Associations of Neighborhood and Family Factors with Trajectories of Physical and Social Aggression During Adolescence

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Abstract

Adolescents develop within multiple contexts that synergistically influence their behavior and health. To understand the simultaneous influence of neighborhood and family contexts on adolescents, this study examined relationships of neighborhood socioeconomic disadvantage, neighborhood social disorganization, family conflict, parent-child bonding and parental control with trajectories of physical and social aggression. The sample included 5,118 adolescents between ages 11 and 18 (50% female, 52% Caucasian) living in predominantly rural areas. Multilevel growth curve models showed an interaction between neighborhood disadvantage, family conflict and gender on the physical aggression trajectories. The interaction suggested more rapid processes of both increase in and desistance from physical aggression over time for boys with high neighborhood disadvantage and high family conflict, as well as a higher starting point, more gradual increase and slower process of desistance over time for girls in similar neighborhood and family contexts. Less parent-child bonding and less parental control also were associated with higher initial levels of physical aggression. For social aggression, an interaction between family conflict and gender showed girls with high family conflict had the highest initial levels of social aggression, with a more gradual increase over time for these girls compared to their male counterparts in high-conflict families or their female counterparts in low-conflict families. Less parent-child bonding was associated with higher initial levels and a faster increase over time of social aggression, and less parental control was associated with higher initial levels of social aggression. The findings suggest early family-based interventions may help prevent perpetration of both physical and social aggression during adolescence.

Keywords

adolescent; aggression; longitudinal survey; neighborhood; family

Study Overview

In this study, we examine whether detrimental influences of neighborhoods on the development of adolescent aggression are altered by family characteristics. During

Conflict of Interest

The authors declare that they have no conflict of interest.

adolescence, youth engage in identity development processes involving experimentation and exploration outside the family (Hill et al. 2007). As parental supervision declines and independence is increasingly granted by parents and exercised by youth, more distal neighborhood influences may gain prominence for development. With increasing autonomy afforded to adolescents, neighborhoods become more accessible; therefore, adolescents are more likely to notice and be influenced by characteristics of their neighborhoods (Witherspoon and Ennett 2011; Chilenski 2011). However, families do remain of central importance to adolescents, and family characteristics may potentially alter negative influences on adolescents either by exacerbating or buffering those other influences.

We focus on the interplay between these two critical contexts during adolescence. At the neighborhood level, we examine socioeconomic disadvantage and social disorganization, both of which repeatedly have been found to be associated with increased physical aggression during adolescence (Loeber and Hay 1997; Farrington 1998; Howell and Hawkins 1998; Lee et al. 2003; Osgood and Chambers 2000; Vazsonyi et al. 2006), and are key constructs in central theories postulating neighborhood influences on behavior (Kramer 2000; Jencks and Mayer 1990; Sampson et al. 2002). The family characteristics examined— family conflict, parent-child bonding, and parental control—are well-established predictors of aggression in early (Vaillancourt et al. 2007) and middle childhood (Joussemet et al. 2008; Pagani et al. 2010), as well as adolescence (see, for example, Campbell et al. 2010; Martino et al. 2008; Underwood et al. 2008; Vazsonyi et al. 2008). Family conflict may exacerbate negative neighborhood influences on adolescent aggression, while parental bonding and control may buffer those negative effects.

Development of Aggression Over Time

We evaluate these possible neighborhood-family interactions in relation to developmental trajectories of both physical and social aggression. Physical aggression includes behaviors that threaten or cause physical harm (Loeber and Hay 1997), whereas social aggression, also called relational or indirect aggression, encompasses more covert behaviors that damage social relationships and obliquely cause harm to victims (Archer and Coyne 2005). We use the term social aggression because it includes behaviors defining both relational and indirect aggression, yet it covers additional behaviors also directed toward social exclusion and often-covert manipulation of social relationships for personal gain (Archer and Coyne 2005; Coyne et al. 2006). Patterns of perpetration and consequences of physical and social aggression differ substantially (Xie et al. 2005; Xie et al. 2002; Cillessen and Borch 2006; Burt and Donnellan 2009). We investigate each type of aggression separately to contribute to the relatively small, but growing, literature on changes in social aggression during adolescence. Very little attention has been given to examining neighborhood effects on social aggression, yet neighborhoods may influence development of each type of aggression differently. Furthermore, and influences of family factors on neighborhood effects (either buffering or exacerbating them) also may differ for each type of aggression.

Adolescence is a time of profound biological, psychological, cognitive and social changes often corresponding with increases in both physical and social aggression (Pepler and Craig 2005; Xie et al. 2002). Here, we aim to build upon longitudinal examinations of aggression during early childhood (see, for example, Broidy et al. 2003) and into adolescence (see, for example, NICHD Early Childcare Research Network 2004) by examining the moderating effects of family characteristics on associations between neighborhood characteristics and adolescent trajectories of aggression, rather than on aggression at a single point in time. This allows for an investigation of how neighborhood and family contexts work in concert to influence aggression over time. Although a small proportion of aggressive adolescents maintain high levels of aggression throughout adolescence (Nagin 1999; Nagin and Tremblay 2001; Moffitt 1993), studies examining mean trajectories of aggression across

adolescence typically find that aggression increases during early to middle adolescence, peaks in later adolescence, and then declines into young adulthood (Moffitt 1993; Aber et al. 2003; Farrell et al. 2005; Karriker-Jaffe et al. 2008). Using multi-level modeling, we examine neighborhood effects on initial levels (at age 11), growth in, and desistance from aggression, along with moderating effects of family characteristics on the trajectories.

Adolescence in Rural Contexts

In this study, we focus on rural adolescents. This is an understudied dimension of the context of youth development, particularly in relation to neighborhood effects (Chilenski 2011). For rural youth, neighborhoods may be highly relevant social contexts: Prior to attaining legal driving age, most early adolescents are likely to be limited in terms of transportation around their rural communities. Thus, in their free time, youth who are walking or bicycling around their home neighborhood would likely face increased exposure to any local risks for antisocial behaviors (Chilenski 2011). Few studies of risk factors for aggression have explicitly examined differences between rural and suburban or urban contexts. Findings from those studies that have done so suggest many of the key risk factors for aggression and violence appear to function similarly in different geographic contexts (see, for example, Trejos-Castillo et al. 2008). That is, predictors that are important in urban areas also appear to be relevant in rural areas. Most studies of neighborhood influences on aggression have been conducted in urban inner-city areas, but some have shown neighborhood disadvantage and disorganization are associated with crime and juvenile arrests in rural areas (Lee et al. 2003; Osgood and Chambers 2000). Family processes also appear to impact youth aggression in rural areas in the same manner as in suburban or urban areas (Vazsonyi et al. 2008). No known studies have examined the interaction of family and neighborhood characteristics on youth risk behaviors in rural areas, however. The following sections provide more details about the specific predictors and hypotheses that are a focus of the current investigation.

