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Neighborhood Violence and Adolescent Friendships

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Neighborhood Violence and Adolescent Friendships

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This paper investigates the social consequences of neighborhood violence. Using ego-centered friendship network data from the National Longitudinal Study of Adolescent Health, a survey of adolescents in the United States in the mid-1990s, it examines the relationship between neighborhood violence and the quantity, closeness, and composition of adolescent same-sex friendships. Though neighborhood violence is unrelated to quantity and closeness net of individual and family characteristics, it predicts boys' friendships with individuals who no longer attend school (who are presumably older or have dropped out of school) and predicts boys' and girls' friendships with individuals who attend other schools. These results are consistent with the theory that violence and fear of victimization focus adolescents' social attention on their neighborhoods and lead them to develop friendships with individuals who can help them to stay safe. By structuring who adolescents interact with, neighborhood violence may play a role in determining the cultural messages and ideals to which they are exposed.

1. Introduction

Violence is a highly spatially organized social phenomenon (Morenoff, Sampson, and Raudenbush 2001; Sampson and Morenoff 2004; Massey 2001), and youth from high poverty neighborhoods are exposed to high rates of crime and violence (Centers for Disease Control 1997; American Academy of Pediatrics 2000). Considerable research has examined the causes of high rates of violence in some neighborhoods, focusing on why structurally disadvantaged neighborhoods have higher rates of violent crime and disorder (e.g. Sampson, Raudenbush, and Earls 1997; Sampson and Raudenbush 1999; Sampson and Groves 1989). Yet we know considerably less about the consequences of growing up in a violent neighborhood. Psychologists have linked exposure to violence to a number of developmental and psychological effects on youth (see Margolin and Gordis 2000 for a review), and physiological responses to the chronic stress of living in a violent neighborhood may lead to health problems and emotional and cognitive impairment (Massey 2004). However, the impact of neighborhood violence on the social lives of residents is less understood, particularly for youth.

Friends have long been thought to influence adolescent decision-making and behavior, and recent research has found peer effects on outcomes ranging from crime and

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delinquency to sexual behavior, drug and alcohol use, and academic achievement (e.g. Matsueda and Anderson 1998; Bearman and Bruckner 1999;, Haynie 2001; Maxwell 2002; Haynie and Osgood 2005; Duncan, Boisjoly, and Harris 2001; Akers 1990; Akers et al. 1979; Matsueda 1992; Heimer and Matsueda 1994; Warr and Stafford 1991). Yet little recent work has addressed the connection between neighborhoods and friendships.[1] This paper seeks to advance the understanding of peer group formation by examining how neighborhoods influence the composition and characteristics of friendship networks.

This study examines the relationship between neighborhood violence and two characteristics of an adolescent's friendship network – (1) number of friends and (2) closeness of friendships – as well as two aspects of the composition of an adolescent's friendship network – (3) proportion of friends who attend the adolescent's school and (4) proportion of friends who are not enrolled in school at all. I draw upon survey data from the National Longitudinal Study of Adolescent Health, which is nationally representative of adolescents in the United States in the mid-1990s. Results show that, controlling for individual, family, and school characteristics, neighborhood violence is unrelated to number of friends or friendship closeness among both boys and girls, but among boys and girls neighborhood violence is a strong predictor of friendships with peers from different schools, and among boys, neighborhood violence is a strong predictor of friendships with individuals not enrolled in school.

2. Previous Research on Consequences of Neighborhood Violence

The consequences of neighborhood violence have been studied from psychological, physiological, and social organization perspectives. Psychological perspectives emphasize the developmental consequences of exposure to high rates of violence. Witnessing and being victimized by violence have been linked to post traumatic stress disorder, anxiety, depression, and aggressive behavior, and are thought to disrupt the developmental trajectories of children (Margolin and Gordis 2000; Garbarino, Kostelny, and Dubrow 1991; Aneshensel and Sucoff 1996; Bingenheimer, Brennan, and Earls 2005). Community violence and recurring episodes of violence lead to heightened arousal or hyper-vigilance, as well as a perception by the child or adolescent that he or she is not worthy of being kept safe (Margolin and Gordis 2000). The results of such exposure to violence may be slowed cognitive development, poor academic achievement, or trouble forming relationships with peers and others (Margolin and Gordis 2000).

Massey (2004) draws upon physiological research on biological responses to stressors such as neighborhood violence to develop a biosocial model of racial stratification. Socioeconomic inequality combined with residential segregation leads to geographically concentrated poverty. This concentration of poverty leads to the concentration of other social problems, particularly crime and violence. Long-term experience of chronic stress created by exposure to violence and threat of victimization can have physiological consequences, one of which is "allostatic load," persistently high levels of production of adrenaline and cortisol. In addition to long-term physical health effects, allostatic load can influence cognitive functioning by inhibiting the formation of connections between neurons in the brain and by impairing memory. Allostatic load can also lead to greater aggressiveness, impulsivity, anger, and susceptibility to substance use (see Massey 2004 for a review). The stresses associated with growing up in a violent neighborhood can extend beyond the immediate threat of victimization, as negative experiences of family members also cause further stress (Charles, Dinwiddie, and Massey 2004; Massey and Fischer 2006).

While the psychological and physiological perspectives emphasize individual-level effects of neighborhood violence, a social organization perspective suggests community-level effects may exist as well. Social organization theory focuses on community capacity for social control, arguing that neighborhood structural disadvantages such as pov-

1 One exception is Anderson (1991, 1999), who shows how peer "street" cultures in disadvantaged neighborhoods promote teenage pregnancy.

erty, ethnic heterogeneity, and residential turnover lead to difficulties establishing and maintaining order (Park and Burgess 1925; Shaw 1929; Shaw and McKay 1942).[2] Collective efficacy, defined as "social cohesion among neighbors combined with their willingness to intervene on behalf of the common good," mediates the relationship between concentrated disadvantages (residential instability, ethnic or racial heterogeneity, and poverty) and violence (Sampson et al. 1997). Thus, the violence that is endemic to disadvantaged neighborhoods can be understood as a direct consequence of the lack of social organization in these neighborhoods, which limits the capacity of local residents to create and maintain order.

However, violence itself may also affect the social organization of local communities, as individuals respond to fears of victimization and engage in adaptive behaviors necessary for survival (Skogan 1992; Venkatesh 2000). In a violent neighborhood, individuals are often cautious about intervening in conflicts or monitoring other people's children for fear of retribution. Residents keep to themselves rather than interacting with neighbors, resulting in thinner social networks and weaker capacity for cooperative behavior. Violence engulfs public spaces such as sidewalks, parks, or commercial areas, depriving adult residents of the opportunity to socialize with neighbors and thereby build the networks needed to marshal resources in support of a common goal or public good (Anderson 1999; Venkatesh 2000). As a result, adult residents may find it increasingly hard to monitor and control the behavior of community members, especially young people, leading to higher rates of problem behavior such as teenage pregnancy or high school dropout.

3. Hypotheses: Neighborhood Violence and Adolescent Friendships

Though there is no prior research that examines the effects of neighborhood violence on adolescent friendship networks, such effects may also be important consequences of neighborhood violence. To the extent that friends serve as an important form of socialization for adolescents, other outcomes may be influenced by the capacity of neighborhood violence to structure peer networks. In this section, I develop hypotheses concerning the impact of neighborhood violence and the fear of victimization on the *characteristics* and *composition* of adolescents' peer networks.

A social organization perspective suggests that high levels of violence in a neighborhood may reduce attachments to those outside of the family, resulting in fewer friendships or friendships that are characterized by lower levels of closeness. As discussed above, when violence takes over public spaces people may retreat from public life and reduce their interactions with non-kin out of fear and distrust of neighbors (Skogan 1992; Venkatesh 2000). Without safe community spaces for social interaction, residents are less able to form and maintain social ties. Adolescents may spend less time with their friends, leading to lower closeness of friendships as well. These predictions suggest the first two hypotheses this paper will examine:

Hypothesis 1a: Higher levels of neighborhood violence will be associated with having fewer friends among adolescents.

Hypothesis 2a: Higher levels of neighborhood violence will be associated with friendships characterized by less closeness among adolescents.

On the other hand, this perspective assumes that adolescents respond to neighborhood violence and fear of victimization in a similar way as adults. It also focuses exclusively on the level of violence, ignoring the ways in which violence is socially organized in poor neighborhoods. An alternative perspective, which emphasizes the social organization of violence among adolescents, suggests that violence may increase number and closeness of friendships.

Efforts to understand the organization of violence in inner city communities have focused on gangs (e.g. Thrasher 1927, Short and Strodtbeck 1965, Sanchez-Jankowski 1991), the interpersonal dynamics of reputation (Anderson

2 This classic Chicago School model has been criticized for overemphasizing the importance of structural factors like economic status, for failure to differentiate black neighborhoods from other ethnic neighborhoods, and for reliance on the over-simplified concentric zone model of the city (Sampson and Morenoff 1997).

1990, 1999; Dance 2002), or neighborhood-based group rivalries (Suttles 1968; Horowitz 1983; Harding 2005). Suttles (1968) sees the youth gang as one of many groups composed of individuals of similar age, gender, ethnicity, and "territory" that make up the "ordered segmentation" of inner city communities. Conflict between these age-segmented groups is structured by gender, age, ethnicity, and territory. While fights among male groups of the same age and ethnicity are common, different age groups also join forces to combat groups of other ethnicities, and groups of different ethnicities will collaborate in conflicts with youth from other territories. While Horowitz (1983) also observed gender and age-segregated groups, she argues that such segmentation has cultural rather than structural roots, particularly the "code of honor" that governs respect and retribution. Harding (2005) argues that neighborhood-based rivalries structure the organization of much of the youth violence in Boston's poor inner-city communities.

To the extent that youth violence is organized by conflicts between gangs, neighborhoods, or other groups, violence may actually serve to increase the number of friendships adolescents have or to strengthen those relationships, creating greater closeness, as adolescents must rely on friends for support and protection. First, friends become a strategy for dealing with fear and reducing the threat of victimization, and adolescents in more violent neighborhoods may seek out more friends as a protection strategy. Second, shared experiences with violence as well as group-, gang-, or neighborhood-based rivalries may strengthen adolescent friendships among those on the same side of violent conflicts with individuals from other groups or territories. This leads to two hypotheses that run counter to those above:

Hypothesis 1b: Higher levels of neighborhood violence will be associated with having more friends among adolescents.

Hypothesis 2b: Higher levels of neighborhood violence will be associated with friendships characterized by more closeness among adolescents.

The social organization of violence may also structure the composition of adolescent friendship networks: the types of individuals with whom adolescents seek out and create friendships. When violence or the threat of violence is based on membership in local groups or residence in particular neighborhoods, an adolescent's friendship group may be more likely to be based on these geographic groupings than on interactions in other contexts such as schools, where rival groups are forced to mix (Harding 2005). In contrast, in safer middle-class neighborhoods, school will be the context in which friendships are developed and maintained. This leads to another hypothesis that this paper will examine:

Hypothesis 3: Higher levels of neighborhood violence will be associated with fewer friendships with adolescents who attend the same school.

