Trajectories of Physical Aggression Among Hispanic Urban Adolescents and Young Adults: An Application of Latent Trajectory Modeling from Ages 12 to 18

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Abstract

This study sought to identify trajectories of physical aggression among urban Hispanic youth, and to examine the effects of risk and protective factors at age 11 on trajectories of physical aggression over time (ages 12–18). Relying on data from 731 urban Hispanic adolescents from Project Northland Chicago (PNC), latent trajectory modeling was used to determine the number of trajectories, and multinomial logistic regression was used to identify the predictors associated with trajectory membership. The results suggested five trajectories of physical aggression (non-aggressive, low stable, escalators, early-rapid desistors, and high aggression/moderate desistors). After adjusting for several risk and protective factors, language preference (e.g. speaking Spanish at home) was identified as a protective factor, while indirect exposure to alcohol, sadness/depression, fewer negative alcohol-related attitudes, and threatening to fight were associated with increased risk for physical aggression. Study implications indicate that early, multilevel prevention efforts are necessary to deter the initiation and promote the desistance of physical aggression over time among urban Hispanic adolescents.

Keywords

Physical aggression; Hispanics; Longitudinal; Urban; Adolescents; Alcohol; Trajectories

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Youth violence is an important public health problem. Violence and physical aggression may result in intentional injuries and homicide and suicide, which are leading causes of death among adolescents (Center for Disease Control and Prevention 2009). Furthermore, aggressive behaviors are also associated with drug use, unsafe sex, dangerous driving, and other health problems (Moffitt 2006; Piquero et al. 2007). Yet, little is known about the trajectories of physical aggression among Hispanic adolescents. Examining trajectories of aggression among urban youth is important because urban environments are often characterized by neighborhood disorder, increased opportunity for drug use, and weaker economic conditions, all of which have been associated with higher rates of violence (Elliott et al. 1996), and Hispanics are disproportionately residents of these areas and the fastest growing ethnic group in the United States (Pew Hispanic Center 2010; U.S. Census Bureau 2005).

Lack of data on aggressive behaviors among Hispanics in the larger criminological literature, however, has limited the study of trajectories of aggression among Hispanic youth (Piquero 2008). In a review of eighty articles on developmental trajectories of criminal activity over the life course, Piquero (2008) found no articles focusing specifically on Hispanics. Instead, the extant research on aggression trajectories has focused on Blacks and Whites, and Hispanics are often combined into a "non-White" categorization, despite knowledge that they may have a distinct set of risk factors compared to other ethnic groups (Loukas et al. 2008; McCord et al. 2001). Recently, only two studies have investigated risk and protective factors associated with delinquency among Hispanic adolescents in general (Jennings et al. 2009; Maldonado-Molina et al. 2009) and from the trajectory modeling framework in particular (Maldonado-Molina et al. 2009). Acknowledging this lack of Hispanic longitudinal delinquency research, it is therefore important to understand the extent to which a common set of risk and protective factors identified in primarily and predominantly white, US-based samples replicate among Hispanics.

Focusing on risk and protective factors associated with racial/ethnic/cultural differences in physical aggression and violence has important implications to the extent to which general or race/ethnic/cultural-specific theories of crime are warranted. The general absence of literature examining the risks specific to Hispanic youth also highlights the need for further theoretically grounded research examining the epidemiology of physical aggression in young Hispanic populations (Akers and Lanier 2009). According to the general strain theory (Agnew 2001, 2006), strains are expected to vary across race/ethnicity/culture, which in turn generate differential outcomes (aggressive behavior versus non-aggressive behavior), suggesting important differences in the etiology of delinquency and physical aggression. A hypothesis which has been recently supported using a Hispanic sample of male and female adolescents (Jennings et al. 2009).

Several theoretical frameworks provide support for the study of risk and protective factors associated with aggressive behaviors during adolescence (Loeber et al. 2009). Expanding on social learning theory (Akers 1985), the problem-behavior theory (Jessor 1991; Jessor et al. 1995) provided a framework to the study of risk factors associated with adolescent problem behaviors (alcohol and illicit drug use, delinquency, drunk-driving), health-related behaviors (e.g. unhealthy eating, tobacco use) and school behaviors (e.g. truancy, dropout, drug use at school). In addition, Hawkins et al. (1992) provided a framework to indentify conditions that increase or decrease the probability of children and adolescents manifesting behavioral problems (Hawkins et al. 1992). In addition to these general theories of risk and protective factors, the theory of unstructured socializing (Osgood et al. 1996) also provided a framework to the study of parental/adult supervision and peer influences associated with physical aggression and other behavioral problems during adolescence (Haynie and Osgood 2005; Osgood and Anderson 2004). Thus, reviews of these theories suggest that when

examining risk and protective factors associated with physical aggression among adolescents, it is important to account for various contextual factors, including individual, family, peer, neighborhood, and cultural influences on physical aggression over time.