Theories of Neighborhood Influence

At the neighborhood level, our work is guided by theory and empirical research on effects of both socioeconomic disadvantage and social disorganization. Theories of social exclusion and relative deprivation emphasize socioeconomic disadvantage as an important influence on adolescent development (Jencks and Mayer 1990; Kramer 2000). Disadvantaged areas restrict exposure to cultural and intellectual capital, thus limiting resources for healthy development (Lynch and Kaplan 2000) and excluding residents from social institutions that promote conventional behavior (Kramer 2000). Further, stressors and frustrations associated with living in socioeconomically disadvantaged areas may prompt youth to act out in both physically and socially aggressive ways. In fact, neighborhood disadvantage has been found to predict trajectories of adolescent aggression, with higher initial levels (Karriker-Jaffe et al. 2009), greater increases over time (Vanfossen et al. 2010), and greater persistence of aggression into young adulthood (Howell and Hawkins 1998) in socioeconomically disadvantaged neighborhoods. Other than the study by Vanfossen and colleagues (2010), which used a composite measure of both physically and socially aggressive behaviors, we are unaware of other work that has examined neighborhood effects on social aggression. In this predominantly rural sample, we expect to see effects for neighborhood disadvantage on both types of aggression; our specific hypotheses are detailed below.

To complement neighborhood disadvantage, we also examine neighborhood social disorganization. Effects of neighborhood disorganization have been explained primarily by theories of collective socialization (Sampson et al. 2002) and neighborhood social control (Kramer 2000). Both theories emphasize social interactions between neighbors that can influence deviance and aggression; these social interactions are likely to be very salient in

small rural communities where residents know the people living nearby. Socially cohesive neighborhoods are characterized by social interactions that promote social bonds between residents, which can provide strong, informal controls of antisocial behavior (Ross and Jang 2000; Sampson et al. 1997). Lack of social cohesion and informal control can lead to socially disordered neighborhoods that allow more unchecked aggression by adolescents living in them. Studies show increases in youth aggression over time (Vanfossen et al. 2010), as well as persistence of aggression into young adulthood among youth in disorganized neighborhoods (Chung et al. 2002). However, some research suggests limited effects of connection to neighbors on problem behaviors (including violence, delinquency and substance use) for rural African-American youth (Vazsonyi et al. 2008). Because social aggression is more covert than physical aggression (Xie et al. 2005; Xie et al. 2002), it is not as visible for social control by neighborhood residents. Thus, there may be less of an effect of social disorganization on social aggression than there may be for physical aggression. Unfortunately, there is a lack of extant studies of neighborhood effects on social aggression to confirm or deny this possibility. We address this limitation of the current literature in the present study. We also ascertain whether effects of neighborhood risk factors such as social disorganization matter more or less for certain young residents by highlighting interactions with family factors, which is the topic we turn to next.

Identification of Possible Family-level Moderators

Family factors are potential moderators of neighborhood influences. This is supported by early theoretical work by Moffit (1993) and others (Duncan et al. 1997), as well as by more recent ecological models of youth development (Gorman-Smith et al. 2000; Cook et al. 2002; Roosa et al. 2003; Schofield et al. 2012). Family processes and parenting practices teach children which behaviors are acceptable in various settings. In the context of neighborhood risk factors for antisocial behaviors, youth with strong family protective factors may be motivated to maintain conventional behavior and avoid involvement in aggression. Conversely, there may be a particularly detrimental interaction of family and neighborhood risk factors on physical and social aggression between childhood and young adulthood. This interplay is the primary focus of the current investigation.

We selected possible family-level moderators that are highlighted by dominant theories of human behavior and adolescent development. Social learning theory postulates that children learn to be aggressive by observing aggressive behaviors of others. When such behaviors result in positive consequences (e.g. increased status, power, and compliance of others to one's requests), children form positive outcome expectations for using aggression themselves. To capture the construct of social learning through behavioral modeling of aggression (Mazur 1990; Baranowski et al. 2002), we include a measure of family conflict in our analyses. Detrimental effects of family conflict on child and adolescent aggression have been found in many studies. For example, Underwood and colleagues (2008) showed that a mother's verbal and physical aggression with her spouse was positively related to daughters' social and physical aggression with peers. In contrast to family conflict, parents' support, respect, and affection for children can promote parent-child bonding, which has been found in numerous studies to be protective against aggression (Jackson and Foshee 1998; Jackson et al. 1998; Vaillancourt et al. 2007; Campbell et al. 2010; Underwood et al. 2008). Parental support, respect and affection may model to the child general prosocial behavior and respect for others that results in reduced perpetration of aggression by children and adolescents with strong family bonds. In addition to parent-child bonds, parental control —through rule-setting and monitoring of adolescent peers and activities—is one of the strongest correlates of adolescent risk behaviors such as aggression (Paschall et al. 1998; Jackson and Foshee 1998; Jackson et al. 1998; Martino et al. 2008; Underwood et al. 2008). The effects of parental control are typically explained using social control theory, which

postulates that without societal control on behavior, one's natural tendencies are to do whatever provides personal gain (Hirschi 1969). Thus, parental control signals to youth that antisocial and aggressive behaviors are not acceptable. We expected to see effects of all three of these family characteristics on the aggression outcomes; interactions with neighborhood risk factors are described in the next section.

Hypotheses

Our hypotheses are framed in terms of effects of the neighborhood and family variables (and their interactions) on three components of the trajectories (the intercept, linear slope and quadratic slope) and on one calculated metric (peak age of involvement). The intercept reflects initial levels of aggression, which are estimated at age 11 for this study. For the intercepts, positive regression coefficients for risk factors (such as neighborhood disadvantage or family conflict) and negative coefficients for protective factors (such as parent-child bonds) indicate higher initial levels of aggression, which implies an earlier onset of these problem behaviors. The linear slope determines how quickly the trajectory rises to and falls from the peak (with positive regression coefficients indicating more rapid escalation of aggression), while the quadratic slope determines the location and height (or sharpness) of the trajectory peak (Fabio et al. 2011). Higher peaks indicate greater involvement in aggressive behavior, while longer or flatter trajectory curves (indicated by negative regression coefficients for the slopes) suggest slower changes in aggressive behavior over time (Fabio et al. 2011). When paired with the age at which the peak occurs during adolescence, slower changes in aggression can indicate delayed desistance. In general, we expected to see higher initial levels of aggressive behavior with flatter curves and later peak ages of involvement for youth in high-risk neighborhoods or from high-risk families. In addition to the main effects, we anticipated that effects of high-risk neighborhoods would be more pronounced for youth who also had family-level risk factors (high family conflict, low parent-child bonding, low parental control) compared to youth in high-risk neighborhoods who do not have family-level risk factors. Specific hypotheses are detailed below.

Based on the foregoing literature, we expected the combination of neighborhood risk and high levels of family conflict to be particularly detrimental. Due to processes described previously, socioeconomically disadvantaged or socially disorganized neighborhoods likely provide more models of aggressive behavior than other neighborhoods, and thus afford more opportunities for adolescents to form positive outcome expectations for using aggression. Additionally, seeing aggressive behavior in multiple contexts may reinforce perceptions about acceptability of aggression. This may result in increased risk of aggression for adolescents who are exposed to aggressive models in both neighborhood and family contexts, compared to those who have aggressive models in only one (or neither) context. Thus, we expected family conflict would exacerbate effects of negative neighborhood characteristics on trajectories of physical and social aggression, such that adolescents living in high-risk neighborhoods and high-conflict families and will have higher initial levels and later peak ages (indicating delayed desistance) of both types of aggression as compared to those who only have one of the two risk factors (H1).