Protection may also come in the form of peers who have high status in the street culture. Among the adolescents who most often perpetuate and are most often victimized by violence, neighborhood violence has the potential to change status hierarchies and affect peer groupings and interactions. For instance, the gang literature has emphasized the role of violence in structuring leadership and status hierarchies (Thrasher 1927; Short and Strodtbeck 1965; Sanchez-Jankowski 1991). According to Thrasher (1927), conflict with other gangs is a central element in gang life, and "gang warfare" erupts over status as well as over economic assets, territory, and the safety of members. Short and Strodtbeck (1965) argue that gang conflict is also a part of status management within the gang, as individuals use violence among gang members and between rival gangs to establish and maintain leadership roles. Violence may also serve to increase the status of specific types of individuals, those whose "street" experience and knowledge allows them to navigate the neighborhood's dangers (Anderson 1999). Because of their high status in the local street culture, others will seek them out for protection. These high status peers are more likely to be older and are more likely to be involved in the underground economy to such an extent that they have dropped out of school. Harding (2005) argues that forming relationships with peers who can provide protection is a survival strategy among adolescents in violent neighborhoods, an adaptation to the high risk of victimization such adolescents

face. This line of reasoning suggests this study's fourth hypothesis:

Hypothesis 4: Higher levels of neighborhood violence will be associated with more friendships with those who do not attend school.

In addition to being highly spatially organized, violent victimization and perpetuation of violence is also highly gendered. Because violent behavior and violent victimization on the streets are more common among males, the friendship dynamics described above may be specific to boys, though there is some evidence that such violence is increasing among girls (Ness 2004). In addition, previous research on peer effects has found gender differences (Heimer and De Coster 1999; Hallinan and Williams 1990; Storvoll and Wichstrom 2002; van Roosmalen and McDaniel 1989). Finally, there may be gender differences in the associations between other covariates and the characteristics of friend networks. For these reasons, all models will be estimated separately by gender, although gender is not a primary focus of this study. I now turn to the data and methods that will be used to examine these relationships.

4. Data and Methods

I use data from the National Longitudinal Survey of Adolescent Health (Addhealth; Harris et al. 2003). The Addhealth survey initially sampled a set of high schools and their feeder schools, resulting in about 150 middle schools, high schools, and junior high schools clustered one or two to a community. The first wave of data collection was in 1994–95, the second wave in 1996, and the third wave in 2001–02. This study uses the wave one data. Students were in grades 7 to 12 in wave one. This wave includes a school administrator questionnaire about school characteristics and policies, an in-school questionnaire completed by almost every eligible student (n ~ 90,000) in the sample schools, and longer in-home student and parent interviews with a subsample of about 20,000 students. Structural neighborhood characteristics from the 1990 census are available for in-home respondents in waves 1 (and in wave 2). In these data, students are nested within neighborhoods which are nested within communities (defined by the sampled high schools and their feeder schools).

Approximately one-third of wave one Addhealth respondents were asked a short series of questions about their closest male and closest female friends. Each respondent in this subsample was able to nominate up to five male and five female friends. I use these respondents for this analysis and restrict my analysis to same-sex friendships (in order to limit the analysis to a reasonable scope). A series of questions are asked about each friend, the first of which is whether the friend is currently enrolled in school (or was enrolled at the end of the last school year if the interview was conducted during summer vacation). If that friend is enrolled in any school, the respondent is also asked whether the friend is enrolled in the same school as the respondent. Unfortunately, no other information about a friend's characteristics is available in the Addhealth data if that friend is not enrolled in one of the sampled schools (i.e. if the friend is not in the sample). The friends module also asks a series of questions about how often the respondent interacts with each nominated friend. These items are combined to form a friendship closeness scale, as described below. While the information about each friend in Addhealth is limited, it is the only nationally representative dataset that includes information on adolescents' friends, neighborhoods, and experiences with violence.

Variables

Neighborhood and individual violence scales: Neighborhoods are measured as the census tract of residence at the time of the wave one in-home interview, most of which were conducted in spring and summer of 1995. The neighborhood violence scale measures the amount of perceived violence in a census tract by aggregating multiple survey responses from Addhealth respondents who live in the same tract.[3] The individual violence scale uses multiple

3 Administrative crime data are not available at the census tract level for the Addhealth data. Mean tract size is 8.4 respondents. The number of respondents per tract varies from one to over 200, and thus the neighborhood violence scale varies considerably in reliability across tracts (mean = 0.48 and standard deviation = 0.28). In the models below, I weight the neighborhood level equations by the tract-specific reliability of the neighborhood violence scale to reduce the impact of this measurement error. Thus, neighborhoods with higher reliabilities are given more weight in the analysis.

measures of the respondent's own violent behavior aggregated to the individual level. The individual violence scale is used to control for the individual's own violent behavior in the regression models. Without this control, an association between neighborhood violence and characteristics of friendships could be due to reverse causality. For example, those who have more out-of-school friends may engage in more violent activities, thereby making the neighborhood more violent and causing neighbors to report more fear of violence.

The individual and neighborhood violence scales are constructed using methods based on the Rasch model that are presented in Raudenbush and Sampson (1999) and Raudenbush, Johnson, and Sampson (2003). The individual violence scale includes seven self-reported measures of one's own violent behavior: fighting, pulling a knife or gun on someone, shooting or stabbing someone, getting into a serious physical fight, injuring someone severely enough to require medical treatment, using or threatening to use a weapon, and participating in a group fight. The neighborhood violence scale includes six reports of violence observed or experienced by the respondent: witnessing a shooting or stabbing, having a weapon pulled on them, being shot, being stabbed, being jumped, and being injured in a fight, and three subjective measures of personal safety: whether or not the neighborhood is safe, the chances that one will be killed, and the parent's assessment of whether the neighborhood has a problem with drugs.[4] In each scale, the items are weighted by their severity, as measured by the inverse of their frequency among all respondents, and variation due to the age and gender of the respondent is removed. Both violence scales are standardized to have mean zero and standard deviation one. Data from all wave one respondents are used to construct the individual and neighborhood violence scales, not just those in the sample selected for the friends module. More details on the construction of these scales are provided in Appendix B.

Number of same sex friends: This variable is the number of same-sex friends the respondent nominates. It ranges from zero to five and is modeled using a Poisson model with over-dispersion and equal exposure. Over-dispersion relaxes the assumption of equal mean and variance in the Poisson distribution by modeling the variance. Approximately 3 percent of respondents report zero friends. Since their outcomes for the other friendship variables are undefined, they are dropped from this study's analysis sample. To the extent that the five friend maximum limits variation in the number of friends, this limit may attenuate the effects of predictor variables on number of friends.

Friendship closeness: Friendship closeness is measured using a scale of five items about each friend the respondent nominates, aggregating all items and all friends to the respondent level. The five items are (1) went to friend's house in past seven days, (2) met friend after school to hang out in past seven days, (3) spent time with friend last weekend, (4) talked to friend about a problem in the past seven days, and (5) talked to friend on the telephone in past seven days. Note that these are all behavioral measures of friendship closeness and not based on subjective impressions. As described in further detail in Appendix B, the model from which this scale is generated includes controls for the order in which a friend was nominated and the total number of friends a respondent nominated and is also adjusted for the "severity" of the item. The scale can be interpreted as the mean closeness measure for each respondent's mean friend. It has no inherent metric but has been standardized to have a mean of zero and a standard deviation of one. Because it is a continuous variable, the friend closeness scale is modeled using a linear model.

Same sex friends not enrolled in respondent's school: This variable is the number of same-sex friends who are enrolled in school but do not attend the same school as the respondent. It ranges from zero to five and is modeled using a Poisson model with over-dispersion. The exposure is the number of friends enrolled in school, so the outcome can be interpreted as the percentage of school-attending friends who attend a different school from the respondent.

Same-sex out of school friends: This variable is the number of friends who the respondent reports are not

4 Removing the three subjective measures of neighborhood violence lowers the reliability of the neighborhood violence scale.

enrolled in school. This measure varies from zero to five. Some respondents nominate less than five friends, so in the Poisson models I include the total number of same-sex friendship nominations as the exposure.

Neighborhood disadvantage: As is the convention in neighborhood effects research (e.g. Sampson et al. 1997), neighborhood disadvantage is measured by a scale constructed from a series of highly correlated neighborhood structural characteristics. Here the neighborhood disadvantage scale is the mean of the following standardized items: the census tract's family poverty rate, percent single mother households, percent youth, male unemployment rate, percent black, percent of those over 25 who are college graduates, percent of workers in managerial or professional occupations, and percent affluent families (those with incomes above $75,000 per year), with the last three reversed in polarity. These data come from the 1990 census. The average inter-item correlation for this scale is 0.52 and Cronbach's alpha is 0.90.

The structural neighborhood disadvantage scale (hereafter, neighborhood disadvantage) measures the economic and social characteristics of the families that make up the neighborhood and which are thought to lead to negative outcomes for youth. Five of these variables (poverty, single-mother households, percent youth, male unemployment, and percent black) indicate the presence of disadvantaged families. Percent youth roughly captures the number of adults per child possibly available to supervise or monitor. The remaining three (college graduates, managerial and professional workers, affluent families) indicate the absence of middle class families since their polarity is reversed. While some researchers (e.g. Brooks-Gunn et al 1993) have argued that the absence of middle class families is more important than the presence of disadvantaged families, there are high inter-item correlations across all eight variables in these data. This suggests that these two sets of measures capture the same underlying neighborhood SES concept but simply focus on the presence of families at opposite ends of the SES distribution as indicators of a neighborhood's position in that distribution. Because of the strong relationship between neighborhood violence and neighborhood disadvantage, it is necessary to control for neighborhood disadvantage in models in which neighborhood violence is the key predictor of interest. Otherwise, the coefficient on neighborhood violence may be biased by other characteristics of disadvantaged neighborhoods.

Unexcused school absences: The mean number of unexcused school absences per month is used as a behavioral measure of school attachment. In wave one, each respondent reports the number of days he or she has been absent from school without an excuse in the current or previous school year. This value is divided by the number of months in the school year that have passed at the time of the interview. I use this variable as a control in the models for out of school friends and friends enrolled in different schools, to prevent spurious association due to low school attachment.

Individual/family controls: Measured at wave one, these controls include race and ethnicity indicators, age, gender, adolescent immigrant status, language spoken at home, log family income, single parent household, step-parent or other household, mother's age at birth, low birth weight, and for the primary parent (mother or female caregiver if available, father or male caregiver if not) immigration status, education, professional/managerial occupation, disability, and welfare receipt. These variables are described in more detail in Appendix A.

Community/school controls: These controls include indicators for private school, Catholic school, and rural/suburban/urban, and measures of school size, as well as percent of students in a college preparatory program and the cumulative dropout rate. For students attending middle or junior high school during wave one, the characteristics of the high school into which their current school feeds are used. These variables are also described in more detail in Appendix A.

