. Incorporating the peer variables explains approximately 16% of the neighborhood disadvantage and 26% of the immigrant concentration effect in our study. Together, these findings indicate that efforts to reduce adolescent violence should focus on altering peer culture in places where socioeconomic resources are in short supply and enhancing those resources wherever feasible. For example, without adequate school resources in disadvantaged neighborhoods, there is little possibility of fostering the type of academic orientation among peers that appears to reduce adolescent violence.

In considering these results, several limitations of the Add Health data must be acknowledged. First, although the in-home interviews were administered at two points in time and home residence information was recorded at both points, exposure to particular types of peer networks were measured only once, during the initial in-home and in-school interviews. Although we preserved the correct causal ordering by modeling violence at time two as a function of peer factors measured at time one, we were unable to examine reciprocal effects among these measures. Future research should continue to examine whether and how adolescent involvement in violence alters the nature and composition of adolescent friendship networks as research increasingly emphasizes both processes of selection and socialization shaping peer influence (e.g., Aseltine 1995; Jussim and Osgood 1989; Kandel 1985, 1996).

A second issue related to selection is that between-neighborhood differences in adolescent behavior may reflect both individual- and neighborhood-level factors (Bursik and Grasmick 1993; Tienda 1991). Individuals are not randomly assigned to neighborhoods but make personal choices about where to live based on individual factors such as education, income, race/ethnicity, and perceived characteristics of the neighborhood (Elliott et al. 1996). Thus, a compositional effect may be produced at the neighborhood-level that is independent of the parenting practices and peer exposures specified in our model. We addressed this concern by measuring parents' reasons for selecting their neighborhoods and including a wide range of family background characteristics (including family SES and family composition) in order to control statistically for those factors most likely to influence residential choice and respondent outcomes (also see, Kowaleski-Jones 2000; Silver 2000; Silver et al. 2002; South and Baumer 2000). Nonetheless, in this, as in all multilevel research, the possibility that compositional biases related to unmeasured (or unmeasurable) factors have affected our results, cannot be ruled out completely.²⁰

²⁰ Experimental research data are currently being gathered to address the role of neighborhood influences on adolescent outcomes. In particular, the "Moving To Opportunity" experiments sponsored by HUD are anticipated to better disentangle the causal pathways through which neighborhoods affect adolescent outcomes (see Katz et al. 2001 for further details).

Other limitations of the data include the omission of potentially important neighborhood-level factors that may affect the relationship between neighborhood disadvantage and violence. For example, this study does not include a measure of collective efficacy although we attempted to account for this important neighborhood characteristic through our inclusion of a measure of neighborhood informal control in supplementary analyses. Unfortunately, a more precise definition of collective efficacy similar to that proposed by Sampson et al. (1997) was beyond our reach. Indeed, recent findings indicate that at the macro-level, neighborhood disadvantage affects crime rates because it reduces opportunities for neighborhood residents to work together to establish and enforce common goals (see Sampson et al. 2002 for a summary of the research). Although our conceptual model assumes that a common neighborhood goal is the collective socialization of adolescents toward prosocial behaviors, and that neighborhood disadvantage impedes the capacity of residents to attain this goal, our research only indirectly tests this idea by demonstrating an association between neighborhood disadvantage and adolescent exposure to violent and academically unmotivated peers. A more complete evaluation of our theoretical model would incorporate a better measure of collective efficacy to determine its role in this proposed causal sequence.

Another dimension of the neighborhood context that may be especially important, but could not be measured in the current study, is the extent to which informal street norms exist that govern the use of violence by adolescents in public spaces (Anderson 1999). While we were able to measure the behavior of friends in the respondent's peer networks, our model would be strengthened by a measure of adolescent cultural beliefs that spanned both the adolescent friendship network and the entire neighborhood. Unfortunately, the Add Health data do not contain a sufficient number of adolescents within census tracts to support the construction of such measures through aggregation, nor does it contain items addressing respondents' beliefs about the appropriateness or usefulness of violence in specific situations. Thus, our study is based on the (untested) assumption that friends' participation in fighting reflects, in part, their subcultural beliefs about the appropriateness of violence in certain situations.

Finally, although our conceptual model treated peer culture as a separate context in which adolescents are enmeshed, our analytical approach treated peer networks as individual-level predictors. Future research should consider whether and how peer networks could be incorporated into models that have adolescents enmeshed within peer networks that are then situated within neighborhoods. Taking this approach would allow for predictions about neighborhood characteristics determining how influential peer networks are for adolescent violence. This would involve at a minimum a three-level model that simply was not possible with available data.

Despite these limitations, the Add Health data is arguably the best data source currently available for testing the mediating effects of peer behavior on the association between neighborhood characteristics and adolescent violence. Thus, the current study fills an important gap in the literature on adolescent violence. By incorporating key contextual measures from multiple levels of observation, we have attempted to extend the recent trend in criminological inquiry toward examining structural and cultural factors related to youth violence. Our results suggest that adolescent violence does indeed depend on contextual risk factors spanning a range of observation levels and theoretical traditions. Neighborhood characteristics appear to set the stage for youth exposure to particular types of peer influence, which in turn affect youths' involvement in violence. It is therefore important to view neighborhoods as potent sources of social experience related to the occurrence of violence.

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