Family-level protective factors also may become increasingly important in the context of neighborhood risk factors that promote aggression. Youth with close bonds with their parents may have ingrained values of respect for others that reduce the risk that they will engage in aggressive behaviors when neighborhood constraints and social controls against aggression are weak. A qualitative study of African American families suggests that neighborhood risk is less damaging for boys from families with close parent-child bonds than for boys without that family-level buffer (Spencer 2001), and other quantitative studies

also documented that negative impacts of neighborhood violence on child competence (Krenichyn et al. 2001) and adolescent mental health (Ozer 2005) may be buffered by a supportive family context. Similarly, Schofield and colleagues (2012) reported findings from quantitative analyses in two samples of fifth-grade students (one Mexican American and one African American) that suggested parent-child bonds buffered effects of neighborhood social disorganization on antisocial behavior (measured by substance use, affiliation with deviant peers and externalizing behaviors). Thus, we expected parental-child bonding would buffer effects of negative neighborhood characteristics on trajectories of physical and social aggression, such that adolescents living in high-risk neighborhoods but who are strongly bonded to parents will have lower initial levels and earlier peak ages of aggression, as compared to those living in high-risk neighborhoods who are not bonded to parents (H2).

Similar to effects of strong parent-child bonds, parental control also may offset risks of living in socioeconomically disadvantaged or socially disorganized neighborhoods. Parental rule-setting and monitoring may decrease adolescent exposure to negative neighborhood influences (Leventhal and Brooks-Gunn 2000; Burton and Jarrett 2000; Rankin and Quane 2002). Also, as noted earlier, adolescents living in socially disorganized neighborhoods experience less social control in that neighbors are not likely to monitor deviant behaviors. However, having parents who exert social control through rule setting and monitoring may offset those neighborhood risks, particularly for physical aggression. We anticipated that parental control would buffer effects of negative neighborhood characteristics on trajectories of physical and social aggression, such that adolescents living in high-risk neighborhoods but with high parental control will have lower initial levels and earlier peak ages of aggression as compared to those living in high-risk neighborhoods with low parental control (H3). Additionally, given the more covert nature of social aggression, we hypothesized that interactions between parental control and neighborhood risk would be stronger when predicting physical aggression (H4).

We examined these hypotheses separately for boys and girls as suggested by Kroneman and colleagues (2004). Although there are few differences in overall trajectory patterns by gender, boys show higher levels of physical aggression than girls throughout childhood and adolescence (Karriker-Jaffe et al. 2008; Vazsonyi and Keiley 2007). Family effects on aggression have been found to be stronger for girls than boys (as in Pagani et al. 2010; Underwood et al. 2008), whereas neighborhood effects have been found to be stronger for boys than girls (as in Beyers et al. 2003; Kroneman et al. 2004). One study of adolescent sexual risk behaviors documented an interaction between neighborhood disadvantage (indicated by single-parent households) and mother-child bonding that revealed family bonds to be more important in disadvantaged neighborhoods for boys but more important in affluent neighborhoods for girls (Cleveland and Gilson 2004). Given the absence of further studies examining differences in the interplay of neighborhood and family factors by gender, it is unclear whether or how interactive effects of neighborhood and family factors on aggression posited here would differ by for boys and girls. To investigate this, we examine the additional moderating role of gender, but do not pose specific hypotheses due to the sparse literature in this area.

Methods

Data came from the Context of Adolescent Substance Use Study (Ennett et al. 2006) and included surveys conducted as a census of all students in the public schools in three counties, telephone interviews from randomly sampled parents, and U.S. Census data. Five waves of in-school surveys were conducted every 6 months between spring 2002 and spring 2004, beginning when students were in 6th-8th grade and ending in 8th-10th grade (average

response rate 81.1%). All public school students were eligible for participation, except those who could not complete questionnaires in English (<1% per wave) and those exclusively in special education (<5% per wave). In accordance with school policy, parents were notified about the study and had the opportunity to refuse their child's participation at the beginning of each academic year or whenever their child became eligible. Adolescents gave written assent to participate at every wave. A random sample of parents (N = 2,062) that met eligibility criteria (child participated in Wave 1 survey, only one child in study, could complete interview in English) was selected for telephone interviews corresponding with the Wave 1 survey (response rate 80.7%). Neighborhoods were based on geocoded student addresses and defined by U.S. Census block groups, which effectively delineate social and structural determinants of health behaviors (Krieger et al. 2002). The Public Health Institutional Review Board at The University of North Carolina at Chapel Hill approved study protocols.

The analysis sample included 5,118 adolescents who were between 11 and 16 years old at Wave 1 and who lived in neighborhoods with at least two respondents (N=128 neighborhoods). At Wave 1, most students (95.6%) were between 11 and 14 years old (*M*=13.1 years). Half (50.1%) the students were female, 52.0% were Caucasian, 38.3% were African-American and 3.8% were Hispanic/Latino. Most students (80.0%) lived with two parents, and 73.0% had at least one parent who had attained education after high school.

The target counties are classified as nonmetropolitan areas with access to an interstate highway (Ricketts et al. 1999). According to the U.S. Census (U.S. Census Bureau 2002), more than half (59.9%) of the three counties' residents lived in rural places of fewer than 2,500 persons. Compared to the general U.S. population, these counties also have a greater proportion of African-Americans (12% nationally vs. 28% study counties) and slightly more people with less than a high school education (20% vs. 23%) and below the poverty level (12% vs. 14%). At the time of Wave 1 data collection, unemployment rates were similar to the national level (6%).

The sample was relatively stable over time. Less than 10% of students moved to a different neighborhood over the course of the study. Approximately half (56.0%) the students participated in all five waves of data collection, and an additional 30.7% participated in three or four waves. As in other studies, adolescents with missing data were more likely to be male, African-American or "other" race/ethnicity, live in a single-parent household and have parents with lower education. Data imputation strategies are described below.

Measures

Physical aggression—The physical aggression scale assessed how many times in the past 3 months respondents reported threatening a teacher, threatening someone with a weapon, getting in a fight in which someone was hit, and hitting/slapping another kid (Farrell et al. 2000). Responses ranged from 0 (*none*) to 4 (*10 or more times*) and were summed (range = 0-16) and log-transformed (range = 0-2.83). Cronbach's alphas ranged from .68 at Wave 1 (*M*=1.27, *SD*=2.03 for raw scores; *M*=0.55, *SD*=0.67 after transformation) to .86 at Wave 5 (*M*=1.36, *SD*=2.94 for raw scores; *M*=0.49, *SD*=0.74 after transformation). At Wave 1, 45.6% of girls and 51.8% of boys had perpetrated physical aggression.

Social aggression: The social aggression scale assessed how many times in the past 3 months respondents reported spreading a false rumor, excluding another student from his/her group of friends, picking on someone, and starting a fight between others (Farrell et al. 2000). Responses ranged from 0 (*none*) to 4 (*10 or more times*) and were summed (range = 0-16) and log-transformed (range = 0-2.83). Cronbach's alphas ranged from .68 at Wave 1

(*M*=2.09, *SD*=2.48 for raw scores; *M*=0.86, *SD*=0.72 after transformation) to .83 at Wave 5 (*M*=2.05, *SD*=3.20 for raw scores; *M*=0.73, *SD*=0.80 after transformation). At Wave 1, 71.0% of girls and 68.3% of boys had perpetrated social aggression.

Neighborhood disadvantage: Neighborhood disadvantage was a static predictor calculated using U.S. Census data on education (percent over age 24 with less than high school education; range=1.4-62.7%, $M = 25.9$, $SD = 12.9$), employment (percent over age 15 in labor force who were unemployed [range=0-29.2%, $M = 6.2$, $SD = 4.9$] and percent in working-class jobs [range=30.6-91.7%, $M = 70.6$, $SD = 10.5$]) and economic resources (percent below poverty [range=0-53.2%, $M = 15.2$, $SD = 10.2$], percent households without car [range=0-36.9%, $M = 8.2$, $SD = 7.5$], and percent renter-occupied housing [range=1.8-76.5%, $M = 26.6$, $SD = 16.9$]) for each student's neighborhood at Wave 1. Each student was assigned their neighborhood average (range=8.3-51.0, $M = 25.34$, $SD = 8.52$, alpha = .88), with high scores indicating more disadvantage. Neighborhood disadvantage was grand-mean centered separately for boys and girls to represent variation across all neighborhoods in the sample (Raudenbush and Bryk 2002). Grand-mean centering for neighborhood covariates also can prevent model instability when cross-level interactions are included (Raudenbush and Bryk 2002).