The Current Study

The present study uses a group-based approach to examine the effects of risk and protective factors at age 11 on trajectories of physical aggression from ages 12 to 18 using self-reported, longitudinal data from Hispanic youth living in Chicago, IL. Using a group-based methodological framework provides the opportunity to study how physical aggression changes over time by: (1) investigating whether there are different groups of adolescents with substantively different trajectories; (2) examining whether trajectories of physical aggression exhibit different shapes at different developmental stages; and (3) testing for the impact of personal, familial, social and environmental factors on the development of physical aggression over time. Specifically, the purpose of the current study is twofold: (a) to identify the number and characteristics of heterogeneous trajectories of physical aggression among urban Hispanics aged 12 to 18; and (b) to examine the effects of risk and protective factors at age 11 on these trajectories. We expect that both, social-ecological (e.g. family, peers, neighborhood context) and intrapersonal factors (e.g. psychological well-being, individual attitudes and beliefs), will differentiate the development of physical aggression over time. We also hypothesize a decline in physical aggression over time.

Methods

Research Design

Data were from Project Northland Chicago (PNC), a group-randomized trial that tested the efficacy of an alcohol preventive program for multi-ethnic urban youth (Komro et al. 2004, 2008). A cohort of youth enrolled in 61 public schools in Chicago participated in the study (29 schools assigned to the intervention, 32 to the comparison group) and completed self-report questionnaires when in 6th, 7th, 8th, and 12th grade. Four school-based surveys were conducted in 6th–8th grade (between 2002 and 2005). Each year, we requested updated information from the Chicago Public School (CPS) system and mailed a postcard to each participant's CPS-provided address in the spring of 2006, 2007, and 2008. In 2009, a follow-up study was conducted (when participants were in the 12th grade) using school-, mail-, and web-based surveys. Details on the research design, sample characteristics, and measures can be found elsewhere (Komro et al. 2008). Parental consent and student assent procedures were approved by the University of Minnesota's Institutional Review Board for the Protection of Human Subjects and the Chicago Public Schools' Law Department. University of Florida and University of Louisville IRBs approved conduct of secondary data analyses of the 6th to 8th grade data, and the 12th grade follow-up survey. A Certificate of Confidentiality was obtained from the U.S. Department of Health and Human Services to further protect the confidentiality of the student responses.

Participants

The current study includes 731 Hispanic adolescents who were in the control group and completed a survey at the beginning of 6th grade (age 11; 50.5% females and 49.5% males) and at least one additional follow-up survey. The majority of these participants lived in the U.S. their entire life (77.9%), spoke Spanish in their homes (67.5%), lived in natural parent households (70.7%), and were from low-income families (87.2% received free or reduced-price lunch). The mean age in 6th grade was 12.3 (sd=0.60), 13.3 in 7th grade (sd=0.53), 14.3 in 8th grade (sd=0.46), and 18.3 in 12th grade (sd=0.46). Of those present at baseline, 98% percent completed a survey in 6th grade, 77% completed a survey in 7th grade, and

70% completed a survey in 8th grade. In addition, 48% of those present at baseline (at age 11, in 2003) also completed a follow-up survey in 12th grade (age 18; in 2009). No significant differences in physical aggression were observed between participants missing in 7th grade (age 13; z=0.77, p=0.72), 8th grade (age 14; z=0.13, p=0.89) or 12th grade (age 11; z=0.88, p=0.38) with regard to the levels of physical aggression at baseline. Participants with higher levels of physical aggression at baseline (age 11), however, were more likely to be missing in the follow-up at the end of 6th grade (age 12; z=*2.31, p*=0.02). Males (z=2.18, p=0.03) and older adolescents (z=2.23, p=0.03) were more likely to be missing at the 12th grade follow-up. No significant differences in levels of physical aggression at baseline (F=1.18, p=0.28) were observed among those who completed the survey on paper (either via mail or in-school; 73.1%) versus the web-based survey (26.9%). Table 1 details the demographics of participants in this study.