Several control variables have missing values.[5] Rather than drop cases with missing values, I impute missing values using chained equations in Stata (Royston 2004). Continuous variables are grand mean centered in the models below.

5 Variables with missing values include parent's education, occupation, disability, immigrant status, and welfare receipt (all less than 2 percent missing). About one-quarter of cases have missing values on family income and mother's age at birth, and about one-sixth of cases have missing values on low birth weight.

Multi-level models

I use multi-level models to examine the relationships between each outcome (Y) and neighborhood violence and neighborhood disadvantage net of individual, family, and school control variables. If we index individuals with i, neighborhoods with j, and schools with k, we can write a three-level model (Raudenbush and Bryk 2002). The individual level equation is:

$$Y_{ijk} = \pi_{0jk} + \pi_{1jk} X_{ijk} + e_{ijk}$$

The link function for Y depends on the type of outcome being modeled (e.g. linear for friendship closeness scale or Poisson for number of friends). X is a set of control variables measuring individual and family characteristics (and π_1 is a vector of coefficients). There is one neighborhood level equation:

$$\pi_{0jk} = \beta_{00k} + \beta_{01k} D_{jk} + \beta_{02k} V_{jk} + r_{jk}$$

This equation models the intercept from the individual level model as a function of neighborhood disadvantage (D) and neighborhood violence (V). β_{02k} is a key coefficient of interest here, as it captures the conditional association between neighborhood violence and the outcome. Finally, there is a school level equation that serves to control for a set of high school characteristics, Z:

$$\beta_{00k} = \gamma_{000} + \gamma_{001} Z_k + u_k$$

Though schools are not of analytical interest here, school is included as a level in the model because of the structure of the data and to allow school characteristics to be used as control variables. Models are estimated using maximum likelihood in HLM 6.2 software (Raudenbush et al. 2004). To allow covariates to have different effects by gender, all models are estimated separately by gender.[6] All models are weighted using the wave one Addhealth weight at the individual level and the reliability of the neighborhood violence scale at the neighborhood level (see note 3 above).

5. Results

Table 1 (see page 101) shows the means of the four friendship variables by gender and by quintiles of the neighborhood violence scale. The most violent neighborhoods are in quintile five. The standard errors for each mean are included in parentheses and take into account the Addhealth complex sampling design using Stata's "svy" command. (Table C1 in Appendix C shows identical statistics by quintiles of the neighborhood disadvantage scale). Adolescents in more violent neighborhoods nominate fewer friends than their counterparts in safer neighborhoods. These differences are statistically significant for both boys and girls. In contrast, there appears to be no simple relationship between friendship closeness and neighborhood violence, though across the board girls tend to report greater closeness than boys. Turning to the composition of the friendship networks, there is a statistically significant relationship between neighborhood violence and the proportion of friends not enrolled in school at all and between neighborhood violence and the percentage of school-attending friends who go to a different school than the respondent. These unadjusted differences are statistically significant among both boys and girls. The remaining results examine the relationship between neighborhood violence and these friendship characteristics using the multi-level models to control for individual, family, neighborhood, and school characteristics.

Number of friends

Table 2 (see page 101) displays models of the number of nominated same-sex friends by gender, controlling for individual, family, and school characteristics. For boys, whether or not neighborhood disadvantage is controlled, neighborhood violence appears unrelated to number of friends, as its coefficient is small and statistically insignificant.[7] For girls, the coefficient for neighborhood violence is statistically significant but relatively small. It indicates that a one standard deviation increase in neighborhood violence decreases the number of friends (compared to an adolescent in a less violent neighborhood) by only about 3 percent.

6 In other words, estimating a single pooled model for both boys and girls would force all covariates that did not have interaction terms to have the same impact on the outcome for both boys and girls. Such a specification could lead to under-controlling for covariates that actually have different effects among boys and girls.

7 I experimented with many other nonlinear specifications of the neighborhood characteristics, but none produced a different result.

Table 1: Adolescent friendship characteristics by quintiles of neighborhood violence scale

Neighborhood violence	Number of friends nominated		Mean friendship closeness scale		Percentage of all friends who do not attend any school		Percentage of school-attending friends who attend a different school from respondent	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
1st quintile	3.62	3.57	−0.07	0.13	8.7	6.7	15.3	15.1
	(0.13)	(0.10)	(0.05)	(0.06)	(1.3)	(1.0)	(1.5)	(1.4)
2st quintile	3.25	3.56	−0.02	0.00	12.0	9.2	17.5	17.7
	(0.19)	(0.19)	(0.04)	(0.08)	(1.3)	(1.7)	(2.9)	(3.8)
3st quintile	3.13	3.23	−0.15	−0.06	15.2	10.2	22.8	18.0
	(0.15)	(0.16)	(0.07)	(0.05)	(2.0)	(1.7)	(2.2)	(2.0)
4st quintile	3.17	3.22	−0.12	0.13	20.2*	10.7	22.6	20.2
	(0.17)	(0.21)	(0.06)	(0.08)	(3.5)	(2.7)	(3.3)	(2.9)
5st quintile	2.93*	2.96*	−0.08	0.05	18.3*	15.4*	24.0*	26.5*
	(0.11)	(0.11)	(0.04)	(0.05)	(2.2)	(2.1)	(2.6)	(2.5)
Total	3.34	3.39	−0.081	0.079	12.9	9.3	18.7	18.2
	(0.11)	(0.11)	(0.033)	(0.042)	(1.2)	(1.0)	(1.4)	(1.5)
Unweighted N	3,255	3,048	3,128	2,937	3,128	2,940	3,002	2,846

(Standard error of the mean in parentheses)
Estimates Account for Addhealth Complex Sample Design
* difference from 1st quintile statistically significant at 0.05 level

Table 2: Three-level Poisson models of number of friends nominated

	Boys			Girls		
	(1)	(2)	(3)	(4)	(5)	(6)
Neighborhood violence	−0.020	−0.015	−0.016	−0.030*	−0.020	−0.021
	(0.013)	(0.013)	(0.013)	(0.013)	(0.014)	(0.013)
Neighborhood disadvantage		−0.015	−0.016		−0.035	−0.034
		(0.021)	(0.021)		(0.025)	(0.025)
Individual violence	0.040*	0.040*	0.042*	−0.010	−0.010	−0.010
	(0.007)	(0.007)	(0.007)	(0.011)	(0.012)	(0.014)
Individual violence × neighborhood violence			0.010*			0.003
			(0.004)			(0.012)
Constant	1.242*	1.244*	1.243*	1.068*	1.074*	1.068*
	(0.080)	(0.079)	(0.077)	(0.061)	(0.061)	(0.061)
Variance components						
Neighborhood	0.006	0.006	0.006	0.013	0.013	0.013
School community	0.021	0.020	0.020	0.016	0.014	0.015
N individuals	3254	3254	3254	3045	3045	3045
N neighborhoods	841	841	841	793	793	793
N school communities	80	80	80	79	79	79

Robust standard errors in parentheses
Descriptive statistics provided in Appendix C
Model includes individual, family, and school control variables (coefficients in Appendix D)
* $p < 0.05$

When neighborhood disadvantage is controlled, this coefficient shrinks and becomes non-significant. Models 3 and 6 add a term for the interaction between individual violence and neighborhood violence to test for heterogeneity in response to neighborhood violence. For boys, the coefficient for this term is statistically significant but small in magnitude, and does not appreciably change the results for the neighborhood characteristics. For girls, this term is small and statistically insignificant.

These results indicate that hypotheses 1a and 1b are both unsupported. In addition, neighborhood disadvantage is also unrelated to number of friends. It appears that the neighborhood differences in number of friends observed in Table 1 are the result of individual, family, or school level characteristics rather than neighborhood processes. Among these variables, individual violence (for boys), race, mother's age, family income (for boys), age (for girls), small school (for girls), immigrant status (for girls), parent's education (for girls), and welfare receipt (for girls) are significant predictors of number of friends. Respondents who engage in more violence report having more friends. This may reflect the tendency for adolescent delinquency and violence to occur in groups. In addition, black respondents report fewer friends than whites, respondents with older mothers report more friends, and male respondents from higher income families report more friends. Female respondents who are older, are non-immigrants, have more educated parents, whose families receive welfare, and who attend small schools report more friends (see Table D1 in Appendix D). Caution should be exercised in interpreting these coefficients, however, as they are included in the models only as control variables for the neighborhood effects, and collinearity with other control variables may be influencing their values.

Friendship closeness

Table 3 displays models of friendship closeness by gender, controlling for individual, family, and school characteristics. Whether or not neighborhood disadvantage is controlled, neighborhood violence appears unrelated to friendship closeness, as its coefficient is also small and statistically insignificant in these models. This is the case for both boys and girls and whether or not a term for the interaction between individual violence and neighborhood violence is included. These results imply that both Hypothesis 2a and hypothesis 2b are also unsupported. Though its coefficients are somewhat larger, neighborhood disadvantage is also not a significant predictor of friendship closeness. What, then, predicts friendship closeness? Among both boys and girls, respondents who engage in more violence report more friendship closeness. This also may reflect the tendency for adolescent delinquency and violence to occur in groups, since this study measures friendship closeness through frequency of interaction. In addition, for both boys and girls, age, school type, and parental education are statistically significant predictors of friendship closeness. Among boys, being Asian and having a higher family income predict friendship closeness, and among girls being Native American, an immigrant, low birth weight, and attending an urban school or a small school are significant predictors (see Appendix D, Table D2).

Friends not enrolled in school

Table 4 presents models of number of friends who do not attend school by gender of the respondent. Models (1), (2), and (3) all show that neighborhood violence is a strong predictor of having friends who have dropped out of school (or are too old to attend school) among boys, whether or not neighborhood disadvantage is controlled and whether or not a term for the interaction between individual violence and neighborhood violence is included. The coefficient from model (3) indicates that boys who live in neighborhoods with one standard deviation higher neighborhood violence have 15 percent more friends who are not attending school than those in neighborhoods with less violence. This estimate should be viewed as a conservative one, as these models control for individual violence in order to prevent attribution of effects of individual violence to neighborhood violence. This effectively assumes that none of the effect of neighborhood violence operates through its effect on individual violence. Nevertheless, these results indicate that hypothesis 4 is supported.