Neighborhood disorganization: Neighborhood disorganization was a static predictor calculated as the sum of three subscale scores ($M = 2.07$, $SD = 0.57$). Subscales assessed parent reports of social bonding (how often they socialize, ask for help, talk about problems, or go out for social evenings with neighbors, alpha = .75 (Parker et al. 2001)), social control (whether neighbors would do something if teens were damaging property, showing disrespect to an adult, fighting, smoking cigarettes, drinking alcohol, and smoking marijuana, alpha = .91 (Sampson et al. 1997)) and crime (whether they had seen someone get arrested, drug deals, someone being beaten up, or someone pull a gun on another person; how safe they feel in their neighborhood during the day and after dark; and whether there is too much drug use or a lot of crime in the neighborhood, alpha = .79). On each subscale, a higher value indicates greater disorganization. To minimize possible biases associated with neighborhood demographic composition, we used factor scores for each subscale derived using a latent variable approach to adjust for adult respondents' demographic characteristics in measures of neighborhood disorganization (Raudenbush 2003). Each student's survey data were linked with parent-report data on social disorganization for their neighborhood, and scores were grand-mean centered separately for boys and girls.

Family conflict: Given our interest in cross-level (neighborhood-family) interactions, we used youth reports of family context at Wave 1. Family conflict consisted of three items (Bloom 1985): "We fight a lot in our family," "Family members sometimes get so angry they throw things," and "Family members sometimes hit each other." Responses were averaged (range: 0-4), with high scores indicating more family conflict (*M*=0.98, *SD*=1.15, alpha = .82). Scores were group-mean centered to represent variation from the average within each neighborhood (Raudenbush and Bryk 2002), and thus family-level regression coefficients are independent of neighborhood characteristics (Bingenheimer and Raudenbush 2004). For family-level predictors involved in cross-level interactions, centering also allows the main effects of one predictor to be interpreted as effects at the average level of the other (Aiken and West 1991).

Parent-child bonding: Parent-child bonding included six youth-report items from the Authoritative Parenting Index (API; Jackson et al. 1998) about whether each parent "tells me when I do a good job on things," "makes me feel better when I am upset" and "wants to hear about my problems," as well as three other items asked about each parent: "how often

hugs or kisses you", "how close you feel toward her/him", and "how close you think s/he feels toward you". Twelve items were averaged (range: 0-3), with high scores indicating more parent-child bonding (M=2.29, SD=0.62, alpha = .88). Scores were group-mean centered for each neighborhood.

Parental control: Parental control included six youth-report items from the API (Jackson et al. 1998) about whether each parent "has rules that I must follow," "tells me times when I must come home," and "makes sure I don't stay up too late." Items were averaged (range: 0-3), with high scores indicating greater parental control (M=2.18, SD=0.78, alpha = .82). Scores were group-mean centered for each neighborhood.

Demographic variables—Demographic control variables were based on all available data at all five waves. The child's self-reported race/ethnicity (African-American, Hispanic or Latino, or other race/ethnicity) was coded with Caucasian as reference. Parent education was measured by child's report of the highest level of education attained by either parent, ranging from 0 (*less than a high school education*) to 5 (*graduate or professional school after college*). Family structure indicated whether the child reported living in a single-parent household at any time during the study. Two geocoding control variables adjusted for type of address and geocode precision. Analyses also used longitudinal address data to control for the number of times students moved to a different neighborhood.

Analytic Strategy

Missing data were replaced by multiple imputation (Rubin 1996). All models had relative efficiencies greater than .95, which suggests that ten imputations were sufficient for stable estimates (Horton and Lipsitz 2001). We used multilevel growth curves to model physical and social aggression trajectories between ages 11 and 18. We ascertained there was no interaction of age with cohort (data available upon request) to justify combining data from three cohorts in the accelerated longitudinal design (Miyazaki and Raudenbush 2000). All analyses were conducted using PROC MIXED in SAS version 9.3 using restricted maximum likelihoods and the Kenward-Roger adjustment of the standard errors and degrees of freedom for more conservative tests of the fixed effects (Kenward and Roger 1997).

Models estimated changes in aggression outcomes over time (level 1) within individuals (level 2) nested within neighborhoods (level 3). In accordance with prior trajectory analyses using these data (Karriker-Jaffe et al. 2008, 2009), the models included three random effects (individual intercept, individual linear slope and neighborhood intercept); level-2 random effects were allowed to correlate. The random effects were significant, indicating there was variability among individuals over time and within neighborhoods. Preliminary analyses suggested the five waves of data could not support additional random effects; thus all effects of level-2 and level-3 predictor variables were fixed.

A standard model specification was used for both aggression outcomes. Level-1 models specify an outcome as a function of chronological age, centered at age 11, using a quadratic curve plus random error. In level-2 models, family factors predicted the level-1 intercept, linear slope and quadratic slope. Neighborhood factors were assessed two ways. First, a set of level-3 models specified disadvantage and disorganization as predictors of the level-2 intercept, which allowed for assessment of main effects of the neighborhood variables on the aggression variables (while accounting for family-level variables). Then, in a second set of models, effects of the neighborhood variables on the level-2 slopes were added to produce cross-level neighborhood-family interaction terms necessary for assessing hypothesized interactions between neighborhood and family factors on the aggression trajectories. Family and neighborhood factors also interacted with gender to assess differences in effects on

aggression intercepts and slopes for boys and girls. This model structure resulted in a series of six 3-way (Neighborhood × Family × Gender) and lower-order interaction terms influencing aggression trajectories over time to assess primary study hypotheses regarding interactions between neighborhood and family factors. Given the number of interactions tested, moderation effects were evaluated in blocks. We used multivariate F-tests to limit overall Type 1 error level to .10 because of the generally reduced power to detect statistically significant interactions (Aiken and West 1991; Frazier et al. 2004). To facilitate interpretation, models were simplified using backwards elimination to remove interactions that were not statistically significant. For significant interactions, trajectories were graphed at high and low values of the predictor of interest, using scores of one standard deviation above and below the mean, and setting all other predictors to zero (Aiken and West 1991). Peak ages of involvement in aggression were obtained from first derivatives of the quadratic models using a ratio of regression coefficients.

Results

Bivariate Relationships

Bivariate correlations provide information on the unadjusted relationships of the neighborhood and family predictors with physical and social aggression. Correlations indicated that all neighborhood and family characteristics were significantly associated with physical aggression for both boys and girls in the direction expected, although most of the correlation coefficients were small (see Table 1). Neither neighborhood characteristic was a statistically significant correlate of social aggression for either boys or girls, but for both boys and girls all family characteristics were significantly associated with social aggression in the direction expected (again, correlations were modest).

Main Effects of Neighborhood and Family Variables

The first set of multivariate models established the independent effects of the neighborhood and family factors. Simplified models (presented in Table 2) suggested significant predictors of the physical and social aggression trajectories varied somewhat by gender, but were quite similar across the two outcomes.