Measures

Dependent Variable

Physical Aggression: A physical aggression index was created for each time point, including physical aggression at age 11 (baseline) and four additional repeated measures (6th, 7th, 8th, and 12th grade; ages 12 to 18). Three items were included: During the last month, how many times have you: (1) pushed, shoved, pulled someone's hair, or grabbed someone?; (2) kicked, hit, or beat up another person?; and (3) taken part in a fight, where a group of your friends were against another group? Responses to each of these three items included: "Never," "1–3 times," and "4 or more times". Scores ranged from 0 to 12 (0 = "Never", 2 = "1 to 3 times", to 4 = "4 or more times" to each of the physical aggression behaviors). A higher score on this index indicates more frequent physical aggression behaviors. The standardized Cronbach's coefficient alpha of the physical aggression measure ranged from 0.60 to 0.75.

Demographics: Demographic variables included age, gender (1 = male, 0 = female), language preference, natural parent household, socioeconomic status, and youth's nationality.

Language Preference: Preference of speaking Spanish at home, an indirect measure of acculturation, was assessed with one item: "What is the language most often spoken in your home?" Responses were coded as "Spanish" versus "English".

Socioeconomic Status: Receipt of free or reduced price lunch, an indicator of socioeconomic status, was assessed with one item: "Do you receive free or reduced-price lunches at school?" Responses were coded as "Yes" versus "No or don't know".

Nationality: Nationality was assessed with one item: "How long have you lived in the United States?" Responses were coded "All of your life" versus "Foreign-born".

Natural Parent Household: Family structure was assessed with one item: "Who do you live with most of the time?" Responses were coded as "Mother and Father together" vs. "Other".

Risk and Protective Factors

Unsupervised Time: Unsupervised time was assessed with one item: "About how many hours a day, do you usually spend without an adult around?" Responses included: "None", "<1 hour", "1–2 hours", "3–4 hours", and "5 or more hours".

Adult Alcohol Consumption: Indirect exposure to alcohol was measured with one item: "How many adults in your neighborhood drink alcohol?". Responses ranged from 0 to 4, including "None", "Few", "Some", "Many", and "Almost all".

Peer Alcohol Use: Peer alcohol use was measured with one item: "How many of your friends drink alcohol?". Responses ranged from 0 to 4, including "None", "Few", "Some", "Many", and "Almost all".

Parental Involvement: The parental involvement scale consisted of ten items measuring parental communication and involvement. These items included frequency of parental praise and general talking, asking about school and where the adolescent was going, discussing problems at school, alcohol advertisement influences, problems with alcohol, alcohol rules, and alcohol consequences, dining habits, and music restrictions. Responses included "Never", "Hardly Ever", "Sometimes", "A lot", and "All the time." Values for each item ranged from 1 to 5, with higher scores indicating greater parental involvement. The standardized Cronbach coefficient alpha for this scale was 0.81.

Physical Threat: "During the last month, how many times have you told someone you were going to hit or beat them up?" Response values ranged from 0 to 2 and included, "Never", "1–3 times", and "4 or more times".

Sad/Depressed: "During the last month, how often have you felt sad or depressed?" Response values ranged from 1 to 3, and included "Never", "1–3 times", and "4 or more times".

Alcohol-Related Attitudes: This scale consisted of five items measuring alcohol use outcome expectations: becoming sick, getting in trouble at school, with the police, and with parents, and losing friendships due to alcohol consumption. Responses ranged from 1–5 for each item, with categories including "Yes", "Maybe Yes", "Not Sure", "Maybe No", and "No". The standardized Cronbach coefficient alpha for this scale was 0.67, and a higher score indicated greater risk.

Analytical Strategy

To examine how many distinct trajectories of physical aggression best represented the heterogeneity in physical aggression between ages 12 to 18 (our first research question), we used mixture or group-based modeling. Mixture, or group-based methods, are often used to model unobserved heterogeneity in a population, and this is especially the case for physical aggression where it is believed that there are distinct subpopulations that differ in their aggression patterns over the life-course (Nagin 2005; Piquero 2008). We conducted the analyses using Proc TRAJ, a procedure in SAS to examine group-based latent trajectory models. Specifically in Proc TRAJ, maximum likelihood parameter estimates are used to estimate the variance-covariance matrix (Nagin 2005) and the trajectories are estimated using all available observations on the dependent measure; therefore, participants were included in the analyses if they had at least one valid observation of the dependent variable (in our study, the aggression measure).