As expected, neighborhood violence is related to composition of friendship networks only for boys, as the coefficients in models (4), (5), and (6) are small and

Table 3: Three-level linear models of friendship closeness scale

	Boys			Girls		
	(1)	(2)	(3)	(4)	(5)	(6)
Neighborhood violence	-0.024	-0.011	-0.014	0.022	0.011	0.010
	(0.026)	(0.034)	(0.034)	(0.029)	(0.033)	(0.032)
Neighborhood disadvantage		-0.040	-0.040		0.044	0.044
		(0.042)	(0.042)		(0.049)	(0.050)
Individual violence	0.089*	0.088*	0.090*	0.131*	0.132*	0.133*
	(0.014)	(0.014)	(0.011)	(0.030)	(0.030)	(0.028)
Individual violence × neighborhood violence			0.018			0.006
			(0.012)			(0.029)
Constant	-0.191	-0.185	-0.187	-0.086	-0.090	-0.091
	(0.102)	(0.105)	(0.104)	(0.088)	(0.090)	(0.089)
Variance components						
Individual	0.815	0.815	0.814	0.882	0.881	0.881
Neighborhood	0.062	0.062	0.062	0.057	0.057	0.057
School community	0.004	0.004	0.004	0.003	0.004	0.004
N individuals	3127	3127	3127	2935	2935	2935
N neighborhoods	795	795	795	759	759	759
N school communities	80	80	80	79	79	79

Robust standard errors in parentheses
Descriptive statistics provided in Appendix C
Model includes individual, family, and school control variables (coefficients in Appendix D)
* $p < 0.05$

Table 4: Three-level Poisson models of number of friends who do not attend school

	Boys			Girls		
	(1)	(2)	(3)	(4)	(5)	(6)
Neighborhood violence	-0.146*	0.142*	0.150*	0.068	0.033	0.043
	(0.063)	(0.056)	(0.058)	(0.069)	(0.068)	(0.075)
Neighborhood disadvantage		0.015	0.016		0.125	0.124
		(0.066)	(0.066)		(0.099)	(0.099)
Individual violence	0.221*	0.221*	0.223*	0.177*	0.179*	0.178*
	(0.040)	(0.040)	(0.047)	(0.060)	(0.060)	(0.056)
Individual violence × neighborhood violence			-0.020			-0.026
			(0.021)			(0.050)
Unexcused school absences	0.021	0.021	0.023	0.046	0.048	0.049
	(0.032)	(0.032)	(0.032)	(0.036)	(0.036)	(0.036)
Constant	-2.333*	-2.333*	-2.334*	-2.539*	-2.545*	-2.539*
	(0.155)	(0.156)	(0.160)	(0.231)	(0.229)	(0.227)
Variance components						
Neighborhood	0.130	0.129	0.125	0.261	0.255	0.256
School community	0.001	0.001	0.002	0.085	0.076	0.075
N individuals	3127	3127	3127	2938	2938	2938
N neighborhoods	795	795	795	760	760	760
N school communities	80	80	80	79	79	79

Robust standard errors in parentheses
Descriptive statistics provided in Appendix C
Model includes individual, family, and school control variables (coefficients in Appendix D)
* $p < 0.05$

statistically insignificant among girls. Note also that individual violence is a strong predictor of having friends who do not attend school among both boys and girls. This result is not particularly surprising, as we would expect adolescents involved in violence to have greater likelihood of having older friends or friends who have dropped out of school. Unfortunately, it is not possible to determine from these data whether friends who do not attend school have dropped out or are simply older.

Several of the control variables are also statistically significant predictors of friends who do not attend school. Among both boys and girls, these include age, speaking a language other than English at home, family structure, and attending a private school. Among boys, being black and attending an urban school are both significant predictors, while among girls, parental occupation and low birth weight are significant predictors. (see Table D3 in Appendix D).

Friends attending different school

Finally, Table 5 (see page 105) displays models of number of school-attending friends who attend a different school than the respondent. This is a measure of the degree to which an adolescent's friendship network is centered not on his or her school, but rather on other contexts, such as the neighborhood. Recall that the exposure is the total number of friends enrolled in school, so the coefficients can be interpreted as the percentage difference in the proportion of friends attending a different school. This exposure is chosen rather than the total number of friends to avoid conflating the outcome here with that in Table 4, which measures friends who do not attend school at all.

In model (1) the relationship between neighborhood violence and the outcome is statistically insignificant among boys, but for this outcome neighborhood disadvantage is a suppressor variable – it is positively related to neighborhood disadvantage but negatively related to the outcome. In model (2), in which neighborhood disadvantage is controlled, the neighborhood violence coefficient is larger and statistically significant. The coefficient indicates that individuals who live in a neighborhood with one standard deviation higher neighborhood violence have a nine percent higher proportion of friends who attend a different school compared to an adolescent in a neighborhood with less violence. The coefficients on the neighborhood disadvantage terms indicate that adolescent boys in more disadvantaged neighborhoods tend to have more friends who attend their own school, net of neighborhood violence. At first, this result appears counterintuitive, but it may reflect the lack of other schooling options in poor neighborhoods, where one's peers likely cannot afford to attend private or religious schools and therefore must also attend the local public school.

Model 3 adds a term for the interaction between individual violence and neighborhood violence, and its coefficient is statistically significant and fairly large. This coefficient implies that the relationship between neighborhood violence and friends who attend other schools is even larger among boys who engage in more violence (or alternatively, that the relationship between individual violence and friends from other schools is stronger in more violent neighborhoods). A one standard deviation increase in individual violence increases the impact of neighborhood violence by about 50 percent (or about 5 percentage points).

Turning to the models for girls, there is also a relationship between neighborhood violence and the proportion of friends who attend a different school, though this relationship is not revealed until the interaction term is added. This interaction term takes into account the heterogeneity of response to neighborhood violence depending on individual violence. In model 6, which includes a term for the interaction between individual violence and neighborhood violence, neighborhood violence is a large and statistically significant predictor of friends who attend another school. The interaction term is negative (though not statistically significant), suggesting that more violent girls may be less affected by their neighborhood's level of violence.[8] In sum,

8 Though it is not possible to probe this finding further here, one possible explanation for this gender difference is that violence among girls is more rare than among boys (see Table C5 in Appendix C), and therefore may not be socially organized around neighborhood identities in the same way that male youth violence is (Harding 2005). For boys, the impacts of individual and neighborhood violence on the importance of neighborhoods for friendships may be mutually reinforcing, while for girls, these impacts may work at cross purposes. Though neighborhood violence (largely the result of male actions) increases the importance of neighborhood for girls' friendship networks, girls who also engage in violence may be less affected by their neighborhoods because their violent behavior is less centered around neighborhood identities. Girls involved in violence may form friendships with violent peers in whatever context they find them.

Table 5: Three–level Poisson models of number of school-attending friends who attend a different school from the respondent

	Boys			Girls		
	(1)	(2)	(3)	(4)	(5)	(6)
Neighborhood violence	0.049	0.092*	0.085*	0.058	0.078	0.094*
	(0.034)	(0.039)	(0.039)	(0.043)	(0.044)	(0.046)
Neighborhood disadvantage		−0.128*	−0.131*		−0.066	−0.067
		(0.064)	(0.063)		(0.064)	(0.064)
Individual violence	0.036	0.035	0.038	0.100*	0.100*	0.095*
	(0.026)	(0.026)	(0.026)	(0.046)	(0.046)	(0.040)
Individual violence × neighborhood violence			0.048*			−0.047
			0.017			(0.030)
Unexcused school absences	0.132*	0.132*	0.126*	0.011	0.011	0.011
	(0.039)	(0.040)	(0.042)	(0.038)	(0.038)	(0.037)
Constant	−2.333*	−2.333*	−2.334*	−2.539*	−2.545*	−2.539*
	(0.155)	(0.156)	(0.160)	(0.231)	(0.229)	(0.227)
Variance components						
Neighborhood	0.130	0.129	0.125	0.261	0.255	0.256
School community	0.001	0.001	0.002	0.085	0.076	0.075
N individuals	3127	3127	3127	2938	2938	2938
N neighborhoods	795	795	795	760	760	760
N school communities	80	80	80	79	79	79

Exposure: Total number of friends enrolled in school
Robust standard errors in parentheses
Descriptive statistics provided in Appendix C
Model includes individual, family, and school control variables (coefficients in Appendix D)
* $p < 0.05$

the results in Table 5 generally support hypothesis 3, but also suggest that there is important variation based on the adolescent's own involvement in violence. Of the control variables, immigrant status, and school location (urban/rural) are statistically significant predictors of friends who attend other schools among both boys and girls. In addition, among boys, black, other race, and parental education are significant predictors, while among girls, Native American, household size, family structure, parental occupation, private school, and school dropout rate are significant predictors.

6. Discussion

This paper has investigated the role of neighborhood violence in structuring the social networks of adolescents. In general, the findings are inconsistent with hypotheses that predict neighborhood effects on number of friends or the closeness of friendships (hypotheses 1a, 1b, 2a, and 2b). Both boys and girls in more violent neighborhoods report having fewer friends, though this appears to be the result of individual and family characteristics rather than neighborhood processes, as these neighborhood differences disappear once individual, family, and school covariates are controlled. This study finds no evidence that neighborhood violence systematically impacts the closeness of adolescent friendships for either boys or girls. These results suggest that adolescents do not react to neighborhood violence by retreating from peer social networks, nor do they react with protection strategies involving more friendships or closer friendships.

Instead, the results suggest a different type of effect of neighborhood violence on friendship networks, especially for boys. Rather than affecting number or closeness of friendships, neighborhood violence is associated with the *composition* of peer networks, i.e. the types of individuals adolescents describe as friends. Consistent with hypothesis 4, boys and girls in more violent neighborhoods are more

likely to be friends with peers with whom they do not attend school. This finding is consistent with an account in which neighborhood-based violence focuses adolescents' attention on their neighborhood as an important context for developing friendships, since neighborhood is the other primary context in which they are likely to make friends. In this account (which is purely speculative), neighborhood or other geographically based rivalries restrict opportunities for friendships to neighborhood peers, leading to fewer friends who attend the same school.

In addition, consistent with hypothesis 3, boys (but not girls) in more violent neighborhoods are also more likely to be friends with individuals who are either too old to be enrolled in school or have dropped out of school. This finding is consistent with an account in which boys in violent neighborhoods develop protection strategies that involve friendships with older individuals or individuals who are more connected to the "street culture." This gender difference in the association between neighborhood violence and friends not enrolled in school suggests that girls are subject to different effects of violence than boys. This should not be surprising given higher rates of violence among males more generally and the normativity of violent behavior among adolescent boys. Boys in more violent neighborhoods may have greater need for these protection strategies (whether or not they themselves engage in violence) and may be more likely to have access to older peers who can provide protection due to greater willingness to participate in violence among males. Indeed, were there equal effects for boys and girls on same-sex non-school friends, one might suspect that other unmeasured processes were actually at work. Future work might investigate whether girls turn to opposite-sex friends for similar security strategies.

More broadly, this study suggests that neighborhood violence has not only the developmental and biosocial effects on youth identified in the previous literature but also has social effects, altering the friendship networks of adolescents, especially boys. It shows for the first time that violence, one of the most spatially organized social phenomena, influences individuals' social relationships. For the neighborhood effects literature, these results suggest that neighborhood violence may be an important mechanism of neighborhood effects on adolescents, particularly for social outcomes involving some degree of decision-making or agency. Prior neighborhood effects research has focused on social isolation and social organization. This study suggests that by structuring who boys interact with, violence may play a role in determining the cultural messages and ideals to which they are most frequently exposed (see also Harding 2005). Those adolescents who have dropped out of school are disconnected from a critical institution that connects young people in disadvantaged neighborhoods to mainstream culture. Such adolescents can be expected to be most likely to reject conventional cultural ideals and provide their peers with an alternative source of socialization, one that offers messages different from those of parents, teachers, or religious institutions. Among potential friends from the neighborhood or elsewhere, such adolescents are most likely to spend considerable time hanging on the streets and be most enmeshed in the "street culture" described by Anderson (1999), Dance (2002), and others.