Of the two neighborhood variables, only socioeconomic disadvantage was associated with either aggression outcome. For physical aggression, higher levels of disadvantage were associated with higher initial levels of aggression (suggesting earlier onset in disadvantaged neighborhoods); this was qualified by gender, such that the effect was stronger for girls than boys. For social aggression, higher levels of disadvantage were associated with marginally higher initial levels of aggression. This effect did not vary by gender. Disadvantage was not associated with the linear or quadratic slopes of either physical or social aggression.

All three of the family variables were associated with both aggression outcomes. For physical aggression, higher levels of family conflict (indicated by positive coefficients for effects on intercept in Table 2) and lower levels of parent-child bonding and parental control (each indicated by negative coefficients for effects on intercept in Table 2) were associated with higher initial levels of physical aggression, suggesting earlier onset as a function of family risk factors. In addition, family conflict was associated with the linear and quadratic slopes of physical aggression, and all effects of family conflict for physical aggression were qualified by gender. Figure 1 (left panel) shows physical aggression trajectories for boys and girls with varying levels of family conflict. Because there was a statistically significant interaction of neighborhood disadvantage and family conflict by gender, more details on their joint impacts on the physical aggression trajectories are provided in the next section.

For social aggression, the pattern of findings for the family variables was similar to physical aggression. Higher levels of family conflict and lower levels of parent-child bonding and parental control were associated with higher initial levels of social aggression. Additionally, family conflict was associated with the linear and quadratic slopes of physical aggression, and all effects of family conflict for social aggression were qualified by gender. Figure 1 (right panel) shows social aggression trajectories for boys and girls with varying levels of family conflict. Girls with high family conflict showed the highest initial levels of social aggression (suggesting earlier onset), with a more gradual linear slope for these girls compared to their male counterparts in high-conflict families or their female counterparts in low-conflict families. Boys from high-conflict families showed the most rapid acceleration, highest peak level and fastest desistance from social aggression of all groups. Counter to expectations, peak ages of involvement in social aggression were earliest for girls in high-conflict families (age 12.7), compared to girls in low-conflict families (age 13.9) and to boys in both high-(age 13.4) and low-conflict families (age 13.9). After approximately age 16, the social aggression trajectories appeared to converge to a similar level of perpetration.

In contrast to the findings for physical aggression, parent-child bonding affected the intercept and linear slope of social aggression, with less parent-child bonding associated with higher initial levels (suggesting earlier onset) and a steeper linear slope (suggesting more rapid escalation) of social aggression. This resulted in an earlier peak age of involvement in social aggression perpetration for youth with low levels of bonding (age 13.3) compared to youth with high levels of bonding (age 13.8). After approximately age 15, the social aggression trajectories for youth with different levels of parental bonds appeared to converge to a similar level of perpetration.

Interaction of Neighborhood and Family Variables

The final models assessed the interaction hypotheses. Of the six 3-way interactions (Neighborhood × Family × Gender) tested for each outcome, only one was significant. For physical aggression, there was a significant 3-way interaction between neighborhood disadvantage, family conflict and gender (presented in Table 3 and described below) that provides partial support for our first hypothesis. All remaining interactions were statistically non-significant and dropped from the model; thus, there was no support for the remaining hypotheses. For social aggression, all interactions were statistically non-significant and dropped from the model; thus, effects of all neighborhood and family variables were independent (as shown in Table 2), and there was no support for any of the interaction hypotheses.

The significant 3-way interaction between neighborhood disadvantage, family conflict and gender that affected the intercept, linear slope and quadratic slope of the physical aggression trajectory. To summarize the complex interrelationships, Figure 2 displays predicted trajectories for hypothetical groups defined by gender and varying levels of neighborhood disadvantage and family conflict. These graphs show that the predicted trajectories of physical aggression were different for boys and girls as a function of these two risk factors.

The findings for boys showed partial support for our first moderation hypothesis. Although the intercept was not markedly higher for boys with both high neighborhood disadvantage and high family conflict as we had hypothesized, the linear slope was steeper (indicating rapid escalation), the peak level of aggression was higher (indicating more perpetration), and the quadratic slope was steeper (indicating more rapid desistance over time). Taken together, these suggest more rapid processes of both escalation and desistance over time for these boys compared to their counterparts in either high-disadvantage neighborhoods (with low conflict) or high-conflict families (with low disadvantage). There was a notable difference in the shape of the trajectory for boys living in high-disadvantage neighborhoods but who had

low levels of family conflict: These boys exhibited an almost flat trajectory that showed a slight increase in physical aggression from age 11 to 18. A small change in these boys' physical aggression over time also was reflected in the coefficients for the interaction of disadvantage and male gender, which further reduced the weak main effect for neighborhood disadvantage. When compared with the trajectory for boys from low-conflict families in Figure 1 (which depicts the effect of family conflict independent of neighborhood disadvantage), addition of neighborhood disadvantage for boys from low-conflict families raised the initial level of physical aggression and further flattened the curve, thus delaying desistance. For boys, the peak ages of involvement in physical aggression for the three trajectory groups that appeared to follow a quadratic form were as follows: 13.9 years for boys in high-disadvantage neighborhoods with high-conflict families, 14.4 years in low-disadvantage neighborhoods with high-conflict families, and 14.6 years in low-disadvantage neighborhoods with low-conflict families.

In contrast to results for boys, the results for girls more closely matched our first moderation hypothesis. For girls with high neighborhood disadvantage and high family conflict, the intercept and peak level of aggression were higher, and the linear and quadratic slopes were less dramatic. These trajectory features suggest a gradual increase from a higher starting point that was accompanied by a slower process of desistance over time for these girls compared to their peers in either high-disadvantage neighborhoods or high-conflict families. Counter to our expectations, for girls, peak ages of involvement in physical aggression were earlier in high-conflict families (age 13.3 in low-disadvantage neighborhoods and age 13.4 in high-disadvantage neighborhoods) than in low-conflict families (age 14.6 in low-disadvantage neighborhoods and age 14.9 in high-disadvantage neighborhoods). Levels of physical aggression for girls from high-conflict families (from both high- and low-disadvantage neighborhoods) were notably higher until approximately age 15 than for girls from low-conflict families.

Discussion

Despite the importance of neighborhoods and families as developmental contexts during adolescence (Hill et al. 2007; Witherspoon and Ennett 2011; Chilenski 2011), relatively few studies have examined their joint effects on antisocial behaviors such as physical and social aggression. Some studies suggest family protective factors can buffer exposure to neighborhood risk (Krenichyn et al. 2001; Spencer 2001; Ozer 2005; Schofield et al. 2012), and that these relationships may further vary by gender (Cleveland and Gilson 2004). We expand on this literature by using multilevel growth curves to examine gender differences in neighborhood and family effects (and their interactions) on aggression trajectories. We describe effects for physical and social aggression separately, thus adding to the growing body of work documenting changes in social aggression during adolescence. Another unique feature of our study is the rural sample, as most neighborhood studies have focused on urban and inner-city youth. Thus, our study is well-positioned to answer important questions about whether and how family characteristics alter negative neighborhood influences on rural adolescents.