Because the dependent variable was count data (number of physical aggression events during the past month), we used the zero-inflated Poisson (ZIP) model (Jones et al. 2001). To evaluate model fit, we followed extant research and used the Bayesian Information Criterion (BIC). BIC (Schwartz 1978) tends to favor more parsimonious models than traditional likelihood ratio tests when used for model selection. We used an iterative procedure to identify a meaningful number of groups, which involved beginning with a one-

group model and continue modeling with two, three, four, five, and six groups, until we maximized the BIC. We also examined trajectories using different types of polynomials (constant only, linear, quadratic, and cubic) in order to determine which approach best characterized physical aggression. We used the maximum posterior probabilities to evaluate the models' ability to sort individuals into the trajectory group to which they have the highest probability of belonging (the "maximum probability" procedure).

In order to determine the effects of several risk and protective factors (at age 11) on the trajectories of physical aggression (ages 12 to 18) within a multivariate framework, we used multinomial logistic regression. In all models, the non-aggressive trajectory served as the reference group to which we compared each of the physical aggression trajectories. We adjusted the standard error by calculating the robust clustered standard error (to account for multilevel nature of the data, since participants were nested within 23 schools). These analyses were conducted using STATA 11 (StataCorp 2009).

Results

Trajectories of Physical Aggression (ages 12 to 18) Among Hispanic Youth

To determine the number and interpretation of trajectories of physical aggression (ages 12 to 18), we used latent trajectory modeling. Five trajectories were identified: Non-aggressive (13.7%), Stable Low aggression (22.7%), Escalators (16.5%), Early and Rapid Desistors (25.9%), and High Aggression-Moderate Desistors (21.2%). A five-group trajectory model (BIC=−4891.87) showed the lowest BIC and AIC when compared to a 2- (BIC=−5170.63), 3- (BIC=−4994.69), 4- (BIC=−4910.20), and 6- (BIC=−4962.51) trajectory model. The mean posterior probabilities for group assignment ranged from 0.70 to 0.85. Figure 1 graphically displays the trajectories of physical aggression among urban Hispanic youth (ages 12 to 18).

Effects of Risk and Protective Factors at Age 11 on Trajectories of Physical Aggression

In the unadjusted models (see Table 2), males, youth with higher number of peers who use alcohol, spend greater amounts of time unsupervised, and report lower parental involvement were at higher risk for reporting physical aggression behaviors. These factors, however, were not significant in the adjusted models that incorporated baseline physical aggression (see Table 2), suggesting that the effect of the factors on trajectories of physical aggression appears to be indirect (e.g., operating through their effect on baseline physical aggression).

After adjusting for baseline physical aggression at age 11, youth who reported threatening to beat someone up, feeling sad or depressed, had a greater number of adults who drink alcohol in their neighborhood, and had fewer negative alcohol-related attitudes were more likely to be assigned to trajectories involving physical aggression. In contrast, language preference (e.g., youth who reported that Spanish was the preferred language at home) was associated with lower physical aggression. Gender differences were not observed in the adjusted models.

Discussion

Examining trajectories of physical aggression among Hispanic adolescents is important because Hispanic youth are disproportionately at risk for behavioral problems, drug use, and greater exposure to violence in their neighborhoods (Coulton et al. 1995; Duncan et al. 2002). This study reported five distinct trajectories of physical aggression among Hispanic youth, a finding consistent with previous trajectory studies using predominantly non-Hispanic samples (Piquero 2008; Fontaine et al. 2009;) as well as being consistent with Hispanic-based trajectory studies (Maldonado-Molina et al. 2009). Findings from the current

study are also consistent with prior research evaluating trajectories of aggression, as most trajectories of criminal activity show a decline by the end of adolescence (regardless of the outcome being assessed) (Maldonado-Molina et al. in press; see also Piquero 2008). In our study, almost half the sample (47%) reported a decline in aggressive behaviors by age 18, while 17 percent reported an increase in aggressive behaviors, 23 percent showed stability in low aggressive behaviors, and only 14 percent were consistently non-aggressive.