This study also carries implications for the analysis of the Addhealth network data and for future efforts to collect ego-based network data on adolescents. Because adolescents from more violent and more disadvantaged neighborhoods have more friends who are not enrolled in school (or friends not enrolled in the school they attend), friendship network data that rely on school-based samples to link friends together may be inappropriate for these adolescents. The Addhealth friend network data allow researchers to link the data records from friends together to measure friend characteristics from the friends' own data records. However, given that many of the friends of adolescents from violent or disadvantaged neighborhoods are not themselves in the sample (because they do not attend school or do not attend the respondent's school or its "sister" school), this feature of the Addhealth data is of little use to researchers interested in these populations.[9] In addition, researchers who use this feature of the data to study

9 The Addhealth study initially sampled high schools and then attempted to select one middle school or junior high school whose students would likely to attend the sampled high school. These middle schools or junior high schools are called "sister" schools by Addhealth researchers.

peer networks of adolescents among the general population of adolescents should recognize that dropping friends who are not in the school-based sample may bias results. The Addhealth friend data seem to have been collected with a suburban, school-based model of adolescent social networks in mind, in which important friendships are those with school peers. This paper shows that this model does not seem to apply to many adolescents in disadvantaged or violent neighborhoods. For example, Table 1 shows that among boys and girls in the most violent neighborhoods, about one-quarter of friends who attend school go to a different school than the respondent, and about one sixth of all friends do not attend school at all.

In closing, the reader is reminded of some of the key limitations of this study. First, because administrative crime data at the neighborhood level are not available, neighborhood violence is measured by aggregating individual responses to the neighborhood level. Small numbers of respondents in some neighborhoods may lead to considerable measurement error, potentially biasing neighborhood violence coefficients downward. In addition, the sample upon which this aggregation is performed includes only those adolescents enrolled in sampled schools and therefore misses other neighborhood adolescents, particularly those who have already dropped out but also those who attend non-sampled schools. Since dropouts are in all likelihood even more exposed to and involved in violence, measures of perceptions of neighborhood violence may be understated, particularly in the most violent neighborhoods. Second, estimates of the impact of neighborhood violence may also be conservative because individual violence is controlled (both in order to allow for interaction terms and to prevent spurious associations due to individual violence causing greater perception of violence among neighbors). Controlling for individual violence removes any effect of neighborhood violence that operates through individual violence. Third, because of data limitations, this study has examined only a limited set of characteristics of adolescent friendship networks. Hopefully with more available measures, future research will be able to examine a wider set of friend characteristics.

Finally, the possibility of unmeasured sources of spuriousness for the relationships between neighborhood violence and composition of peer networks means that there could be alternative explanations for the associations documented in this study. In particular, if there are additional unmeasured individual, family, school, or neighborhood characteristics that predict both exposure to a violent neighborhood and the composition of peer networks, then the associations emphasized here may be upwardly biased. For example, if parents who are less able or willing to monitor and control their adolescents' friendship networks are also more likely to live in a violent neighborhood, then failure to control for this family characteristic could bias upward estimates of the relationship between neighborhood violence and composition of peer networks. Or if less socially organized neighborhoods had more violence and were less able to monitor cross-age peer interactions (one possible component of friends who do not attend school), then failure to control for this neighborhood characteristic could bias upward estimates of the relationship between neighborhood violence and friends who do not attend school. Given that experimental manipulation of neighborhood violence is not ethically possible and that the prospects for an instrumental variable for neighborhood of residence are slim, only future data sets that include such measures can resolve these types of questions.

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Appendix A: Descriptions of Individual, Family, and School Control Variables (All measured at wave one)

Individual characteristics:
Race/ethnicity: A set of indicator (0/1) variables for the adolescent's race and ethnicity. In Addhealth, the adolescent can self-identify as belonging to one or more categories, including white, black, Native American, Asian, or other race. White is the omitted category in models. I also include an indicator variable for those adolescents who choose more than one category. The adolescent can also choose to identify as Hispanic/Latino or not.
Immigrant: Born outside the United States.
Low birth weight: Less than 88 ounces (2.5 kg).
Mother's age at birth: The age in years of the mother when the adolescent was born.

Family characteristics:
Home language not English
Household size: The number of persons living in the adolescent's household.
Household type: Married, single parent, and other (which includes step-parent families). Married is the omitted category.

Parent variables are based on the primary residential parent who completed the parent questionnaire, usually the biological mother but sometimes the father or other caretaker.
Parent immigrant: Primary parent not born in the US.
Parental education: Primary parent's completed level of education: less than high school, high school graduate, some college or trade school, and college graduate. Less than high school is the omitted category.
Parent professional occupation: Primary parent currently works in a managerial or professional occupation.
Parent disabled: Primary parent is mentally or physically handicapped.
Parent welfare receipt: Primary parent currently receives welfare, either for self or for the adolescent.
Log family income: The natural logarithm of the household's total income in thousands of dollars, as reported in the parent questionnaire.

Community/school characteristics:
Urbanicity: School location urban, suburban, or rural. Suburban is the omitted category.
School size: Number of students at the school; small (< 400), medium (400–1000), and large (> 1000). Medium is the omitted category.
Cumulative dropout rate: The proportion of students who begin the school in its lowest grade who fail to complete its highest grade.
Percent college prep program: The proportion of twelfth graders who are enrolled in an academic or college prep program.
Catholic school
Private school: All other non-public schools.

Appendix B: Individual Violence, Neighborhood Violence, and Friendship Closeness Scales

Construction of the individual and neighborhood violence scales is based on methods described in Raudenbush and Sampson (1999). In the case of the neighborhood violence scale, these methods provide a method for aggregating survey data collected from individual respondents to the neighborhood level. Each scale combines data from multiple indicators of the concept per respondent. There are seven binary indicators for the individual violence measure and nine binary indicators for the neighborhood violence measure (these indicators are described in the main text). The violence scales are constructed using all wave one Addhealth cases, not just those respondents used in this analysis (which is limited to those selected for the detailed module on friendships).

The multiple indicators can be thought of as hierarchically nested in a three level model: items nested within individuals nested within neighborhoods. I modeled these items using three-level logit models. The dependent variable in each model is the value of the particular indicator. The level 1 model includes a constant and dummy variables for each item (minus one to allow for an omitted category). The level two model includes a constant with a random effect and age and gender indicators. These age and gender variables remove age- and gender-based variation from the scale. The omitted category for the age indicators is 15, and the gender indicator is one for male and zero for female. The level three model includes only a constant with a random effect.

Table B1: Multi-level logit model used in construction of individual violence scalew

Term	Coefficient (standard error)
Constant	–2.986 (0.047)
Item-level variables:	
Item 1 (in physical fight)	omitted
Item 2 (pulled knife/gun)	–3.001 (0.041)
Item 3 (shot/stabbed someone)	–4.079 (0.055)
Item 4 (serious fight)	–0.032 (0.022)
Item 5 (caused injury requiring treatment)	–1.058 (0.026)
Item 6 (use or threaten with weapon)	–3.174 (0.043)
Item 7 (in group fight)	–0.957 (0.028)
Individual-level variables:	
Age 11	–0.085 (0.397)
Age 12	–0.140 (0.107)
Age 13	–0.022 (0.056)
Age 14	0.063 (0.052)
Age 15	omitted
Age 16	–0.125 (0.047)
Age 17	–0.297 (0.052)
Age 18	–0.483 (0.054)
Age 19	–0.362 (0.108)
Age 20	–0.366 (0.280)
Age 21	–0.680 (1.028)
Male	1.051 (0.033)
Variance components:	
Neighborhood	0.199
Individual	2.580
N items	142,555
N individuals	20,399
N neighborhoods	2,431

Table B2: Multi-level logit model used in construction of neighborhood violence scale

Term	Coefficient (standard error)
Constant	-2.645 (0.034)
Item-level variables:	
Item 1 (saw shooting/stabbing)	omitted
Item 2 (had weapon pulled)	0.042 (0.031)
Item 3 (shot)	-2.501 (0.065)
Item 4 (stabbed)	-1.098 (0.039)
Item 5 (was jumped)	-0.102 (0.031)
Item 6 (injured in fight)	-0.429 (0.033)
Item 7 (neighborhood not safe)	-0.116 (0.031)
Item 8 (> = 50-50 chance getting killed)	0.262 (0.030)
Item 9 (drug problem in neighborhood)	-0.347 (0.035)
Individual-level variables:	
Age 11	-0.415 (0.532)
Age 12	-0.430 (0.081)
Age 13	-0.356 (0.045)
Age 14	-0.129 (0.040)
Age 15	omitted
Age 16	0.009 (0.035)
Age 17	-0.011 (0.036)
Age 18	-0.028 (0.038)
Age 19	0.070 (0.076)
Age 20	0.241 (0.176)
Age 21	0.100 (0.390)
Male	0.502 (0.022)
Variance components:	
Neighborhood	0.302
Individual	0.775
N items	180,158
N individuals	20,531
N neighborhoods	2,449

After estimating this model, the predicted value of the constant for either the individual (for the individual violence scale) or the neighborhood (for the neighborhood scale) is the measure for the scale in the logit metric (known as empirical Bayes estimates). These values are the sum of the constant and either the individual-specific or neighborhood-specific random effect. The variables are then standardized for easier interpretation. Coefficients on the item indicators can be interpreted as item "severity" relative to the omitted category. The more negative a coefficient, the rarer the indicator. The age and gender indicators capture differences by age and gender in the items, and they allow the resulting scales to be independent of differences across neighborhoods in the age and gender of sampled individuals. An additional advantage of this framework is that individuals with missing data on some items do not need to be excluded from the model as long as they have data on at least one item. Reliability of the individual violence scale has a mean of 0.58 and a standard deviation of 0.14. Reliability of the neighborhood violence scale has a mean of 0.48 and a standard deviation of 0.28 (see Raudenbush and Sampson 1999 on calculating reliabilities).