In this predominantly rural sample, there was partial support for our first hypothesis: Family conflict exacerbated effects of neighborhood disadvantage on physical aggression trajectories, with differential effects for boys and girls. For both boys and girls, the highest levels of physical aggression were in the context of both neighborhood disadvantage and family conflict. For boys, this pattern remained through approximately age 15, after which the highest-risk boys declined to lower levels of perpetration. Boys living in high-disadvantage neighborhoods who had low levels of family conflict exhibited an almost flat trajectory of physical aggression over time, with only a modest increase in initial levels of

aggression above that observed for boys in low-disadvantage areas with low family conflict. For boys, the findings suggest that family conflict is a more important predictor of physical aggression than is neighborhood disadvantage. During adolescence, boys may have greater freedom than girls to explore areas beyond their residential neighborhood (Leventhal and Brooks-Gunn 2000), which may dilute neighborhood effects defined by where they live (Inagami et al. 2007). Results also may be partially an artifact of measurement, given the overlap between the content of the physical aggression and family conflict measures (each included physically hitting others, for example).

As evident in the 3-way interactions, the joint effects of neighborhood disadvantage and family conflict for girls contrast differed from those for boys. For girls, the interaction of neighborhood disadvantage and family conflict resulted in trajectories for the highest-risk girls depicting the most severe and long-lasting behavior problems. Girls in high-disadvantage neighborhoods showed highly elevated initial levels of physical aggression and slower change over time in the context of high family conflict, which indicates both early onset and delayed desistance. The combination of early exposure to neighborhood and family risk factors set the girls up for sustained involvement in physical aggression that persisted throughout adolescence. Social controls against aggression are weaker in disadvantaged neighborhoods (as evident in the strong correlation between the two neighborhood risk factors reported in Table 1), and these may differentially impact girls with aggressive family role models. There also were more rapid increases in physical aggression for girls in high-disadvantage neighborhoods in the context of low family conflict. These girls exhibited lower levels of aggression at age 11 (likely attributable to the lack of aggressive family role models), and their rapid escalation suggests that the impact of neighborhood disadvantage was most evident as adolescence progressed (such as between ages 13 and 16) and the neighborhood context became more salient. This is consistent with Moffit's (1993) conceptualization of adolescent-limited behavior problems as a function of setting and opportunity. Despite the strong theoretical rationale, we are unaware of other studies that have examined the interrelationship of neighborhood disadvantage and family conflict on physical aggression. Our findings should be replicated in other samples, particularly considering that this was the only one of six 3-way interactions that attained statistical significance for either outcome.

There are alternate models depicting the interrelationship of neighborhood and family contexts. We framed our hypotheses in terms of family factors modifying neighborhood effects because the more proximal family influences are likely to alter those of more distal neighborhood contexts. (Note that it also is possible to interpret our findings in terms of an intensified relationship between family conflict and physical aggression in the context of neighborhood disadvantage, as both predictors were measured contemporaneously.) Future research involving longitudinal prediction of family functioning in different neighborhood contexts would be informative for assessing whether family protective factors mediate (as in Spano et al. 2009; Spano et al. 2012), rather than moderate, neighborhood effects on adolescent risk behaviors. This alternate conceptualization of the interrelationships between neighborhood and family factors over time is a focus of many "cascade" models of child development (such as Dodge et al. 2008). These models specify pathways through which early exposures to neighborhood risk factors might affect adolescent behavioral outcomes. For example, in their study of adolescent violence, Dodge and colleagues (2008) observed neighborhood effects on family processes as well as on early school failure and later affiliation with deviant peers; all of these predicted perpetration of violence in grades 10 and 11.

We found no evidence that family strengths buffered negative neighborhood effects. This is counter to prior research on different indicators of adolescent functioning (Spencer 2001;

Rankin and Quane 2002; Krenichyn et al. 2001). The divergence of our findings may be due to our focus on adolescent aggression, however. The interactions of neighborhood and family factors examined by Krenichyn and colleagues (2001) and Rankin and Quane (2002) were in relation to the promotion of prosocial youth behaviors. These processes may differ substantially from those inhibiting antisocial behaviors such as aggression, and further research is needed to confirm our results.

Overall, our null findings for social disorganization suggest neighborhood social processes may have limited impact on adolescents in nonmetropolitan environments where population density is low and residents may be geographically distant from one another. However, neighborhood effects on youth behavior are generally small (Kroneman et al. 2004), thus our findings may not be unique to the rural setting. Another consideration is that parent reports of neighborhood social processes, as used in this study, may have less relevance for adolescent residents than their own perceptions (Byrnes et al. 2007; Witherspoon and Ennett 2011). Additionally, the composite measure of neighborhood disorganization may have masked unique relationships between distinct elements of disorganization (neighborhood bonds, crime, monitoring) and the aggression outcomes, which should be investigated in future studies.

Family conflict, parent-child bonding and parental control were more influential determinants of adolescent aggression trajectories than either neighborhood disadvantage or disorganization. This is consistent with socioecological development models that emphasize more proximal factors over distal influences (Bronfenbrenner 1979) and with longitudinal studies of aggression that suggest that an early age of initiation and high levels of offending throughout adolescence are largely caused by family factors (Patterson et al. 1989). In the main effects models, we found consistent influence of the family factors on initial aggression levels, with inconsistent effects on change over time. Some longitudinal studies of aggression (Jackson and Foshee 1998; Saner and Ellickson 1996) and delinquency (Loeber and Stouthamer-Loeber 1986; Wiesner and Silbereisen 2003) suggest family factors affect change in antisocial behaviors over time, but one study noted the strongest effects of parental monitoring on initial levels of adolescent conduct problems (Simons-Morton et al. 2008). Further research examining time-varying associations would be helpful to identify particular parenting and family factors that become increasingly relevant as young adulthood approaches.

Counter to expectations, peak ages of involvement in both types of aggression were somewhat earlier in high-conflict families than in low-conflict families for both boys and girls. A similar effect was noted for effects of parent-child bonding on social aggression. This shift in peak age suggests desistance begins earlier, although in most instances, youth did engage in relatively high levels of aggression into late adolescence. Additional research is necessary to replicate these findings in other samples and with different measures. Because trajectories appeared to be more strongly impacted by family conflict and parent-child bonding at younger ages, future studies should investigate mechanisms by which families influence aggression during adolescence to better understand how social learning or other explanatory processes might impact initial levels and peak ages of aggression. Strong associations between conflict and bonds with aggressive behaviors among young adolescents may result from an early orientation to family members as key social referents that later is replaced by an increased influence of peers, as noted by Pagani and colleagues (2010).

Several limitations of the current study deserve mention. First, although examining neighborhood and family effects on aggression in a nonmetropolitan context is an important innovation, using a predominantly rural sample from a localized area may have limited

detectable neighborhood effects (Leventhal and Brooks-Gunn 2000). Although research suggests neighborhood studies on adolescent outcomes generally show similar effects regardless of level of aggregation of the data (Cleveland and Gilson 2004; Sampson et al. 2002), rural residents may not define neighborhoods the same way as their suburban or urban counterparts. This may decrease relevance of geographic analyses of rural neighborhood effects. The distributions of the variables used the composite score of neighborhood disadvantage varied, and it may be that those indicators with greater variability (such as education, occupational class and poverty status—all of which are integral to the construct of socioeconomic disadvantage) contributed more to the overall effects observed than other variables with more restricted ranges (such as access to a car). Additionally, generalizability may be limited to similar rural contexts or similar samples of adolescents with well-educated parents. Another concern is that the strong family effects may be partly attributable to same-source bias, since all family and aggression measures came from youth-report data. However, we did find levels of aggression approximating those documented in other studies with youth of similar ages (Farrell et al. 2000; Chilenski 2011), and findings resemble those from other longitudinal studies of family effects on aggression (Underwood et al. 2008; Pagani et al. 2010). Research suggests that youth- and parent-reports of physical aggression in childhood and early adolescence are highly comparable, but that youth self-reports may better differentiate between behaviors of varying severity (Di Gunta et al. 2010), such as those used in this study. Finally, given our specific interest in neighborhood and family factors, we did not incorporate other relevant predictors of youth aggression (such as peer affiliation and school context), which may assume enhanced importance in rural areas where neighborhood effects are relatively weak.