Table B3: Multi-level logit model used in construction of friendship closeness scale

Term	Coefficient (standard error)
Constant	0.040 (0.017)
Item-level variables:	
Item 1 (went to friend's house in past 7 days)	omitted
Item 2 (met friend after school in past 7 days)	0.511 (0.021)
Item 3 (spent time with friend last weekend)	0.243 (0.021)
Item 4 (talked to friend about problem past 7 days)	-0.030 (0.021)
Item 5 (talked to friend on phone in past 7 days)	0.994 (0.022)
Friend-level variables:	
Friend number: 1	omitted
Friend number: 2	-0.522 (0.023)
Friend number: 3	-0.839 (0.025)
Friend number: 4	-1.046 (0.029)
Friend number: 5	-1.182 (0.033)
Individual-level variables:	
One friend	-0.285 (0.063)
Two friends	-0.152 (0.049)
Three friends	-0.010 (0.042)
Four friends	-0.092 (0.044)
Five friends	omitted
Variance components:	
Friend	0.502
Individual	0.969
N items	112,676
N friends	22,539
N individuals	6,469

The friendship closeness scale is constructed in a similar fashion, except in this scale the binary items are nested within friends which are nested within respondents (these items are described in the main text). Controls are included at the friend level for the order in which the friend was nominated, and controls are included at the respondent level for the total number of friends nominated. This removes from the scale variation in closeness due to nomination order or total number of friends the respondent nominated. Reliability of the friendship closeness scale has a mean of 0.65 and standard deviation of 0.13.

The estimated models used to construct the scales are displayed in Tables B1–B3.

Appendix C: Descriptive Statistics

Table C1: Adolescent friendship characteristics by quintiles of neighborhood disadvantage scale

Neighborhood disadvantage	Number of friends nominated		Mean friendship closeness scale		Percentage of all friends who do not attend any school		Percentage of school-attending friends who attend a different school from respondent	
	Boys	Girls	Boys	Boys	Boys	Girls	Boys	Girls
1st quintile	3.66	3.78	6.8	6.8	6.8	5.5	15.2	17.1
	(0.15)	(0.12)	(1.6)	(1.6)	(1.6)	(1.4)	(2.4)	(2.2)
2st quintile	3.54	3.56	9.3	9.3	9.3	7.8	20.0	17.7
	(0.11)	(0.12)	(1.4)	(1.4)	(1.4)	(1.0)	(2.3)	(2.3)
3st quintile	3.44	3.40	14.3	14.3	14.3	8.3	18.0	16.1
	(0.14)	(0.15)	(1.4)	(1.4)	(1.4)	(1.2)	(2.1)	(2.0)
4st quintile	2.93*	2.98*	18.2*	18.2*	18.2*	14.5	19.7	19.9
	(0.18)	(0.15)	(1.9)	(1.9)	(1.9)	(1.7)	(2.2)	(2.3)
5st quintile	2.85*	2.77*	17.8*	17.8*	17.8*	15.7*	22.3	25.0
	(0.22)	(0.20)	(2.3)	(2.3)	(2.3)	(2.4)	(3.0)	(4.5)
Total	3.37	3.39	12.9	12.9	12.9	9.3	18.7	18.2
	(0.11)	(0.11)	(1.2)	(1.2)	(1.2)	(1.0)	(1.4)	(1.5)
Unweighted N	3,255	3,048	3,128	3,128	3,128	2,940	3,002	2,846

(Standard error of the mean in parentheses)
Estimates Account for Addhealth Complex Sample Design
* difference from 1st quintile statistically significant at 0.05 level

Table C2: Descriptive statistics for variables in Table 2 models

	Boys		Girls	
	Mean	SD	Mean	SD
Individual-level variables:				
Number of friends nominated	3.42	1.56	3.31	1.54
Individual violence scale	0.02	1.08	−0.03	0.92
Age	16.16	1.67	16.00	1.68
Hispanic	0.20	0.40	0.21	0.41
Black	0.18	0.39	0.18	0.38
Native American	0.04	0.19	0.03	0.17
Asian	0.12	0.32	0.11	0.31
Other race	0.12	0.32	0.12	0.32
Multi-racial	0.05	0.22	0.04	0.2
Home language not English	0.14	0.35	0.15	0.35
Immigrant	0.12	0.32	0.12	0.32
Household size	4.68	1.81	4.75	1.81
Single-parent household	0.24	0.43	0.23	0.42
Other household type	0.23	0.42	0.24	0.43
Parent immigrant	0.27	0.44	0.26	0.44
Parental education: high school graduate	0.29	0.45	0.28	0.45
Parental education: some college	0.28	0.45	0.26	0.44
Parental education: college graduate	0.22	0.41	0.23	0.42
Parent professional occupation	0.30	0.46	0.33	0.47
Parent disabled	0.04	0.2	0.05	0.22
Parent welfare receipt	0.09	0.29	0.11	0.31
Log family income	3.51	0.86	3.54	0.84
Low birth weight	0.08	0.27	0.09	0.29
Mother's age at birth	25.68	5.48	25.62	5.48
Neighborhood variables:				
Neighborhood violence scale	−0.05	1.08	−0.03	1.08
Neighborhood disadvantage scale	−0.01	0.94	0	0.98
Community/school variables:				
Urban	0.30	0.46	0.30	0.46
Rural	0.17	0.38	0.18	0.38
Small school size (< 400)	0.17	0.38	0.18	0.38
Large school size (> 1000)	0.47	0.50	0.47	0.50
Cumulative dropout rate	12.31	12.35	12.47	12.35
% College prep program	56.71	28.04	57.09	27.1
Catholic school	0.04	0.19	0.03	0.16
Private school	0.03	0.16	0.03	0.16

Note: See variable descriptions in Appendix A

Table C3: Descriptive statistics for variables in Table 3 models

	Boys		Girls	
	Mean	SD	Mean	SD
Individual-level variables				
Friendship closeness scale	−0.01	1	0	1
Individual violence scale	0.03	1.08	−0.02	0.92
Number unexcused absences	0.45	1.18	0.37	1.13
Age	16.13	1.66	15.98	1.68
Hispanic	0.20	0.40	0.20	0.40
Black	0.18	0.38	0.17	0.38
Native American	0.04	0.19	0.03	0.18
Asian	0.12	0.32	0.11	0.31
Other race	0.12	0.32	0.11	0.32
Multi-racial	0.05	0.22	0.04	0.2
Home language not English	0.14	0.35	0.14	0.35
Immigrant	0.12	0.32	0.11	0.31
Household size	4.67	1.71	4.73	1.73
Single parent household	0.24	0.43	0.22	0.42
Other household type	0.22	0.42	0.24	0.43
Parent immigrant	0.27	0.44	0.26	0.44
Parental education: high school graduate	0.29	0.45	0.28	0.45
Parental education: some college	0.29	0.45	0.27	0.44
Parental education: college graduate	0.22	0.42	0.24	0.43
Parent professional occupation	0.31	0.46	0.33	0.47
Parent disabled	0.04	0.2	0.05	0.22
Parent welfare receipt	0.09	0.28	0.10	0.31
Log family income	3.52	0.85	3.56	0.83
Low birth weight	0.08	0.27	0.09	0.29
Mother's age at birth	25.70	5.48	25.69	5.48
Neighborhood variables				
Neighborhood violence scale	−0.07	1.08	−0.04	1.09
Neighborhood disadvantage scale	−0.02	0.92	−0.02	0.96
Community/school variables				
Urban	0.30	0.46	0.30	0.46
Rural	0.17	0.38	0.18	0.38
Small school size (< 400)	0.17	0.38	0.18	0.38
Large school size (> 1000)	0.47	0.50	0.47	0.50
Cumulative dropout rate	12.31	12.35	12.47	12.35
% College prep program	57.52	27.31	57.09	27.1
Catholic school	0.04	0.19	0.03	0.16
Private school	0.03	0.16	0.03	0.16

Note: See variable descriptions in Appendix A

Table C4: Descriptive statistics for variables in Table 4 models

	Boys		Girls	
	Mean	SD	Mean	SD
Individual-level variables				
Number of friends nominated	3.55	1.43	3.43	1.43
Number of friends not attending school	0.46	0.89	0.31	0.71
Individual violence scale	0.03	1.08	−0.02	0.92
Number unexcused absences	0.45	1.18	0.37	1.13
Age	16.13	1.66	15.98	1.68
Hispanic	0.20	0.40	0.20	0.40
Black	0.18	0.38	0.17	0.38
Native American	0.04	0.19	0.03	0.18
Asian	0.12	0.32	0.11	0.31
Other race	0.12	0.32	0.11	0.32
Multi-racial	0.05	0.22	0.04	0.20
Home language not English	0.14	0.35	0.14	0.35
Immigrant	0.12	0.32	0.11	0.31
Household size	4.67	1.71	4.73	1.73
Single parent household	0.24	0.43	0.22	0.42
Other household type	0.22	0.42	0.24	0.43
Parent immigrant	0.27	0.44	0.26	0.44
Parental education: high school graduate	0.29	0.45	0.28	0.45
Parental education: some college	0.29	0.45	0.27	0.44
Parental education: college graduate	0.22	0.42	0.24	0.43
Parent professional occupation	0.31	0.46	0.33	0.47
Parent disabled	0.04	0.20	0.05	0.22
Parent welfare receipt	0.09	0.28	0.10	0.31
Log family income	3.52	0.85	3.56	0.83
Low birth weight	0.08	0.27	0.09	0.29
Mother's age at birth	25.7	5.48	25.69	5.48
Neighborhood variables				
Neighborhood violence scale	−0.07	1.08	−0.04	1.09
Neighborhood disadvantage scale	−0.02	0.92	−0.02	0.96
Community/school variables				
Urban	0.30	0.46	0.30	0.46
Rural	0.17	0.38	0.18	0.38
Small school size (< 400)	0.17	0.38	0.18	0.38
Large school size (> 1000)	0.47	0.50	0.47	0.50
Cumulative dropout rate	12.31	12.35	12.47	12.35
% College prep program	56.71	28.04	57.09	27.1
Catholic school	0.04	0.19	0.03	0.16
Private school	0.03	0.16	0.03	0.16

Note: See variable descriptions in Appendix A

Table C5: Descriptive statistics for variables in Table 5 models

	Boys		Girls	
	Mean	SD	Mean	SD
Individual-level variables				
Number of friends who attend school	3.23	1.44	3.22	1.43
Number of friends attending different school	0.62	0.99	0.58	0.93
Individual violence scale	0.01	1.07	−0.03	0.92
Number unexcused absences	0.43	1.13	0.36	1.11
Age	16.09	1.65	15.94	1.67
Hispanic	0.19	0.39	0.20	0.40
Black	0.18	0.38	0.17	0.37
Native American	0.04	0.19	0.03	0.18
Asian	0.12	0.32	0.11	0.32
Other race	0.12	0.32	0.11	0.32
Multi-racial	0.05	0.22	0.04	0.2
Home language not English	0.14	0.34	0.14	0.35
Immigrant	0.12	0.32	0.11	0.31
Household size	4.68	1.71	4.73	1.71
Single parent household	0.24	0.43	0.23	0.42
Other household type	0.22	0.41	0.23	0.42
Parent immigrant	0.26	0.44	0.25	0.44
Parental education: high school graduate	0.29	0.45	0.28	0.45
Parental education: some college	0.29	0.45	0.27	0.44
Parental education: college graduate	0.23	0.42	0.24	0.43
Parent professional occupation	0.31	0.46	0.34	0.47
Parent disabled	0.04	0.2	0.05	0.22
Parent welfare receipt	0.09	0.28	0.10	0.30
Log family income	3.53	0.85	3.57	0.84
Low birth weight	0.08	0.27	0.09	0.29
Mother's age at birth	25.74	5.5	25.76	5.47
Neighborhood variables				
Neighborhood violence scale	−0.09	1.08	−0.06	1.10
Neighborhood disadvantage scale	−0.04	0.93	−0.03	0.95
Community/school variables				
Urban	0.30	0.46	0.30	0.46
Rural	0.17	0.38	0.18	0.38
Small school size (< 400)	0.17	0.38	0.18	0.38
Large school size (> 1000)	0.47	0.50	0.47	0.50
Cumulative dropout rate	12.31	12.35	12.47	12.35
% College prep program	56.71	28.04	57.09	27.1
Catholic school	0.04	0.19	0.03	0.16
Private school	0.03	0.16	0.03	0.16

Note: See variable descriptions in Appendix A

Appendix D: Coefficients on Control Variables from Models in Tables 2–5

Table D1: Control variable coefficients from models in Table 2

	(1)	(2)	(3)	(4)	(5)	(6)
Individual / family level variables						
Age	−0.019	−0.019	−0.019	−0.038*	−0.039*	−0.038*
	(0.015)	(0.015)	(0.015)	(0.007)	(0.007)	(0.007)
Hispanic	0.091	0.092	0.089	0.010	0.010	0.010
	(0.051)	(0.052)	(0.051)	(0.040)	(0.040)	(0.040)
Black	−0.093*	−0.090*	−0.090*	−0.115*	−0.105*	−0.105*
	(0.036)	(0.037)	(0.038)	(0.030)	(0.030)	(0.029)
Native American	−0.034	−0.034	−0.030	0.018	0.018	0.019
	(0.050)	(0.050)	(0.049)	(0.053)	(0.054)	(0.057)
Asian	−0.019	−0.018	−0.011	−0.002	0.000	0.001
	(0.047)	(0.047)	(0.048)	(0.034)	(0.033)	(0.033)
Other race	0.022	0.022	0.026	−0.039	−0.039	−0.038
	(0.021)	(0.021)	(0.021)	(0.052)	(0.051)	(0.051)
Multi-racial	0.053	0.052	0.049	0.137	0.134	0.133
	(0.030)	(0.030)	(0.030)	(0.071)	(0.072)	(0.075)
Home language not English	−0.043	−0.042	−0.040	0.011	0.011	0.011
	(0.034)	(0.034)	(0.035)	(0.049)	(0.049)	(0.051)

Table D1: Control variable coefficients from models in Table 2 (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)
Immigrant	−0.009	−0.009	−0.011	−0.143*	−0.142*	−0.142*
	(0.025)	(0.025)	(0.025)	(0.032)	(0.032)	(0.031)
Household size	0.014	0.014	0.014	0.008	0.008	0.008
	(0.009)	(0.009)	(0.009)	(0.010)	(0.010)	(0.010)
Single parent household	0.019	0.019	0.022	0.003	0.003	0.003
	(0.029)	(0.030)	(0.030)	(0.019)	(0.019)	(0.019)
Other household type	−0.006	−0.007	−0.005	−0.041	−0.041	−0.040
	(0.033)	(0.033)	(0.032)	(0.025)	(0.025)	(0.026)
Parent immigrant	−0.049	−0.049	−0.050	0.045	0.044	0.045
	(0.039)	(0.039)	(0.039)	(0.050)	(0.050)	(0.051)
Parental education – high school graduate	−0.063	−0.063	−0.064	0.095*	0.094*	0.094*
	(0.048)	(0.047)	(0.047)	(0.042)	(0.042)	(0.042)
Parental education – some college	−0.020	−0.020	−0.021	0.082*	0.079*	0.080*
	(0.039)	(0.038)	(0.038)	(0.037)	(0.037)	(0.037)
Parental education – college	−0.027	−0.028	−0.031	0.095*	0.091	0.091
	(0.061)	(0.061)	(0.061)	(0.047)	(0.048)	(0.048)
Parent professional/managerial occupation	−0.019	−0.020	−0.020	0.070	0.069	0.069
	(0.033)	(0.033)	(0.033)	(0.039)	(0.039)	(0.040)
Parent disabled	0.065	0.065	0.064	−0.077	−0.077	−0.076
	(0.046)	(0.046)	(0.046)	(0.045)	(0.045)	(0.045)
Family welfare receipt	−0.057	−0.056	−0.059	0.061*	0.062*	0.062*
	(0.053)	(0.053)	(0.052)	(0.025)	(0.025)	(0.025)
Log family income	0.054*	0.054*	0.054*	0.010	0.009	0.009
	(0.021)	(0.021)	(0.021)	(0.020)	(0.021)	(0.021)
Low birth weight	−0.005	−0.004	−0.004	−0.048	−0.049	−0.049
	(0.063)	(0.063)	(0.063)	(0.046)	(0.046)	(0.046)
Mother's age at birth	0.006*	0.006*	0.006*	0.004*	0.004*	0.004*
	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
School/community level variables						
Urban	−0.085	−0.084	−0.085	−0.002	−0.002	−0.003
	(0.051)	(0.051)	(0.051)	(0.048)	(0.046)	(0.046)
Rural	0.075	0.079	0.078	−0.058	−0.048	−0.048
	(0.072)	(0.071)	(0.071)	(0.064)	(0.064)	(0.064)
Small	0.029	0.031	0.033	0.149*	0.153*	0.153*
	(0.077)	(0.077)	(0.076)	(0.061)	(0.061)	(0.061)
Large	−0.004	−0.009	−0.009	0.006	−0.004	−0.004
	(0.055)	(0.054)	(0.054)	(0.058)	(0.055)	(0.055)
Cumulative dropout rate	0.001	0.001	0.001	0.000	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Percent in college prep program	0.001	0.001	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Catholic school	0.069	0.062	0.062	−0.004	−0.019	−0.019
	(0.065)	(0.064)	(0.064)	(0.063)	(0.058)	(0.058)
Private school	−0.036	−0.040	−0.040	0.060	0.055	0.053
	(0.057)	(0.057)	(0.057)	(0.073)	(0.073)	(0.071)

Robust standard errors in parentheses
* $p < 0.05$

Table D2: Control variable coefficients from models in Table 3

	(1)	(2)	(3)	(4)	(5)	(6)
Individual / family level variables						
Age	0.113*	0.113*	0.113*	0.059*	0.060*	0.060*
	(0.018)	(0.018)	(0.018)	(0.018)	(0.017)	(0.018)
Hispanic	0.019	0.018	0.014	-0.081	-0.079	-0.079
	(0.073)	(0.072)	(0.073)	(0.077)	(0.078)	(0.078)
Black	0.077	0.085	0.086	-0.069	-0.081	-0.082
	(0.071)	(0.067)	(0.066)	(0.077)	(0.078)	(0.078)
Native American	0.240	0.236	0.242	-0.420*	-0.419*	-0.416*
	(0.180)	(0.183)	(0.184)	(0.180)	(0.181)	(0.180)
Asian	0.200*	0.201*	0.213*	-0.069	-0.070	-0.070
	(0.095)	(0.095)	(0.098)	(0.085)	(0.084)	(0.083)
Other race	-0.079	-0.080	-0.074	-0.116	-0.115	-0.115
	(0.082)	(0.082)	(0.084)	(0.088)	(0.087)	(0.086)
Multi-rRacial	-0.120	-0.121	-0.127	-0.041	-0.037	-0.038
	(0.104)	(0.104)	(0.104)	(0.125)	(0.124)	(0.121)
Home language not English	0.088	0.089	0.091	0.038	0.037	0.036
	(0.067)	(0.067)	(0.067)	(0.043)	(0.043)	(0.043)
Immigrant	-0.086	-0.087	-0.089	0.209*	0.208*	0.210*
	(0.057)	(0.058)	(0.055)	(0.086)	(0.086)	(0.082)
Household Size	-0.016	-0.016	-0.017	0.008	0.008	0.008
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Single parent household	0.025	0.024	0.029	0.071	0.070	0.070
	(0.075)	(0.074)	(0.072)	(0.122)	(0.124)	(0.124)
Other household type	-0.016	-0.018	-0.016	-0.083	-0.083	-0.083
	(0.085)	(0.085)	(0.084)	(0.050)	(0.050)	(0.051)
Parent immigrant	0.058	0.057	0.056	-0.013	-0.012	-0.011
	(0.066)	(0.066)	(0.066)	(0.053)	(0.053)	(0.055)
Parental education – high school graduate	0.113	0.111	0.110	0.081	0.082	0.083
	(0.096)	(0.098)	(0.097)	(0.050)	(0.050)	(0.050)
Parental education – some college	0.137*	0.134*	0.132*	0.177*	0.182*	0.182*
	(0.065)	(0.067)	(0.066)	(0.078)	(0.076)	(0.075)
Parental education – college	0.103	0.099	0.093	0.299*	0.306*	0.306*
	(0.083)	(0.086)	(0.084)	(0.095)	(0.096)	(0.095)
Parent professional/managerial occupation	0.065	0.062	0.061	-0.072	-0.070	-0.071
	(0.056)	(0.056)	(0.055)	(0.061)	(0.061)	(0.061)
Parent disabled	-0.037	-0.037	-0.038	0.122	0.122	0.123
	(0.131)	(0.130)	(0.130)	(0.103)	(0.103)	(0.103)
Family welfare receipt	0.029	0.031	0.026	0.135	0.131	0.131
	(0.069)	(0.069)	(0.069)	(0.124)	(0.123)	(0.123)
Low family income	0.072*	0.070*	0.070*	0.054	0.056	0.056*
	(0.030)	(0.030)	(0.029)	(0.030)	(0.030)	(0.028)
Low birth weight	0.085	0.087	0.086	-0.139*	-0.138*	-0.138*
	(0.110)	(0.110)	(0.109)	(0.056)	(0.056)	(0.056)
Mother's age at birth	-0.005	-0.006	-0.006	0.000	0.000	0.000
	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)

Table D2: Control variable coefficients from models in Table 3 (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)
School/community level variables						
Urban	-0.094	-0.088	-0.090	-0.148*	-0.154*	-0.154*
	(0.068)	(0.069)	(0.068)	(0.054)	(0.056)	(0.055)
Rural	-0.135	-0.125	-0.123	-0.096	-0.110	-0.111
	(0.084)	(0.085)	(0.085)	(0.063)	(0.065)	(0.066)
Small	-0.145	-0.138	-0.137	-0.300*	-0.305*	-0.304*
	(0.090)	(0.092)	(0.092)	(0.103)	(0.104)	(0.103)
Large	0.092	0.079	0.079	0.113	0.127	0.127
	(0.082)	(0.084)	(0.084)	(0.076)	(0.080)	(0.079)
Cumulative dropout rate	-0.003	-0.003	-0.002	-0.004	-0.004	-0.004
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Percent in college prep program	0.000	0.000	0.000	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Catholic school	0.506*	0.494*	0.495*	0.424*	0.437*	0.437*
	(0.115)	(0.112)	(0.109)	(0.182)	(0.178)	(0.177)
Private school	-0.494*	-0.496*	-0.497*	0.062	0.061	0.057
	(0.136)	(0.126)	(0.126)	(0.119)	(0.120)	(0.121)