This study has several strengths that counter the aforementioned limitations. First, a large census of adolescents from three counties completed five waves of questionnaires. Response rates were high, and the demographically diverse sample was drawn from a wide variety of neighborhoods. Indicators of family context were based on established measures with good reliability. We used both U.S. Census data and parent-report data to describe neighborhoods to avoid same-source bias and capture subjective neighborhood characteristics (Weden et al. 2008). We used block groups, a relatively small Census unit, to approximate neighborhoods. Additionally, neighborhood self-report measures were adjusted for biases associated with parents' demographic characteristics (Raudenbush 2003) to limit influence of compositional factors (Oakes 2004). Finally, we employed multiple imputation procedures to replace missing values to minimize effects of attrition, and we note 87% of adolescents completed at least three of the five surveys. These strengths enhance the contribution of our findings to the literature on adolescent development

Our results have implications for prevention of youth aggression. During late childhood and early adolescence, family processes are important determinants of later aggressive behaviors. The influence of these early predictors has been described by others (such as Dodge et al. 2008). The present depiction of relationships between both family and neighborhood factors with growth in, and desistance from, two common forms of antisocial behavior further highlights how context shapes adolescent development over time. Many significant associations of these family and neighborhood predictors were with initial levels of aggression, which suggests early prevention programs are needed. Family-based programs founded in theories of social control (Hirschi 1969), social learning (Baranowski et al. 2002) and effective parenting (Darling and Steinberg 1993) implemented in childhood may help prevent adolescent physical and social aggression, regardless of the neighborhood environment. Certain youth (such as those from high-conflict families) appear to be at increased risk for aggression in the context of neighborhood disadvantage, and this risk may become more acute during adolescence. In concert with family-based programs,

neighborhood-level interventions starting in early adolescence may help prevent physical aggression perpetrated by youth from high-risk families.

Acknowledgments

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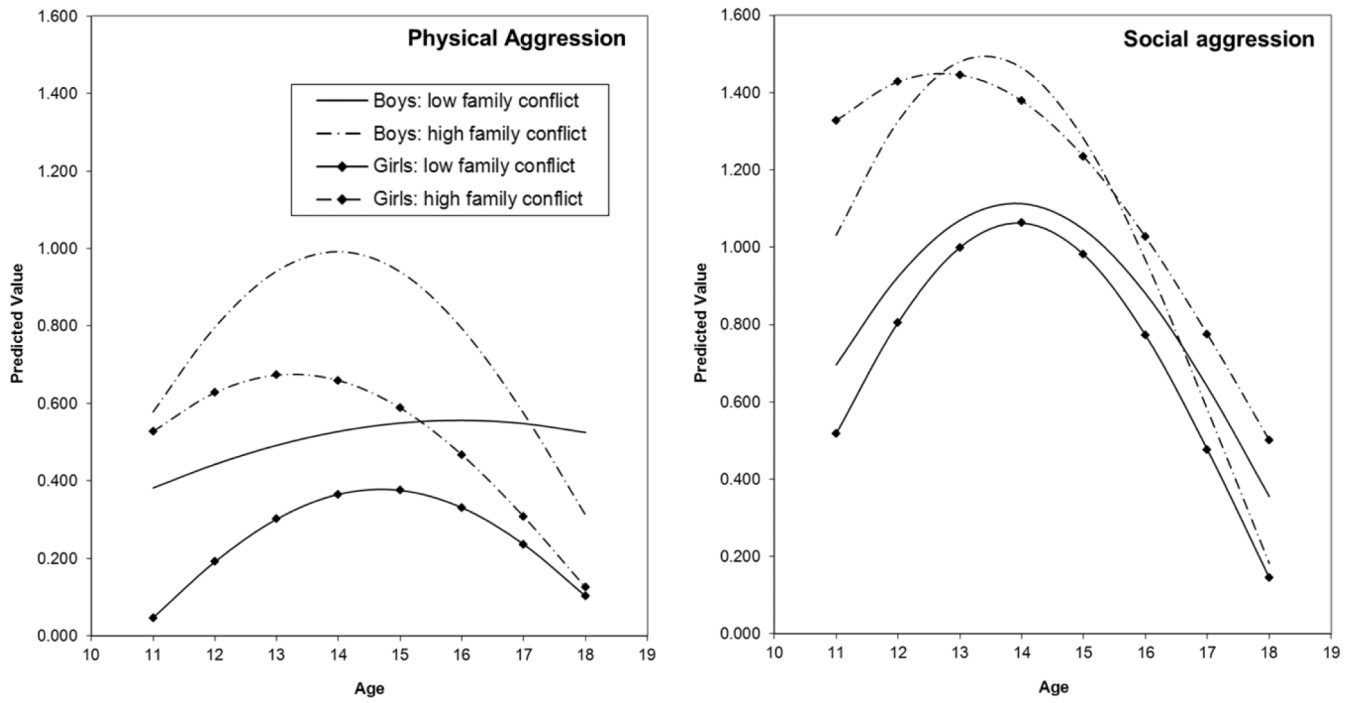
Figure 1.
Trajectories of physical aggression (left) and social aggression (left) as a function of age, gender and family conflict.
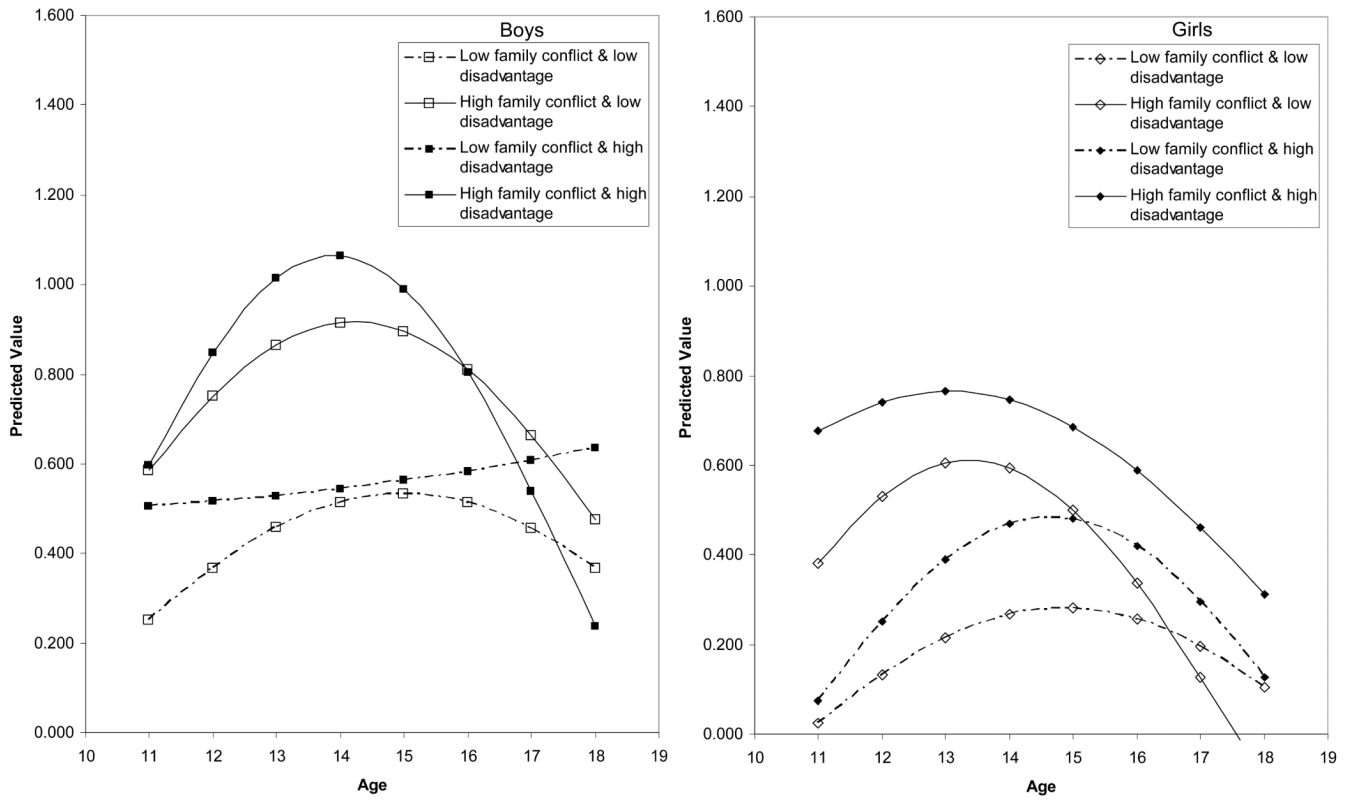
Figure 2.
Trajectories of physical aggression as a function of age, gender, neighborhood disadvantage
and family conflict