Robust standard errors in parentheses
* $p < 0.05$

Table D3: Control variable coefficients from models in Table 4

	(1)	(2)	(3)	(4)	(5)	(6)
Individual/family level variables						
Age	0.325*	0.325*	0.324*	0.382*	0.383*	0.382*
	(0.045)	(0.045)	(0.045)	(0.035)	(0.035)	(0.035)
Hispanic	0.086	0.086	0.096	0.219	0.220	0.222
	(0.143)	(0.142)	(0.142)	(0.187)	(0.183)	(0.181)
Black	-0.390*	-0.393*	-0.386*	0.068	0.032	0.036
	(0.128)	(0.132)	(0.132)	(0.146)	(0.162)	(0.155)
Native American	-0.120	-0.119	-0.121	-0.348	-0.347	-0.360
	(0.110)	(0.111)	(0.109)	(0.265)	(0.264)	(0.261)
Other race	0.070	0.071	0.072	-0.362	-0.365	-0.367
	(0.115)	(0.117)	(0.114)	(0.194)	(0.192)	(0.193)
Multi-rRacial	0.336*	0.337*	0.332*	-0.129	-0.114	-0.110
	(0.114)	(0.113)	(0.115)	(0.187)	(0.184)	(0.183)
Home language not English	-0.186*	-0.187*	-0.188*	-0.277*	-0.279*	-0.274*
	(0.081)	(0.081)	(0.082)	(0.104)	(0.103)	(0.104)
Immigrant	-0.287*	-0.287*	-0.284*	0.034	0.033	0.028
	(0.134)	(0.133)	(0.128)	(0.119)	(0.121)	(0.119)
Household size	-0.042	-0.042	-0.042	-0.049	-0.050	-0.051
	(0.022)	(0.022)	(0.022)	(0.038)	(0.038)	(0.038)
Single parent household	0.270*	0.270*	0.260*	0.406*	0.403*	0.403*
	(0.100)	(0.101)	(0.104)	(0.114)	(0.115)	(0.116)
Other household type	0.134	0.135	0.130	0.206	0.206	0.203
	(0.076)	(0.076)	(0.073)	(0.124)	(0.125)	(0.121)

Table D3: Control variable coefficients from models in Table 4 (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)
Parent immigrant	0.016	0.017	0.013	−0.048	−0.055	−0.057
	(0.087)	(0.088)	(0.084)	(0.224)	(0.228)	(0.229)
Parental education – high school graduate	0.047	0.048	0.052	−0.117	−0.116	−0.117
	(0.098)	(0.099)	(0.100)	(0.139)	(0.138)	(0.137)
Parental education – some college	−0.084	−0.083	−0.078	−0.188	−0.180	−0.182
	(0.146)	(0.147)	(0.150)	(0.148)	(0.147)	(0.150)
Parental education – college	−0.034	−0.033	−0.026	−0.363	−0.350	−0.352
	(0.171)	(0.172)	(0.174)	(0.294)	(0.298)	(0.294)
Parent professional/managerial occupation	−0.019	−0.018	−0.016	−0.199*	−0.199*	−0.194*
	(0.077)	(0.077)	(0.076)	(0.087)	(0.087)	(0.083)
Parent disabled	0.116	0.116	0.116	0.285*	0.292*	0.290*
	(0.149)	(0.149)	(0.150)	(0.146)	(0.147)	(0.147)
Family welfare receipt	0.157	0.155	0.163	0.310*	0.296*	0.300*
	(0.093)	(0.093)	(0.094)	(0.150)	(0.150)	(0.151)
Log family income	−0.023	−0.023	−0.024	0.110	0.115	0.118
	(0.067)	(0.067)	(0.067)	(0.070)	(0.069)	(0.065)
Low birth weight	0.059	0.058	0.062	0.502*	0.502*	0.503*
	(0.254)	(0.253)	(0.257)	(0.217)	(0.219)	(0.219)
Mother's age at birth	−0.006	−0.006	−0.006	−0.016	−0.016	−0.016
	(0.006)	(0.006)	(0.006)	(0.010)	(0.010)	(0.010)
School/community level variables						
Urban	0.362*	0.358*	0.364*	0.054	0.050	0.053
	(0.084)	(0.088)	(0.088)	(0.144)	(0.142)	(0.141)
Rural	0.206	0.200	0.207	−0.069	−0.121	−0.116
	(0.117)	(0.117)	(0.120)	(0.216)	(0.210)	(0.206)
Small	−0.079	−0.082	−0.078	0.159	0.144	0.137
	(0.149)	(0.148)	(0.150)	(0.240)	(0.233)	(0.231)
Large	−0.081	−0.076	−0.074	0.062	0.091	0.085
	(0.123)	(0.127)	(0.128)	(0.193)	(0.193)	(0.190)
Cumulative dropout rate	0.001	0.001	0.001	0.003	0.001	0.001
	(0.003)	(0.003)	(0.003)	(0.006)	(0.006)	(0.006)
Percent in college prep program	−0.001	−0.001	−0.001	−0.001	−0.001	−0.001
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
Catholic school	−0.839	−0.835	−0.833	−0.078	−0.038	−0.043
	(0.492)	(0.492)	(0.498)	(0.298)	(0.304)	(0.302)
Private school	−3.499*	−3.501*	−3.492*	−0.515*	−0.524*	−0.507*
	(0.301)	(0.302)	(0.300)	(0.234)	(0.222)	(0.226)

Robust standard errors in parentheses
* $p < 0.05$

Table D4: Control variable coefficients from models in Table 5

	(1)	(2)	(3)	(4)	(5)	(6)
Individual/family level variables						
Age	-0.037	-0.037	-0.035	0.030	0.029	0.028
	(0.031)	(0.031)	(0.030)	(0.027)	(0.027)	(0.027)
Hispanic	-0.026	-0.029	-0.051	0.036	0.035	0.037
	(0.099)	(0.098)	(0.096)	(0.138)	(0.137)	(0.137)
Black	0.299*	0.326*	0.323*	0.132	0.151	0.155
	(0.083)	(0.081)	(0.077)	(0.086)	(0.087)	(0.086)
Native American	0.186	0.179	0.200	-0.963*	-0.966*	-0.993*
	(0.146)	(0.146)	(0.147)	(0.305)	(0.307)	(0.317)
Other race	-0.326*	-0.328*	-0.318*	-0.028	-0.027	-0.031
	(0.102)	(0.102)	(0.103)	(0.150)	(0.149)	(0.150)
Multi-racial	0.181	0.175	0.168	0.131	0.131	0.139
	(0.141)	(0.141)	(0.140)	(0.092)	(0.093)	(0.094)
Home language not English	0.072	0.075	0.076	-0.126	-0.124	-0.111
	(0.124)	(0.125)	(0.116)	(0.156)	(0.157)	(0.155)
Immigrant	-0.171	-0.177	-0.186*	-0.385*	-0.382*	-0.393*
	(0.093)	(0.093)	(0.090)	(0.077)	(0.077)	(0.077)
Household size	-0.013	-0.012	-0.013	-0.041*	-0.041*	-0.042*
	(0.016)	(0.016)	(0.016)	(0.020)	(0.020)	(0.020)
Single parent household	0.022	0.018	0.033	0.180	0.182	0.175
	(0.073)	(0.073)	(0.072)	(0.132)	(0.133)	(0.133)
Other household type	0.050	0.047	0.052	0.306*	0.307*	0.303*
	(0.089)	(0.087)	(0.085)	(0.057)	(0.057)	(0.056)
Parent immigrant	-0.048	-0.049	-0.032	-0.116	-0.115	-0.125
	(0.091)	(0.090)	(0.086)	(0.078)	(0.077)	(0.076)
Parental education – high school graduate	-0.301*	-0.303*	-0.305*	-0.083	-0.084	-0.086
	(0.082)	(0.079)	(0.079)	(0.077)	(0.077)	(0.077)
Parental education – some college	-0.086	-0.095	-0.098	0.047	0.043	0.039
	(0.081)	(0.080)	(0.079)	(0.120)	(0.120)	(0.122)
Parental education – college	-0.171	-0.180	-0.187	-0.036	-0.043	-0.043
	(0.105)	(0.104)	(0.102)	(0.131)	(0.130)	(0.131)
Parent professional/managerial occupation	-0.024	-0.032	-0.036	-0.198*	-0.200*	-0.194*
	(0.071)	(0.072)	(0.071)	(0.079)	(0.079)	(0.078)
Parent disabled	-0.295	-0.292	-0.287	0.183	0.183	0.176
	(0.194)	(0.193)	(0.192)	(0.194)	(0.194)	(0.194)
Family welfare receipt	0.178	0.185	0.166	0.088	0.091	0.093
	(0.105)	(0.102)	(0.100)	(0.087)	(0.085)	(0.084)
Log family income	-0.113	-0.118	-0.119	0.071	0.068	0.072
	(0.052)	(0.052)	(0.051)	(0.049)	(0.050)	(0.050)
Low birth weight	-0.230	-0.223	-0.234	-0.213	-0.216	-0.215
	(0.182)	(0.183)	(0.187)	(0.165)	(0.164)	(0.164)
Mother's age at birth	0.004	0.004	0.004	0.007	0.007	0.007
	(0.010)	(0.010)	(0.010)	(0.006)	(0.006)	(0.006)
School/community level variables						
Urban	0.253*	0.266*	0.257*	0.398*	0.398*	0.404*
	(0.109)	(0.110)	(0.109)	(0.094)	(0.092)	(0.092)

Table D4: Control variable coefficients from models in Table 5 (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)
Rural	−0.367*	−0.326*	−0.335*	−0.371*	−0.352*	−0.345*
	(0.137)	(0.142)	(0.140)	(0.183)	(0.180)	(0.177)
Small	−0.266	−0.255	−0.249	−0.070	−0.059	−0.068
	(0.171)	(0.174)	(0.170)	(0.197)	(0.194)	(0.194)
Large	−0.109	−0.149	−0.150	−0.163	−0.182	−0.191
	(0.158)	(0.153)	(0.152)	(0.131)	(0.129)	(0.130)
Cumulative dropout rate	−0.005	−0.004	−0.004	−0.006*	−0.006*	−0.006*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Percent in college prep program	0.001	0.001	0.001	−0.001	−0.001	−0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Catholic school	0.123	0.067	0.074	0.055	0.024	0.024
	(0.243)	(0.248)	(0.247)	(0.193)	(0.188)	(0.185)
Private school	0.421	0.397	0.399	0.487*	0.479*	0.511*
	(0.254)	(0.279)	(0.269)	(0.124)	(0.135)	(0.134)

Robust standard errors in parentheses
* $p < 0.05$

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