Table 1

Bivariate correlations between neighborhood and family constructs and aggression outcomes.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Physical aggression	---	.71[**]	.05[**]	.04[**]	.17[**]	−.11[**]	−.10[**]
(2) Social aggression	.61[**]	---	−.01	−.01	.11[**]	−.09[**]	−.09[**]
(3) Neighborhood socioeconomic disadvantage	.12[**]	.02	---	.72[**]	0.04[**]	−.12[**]	−.12[**]
(4) Neighborhood social disorganization	.09[**]	.01	.72[**]	---	0.05[**]	−.08[**]	−.08[**]
(5) Family conflict	.19[**]	.16[**]	.08[**]	.08[**]	---	−.28[**]	−.15[**]
(6) Parent-child bonding	−.14[**]	−.12[**]	−.08[**]	−.08[**]	−.35[**]	---	.56[**]
(7) Parental control	−.14[**]	−.09[**]	−.12[**]	−.08[**]	−.24[**]	.52[**]	---

Note. Males (N=2553) above diagonal; females (N=2565) below.

[*]
$p < .05$.

[**]
$p < .01$.

Table 2

Independent associations of neighborhood and family factors with physical and social aggression trajectories between ages 11 to 18

	Physical Aggression		Social Aggression	
	B	**95% CI**	**B**	**95% CI**
Effects on intercept				
Intercept	0.238[**]	(0.106, 0.370)	0.635[**]	(0.485, 0.785)
Male	0.153[**]	(0.048, 0.258)	−0.015	(−0.136, 0.107)
Socioeconomic disadvantage	0.007[**]	(0.004, 0.010)	0.003[†]	(0.000, 0.006)
Social disorganization	0.003	(−0.039, 0.045)	−0.004	(−0.051, 0.043)
Family conflict	0.169[**]	(0.109, 0.228)	0.191[**]	(0.118, 0.263)
Parent-child bonding	−0.036[*]	(−0.067, −0.006)	−0.140[**]	(−0.205, −0.075)
Parental control	−0.060[**]	(−0.082, −0.038)	−0.049[**]	(−0.073, −0.025)
Disadvantage[*]Male	−0.004[**]	(−0.007, −0.010)		
Conflict[*]Male	−0.109[*]	(−0.199, −0.020)	−0.110[*]	(−0.213, −0.008)
Effects on linear slope				
Age	0.115[**]	(0.062, 0.167)	0.133[**]	(0.079, 0.187)
Male	−0.012	(−0.082, 0.059)	0.029	(−0.052, 0.109)
Conflict	−0.031	(−0.070, 0.009)	−0.067[**]	(−0.114, −0.019)
Bonding			0.022[*]	(0.002, 0.042)
Conflict[*]Male	0.078[**]	(0.021, 0.136)	0.075[*]	(0.007, 0.143)
Effects on quadratic slope				
Age-squared	−0.019[**]	(−0.027, −0.012)	−0.026[**]	(−0.035, −0.018)
Male	0.003	(−0.008, 0.014)	−0.005	(−0.017, 0.008)
Conflict	0.001	(−0.005, 0.008)	0.008[*]	(0.001, 0.016)
Conflict[*]Male	−0.011[*]	(−0.020, −0.001)	−0.012[*]	(−0.023, −0.001)

Note. CI = confidence interval. Effects on slopes and interactions with sex were dropped when not statistically significant at the .10 level. All analyses controlled for race/ethnicity, parent education, family structure, the number of times the student moved across the five waves of data collection, the type of address geocoded and the precision of the neighborhood geocode match.

[†]*p* < .10

[*]*p* < .05.

[**]*p* < .01

Table 3

Interactions of neighborhood disadvantage and family conflict for physical aggression trajectories between ages 11 to 18

	Physical Aggression	
	B	**95% CI**
Effects on intercept		
Intercept	0.232**	(0.100, 0.365)
Male	0.160**	(0.053, 0.267)
Socioeconomic disadvantage	0.007	(−0.002, 0.015)
Social disorganization	0.003	(−0.039, 0.045)
Family conflict	0.163**	(0.103, 0.224)
Parent-child bonding	−0.037*	(−0.067, −0.006)
Parental control	−0.060**	(−0.082, −0.037)
Disadvantage*Male	−0.001	(−0.013, 0.011)
Conflict*Male	−0.098*	(−0.188, −0.008)
Conflict*Disadvantage	0.004	(−0.004, 0.011)
Conflict*Disadvantage*Male	−0.008	(−0.019, 0.003)
Effects on linear slope		
Age	0.118**	(0.065, 0.172)
Male	−0.017	(−0.088, 0.054)
Disadvantage	0.000	(−0.006, 0.005)
Conflict	−0.025	(−0.065, 0.015)
Disadvantage*Male	−0.001	(−0.009, 0.008)
Conflict*Male	0.067*	(0.009, 0.125)
Conflict*Disadvantage	−0.004	(−0.008, 0.001)
Conflict*Disadvantage*Male	0.007*	(0.001, 0.014)
Effects on quadratic slope		
Age-squared	−0.020**	(−0.027, −0.012)
Male	0.004	(−0.007, 0.015)
Disadvantage	0.000	(−0.001, 0.001)
Conflict	0.000	(−0.007, 0.007)
Disadvantage*Male	0.000	(−0.001, 0.001)
Conflict*Male	−0.008†	(−0.018, 0.001)
Conflict*Disadvantage	0.001†	(0.000, 0.001)
Conflict*Disadvantage*Male	−0.001*	(−0.002, 0.000)

Note. CI = confidence interval. Interactions of neighborhood and family variables were dropped when not statistically significant at the .10 level. All analyses controlled for race/ethnicity, parent education, family structure, the number of times the student moved across the five waves of data collection, the type of address geocoded and the precision of the neighborhood geocode match.

†
p < .10

*
$p < .05$.

**
$p < .01$