Our study also supports investigation into the role of ecological and intrapersonal factors associated with physical aggression. After controlling for several risk factors, an indirect measure of exposure to alcohol (i.e., an estimation of the number of adults who drink alcohol in the adolescents' neighborhood) was associated with greater physical aggression. More importantly, indirect exposure to alcohol was a significant risk factor only for the "High Aggression/ Moderate Desistors" trajectory, a group showing the highest levels of physical aggression and the slowest decline in aggression over time. In addition, youth who reported feeling sad or depressed during early adolescence were at higher risk for physical aggression during middle adolescence and early adulthood. Thus, these findings highlight the need to investigate the relation between psychological well-being and physical aggression among Hispanic adolescents (Jennings et al. 2010), in addition to exploring the role of alcohol exposure and neighborhood context on trajectories of physical aggression over time.

Consistent with literature on the role of acculturation and problem behaviors during adolescence (Schwartz et al. in press), youth who reported that Spanish was the preferred language at home were significantly less likely to engage in physical aggression. One might hypothesize that reduced intergenerational conflict among families that retain values and behaviors from their culture of origin may protect Hispanic adolescents (Pérez et al. 2008). For instance, preventive interventions among Hispanic families have shown that minimizing intergenerational (parent-child) conflict has been associated with improved family functioning and reduced drug use, among other behavioral problems (Pantin et al. 2009; Prado et al. 2007). Future research should focus on understanding the protective family and parenting mechanisms (reflected in cultural values and behaviors) that are protecting Hispanic adolescents from aggressive behavior. Future studies should also focus preventive efforts on the development of intervention programs to target protective factors associated with desistance from aggressive behavior(s) during early adolescence.

The findings from this study should be considered in light of a few limitations. Considering that our trajectory analysis relied on single-item measures and self-reported data, future studies should include data from multiple sources (e.g., parent, teacher) and examine youth aggression using official data. In addition, our study included only indirect measures of psychological well-being, neighborhood exposure to alcohol, and acculturation, which limits the in-depth examination of these ecological and intrapersonal factors on trajectories of physical aggression over time. Finally, although our study included a large sample of Hispanic adolescents, it did not permit the examination of within-ethnic group comparisons. Therefore, future studies should focus on examining whether the trajectories of physical aggression differ across distinct sub-groups of Hispanic adolescents.

Despite these limitations, our study has several strengths. First, the current study uses a group-based trajectory procedure, an advanced statistical technique, and longitudinal data to explore physical aggression over time. Second, our study includes a sample of Hispanic adolescents ages 11 to 18, an understudied and at-risk population (rather than a clinical or normative sample). Third, our study uses longitudinal data to assess monthly physical aggression from adolescence to early adulthood, permitting identification of distinct trajectories and the evaluation of how risk and protective factors during early adolescence

are associated with the development of trajectories of aggressive behaviors. This is an important contribution because it permits the examination of physical aggression over the life-course, as few studies have examined trajectories of physical aggression and other antisocial behaviors from early adolescence to adulthood, particularly among Hispanic populations (Piquero 2008).

The current study has important implications for the future of criminal justice policy and practice. Historically, the justice system has acted in a largely reactive manner, and little data has been collected that will allow us to learn about the prevention of aggression by early intervention. The results of this study demonstrate that adolescents are initiating aggressive behaviors early on in the life-course, and multiple levels of influence play a role in their participation in aggressive activity (e.g., neighborhood exposure, family, peer, and individual factors). Early intervention at more than one level may be more effective in reducing physical aggression and delinquency in Hispanic populations than the more traditional treatment strategies employed after the adolescent has initiated problem behavior. In sum, examining the etiology of physical aggression can provide a foundation for the development of preventive interventions targeting risk and protective factors associated with aggressive behavior(s) among Hispanics adolescents.

Acknowledgments

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Dr. Kelli A. Komro is an Associate Professor in the Department of Epidemiology and Health Policy Research and the Associate Director of the Institute for Child Health Policy, College of Medicine, University of Florida. She received her doctorate in epidemiology from the University of Minnesota. Her research interests include design and implementation of multi-level prevention and health promotion strategies for disadvantaged youth, as well as experimental and quasi-experimental methods to evaluate interventions.
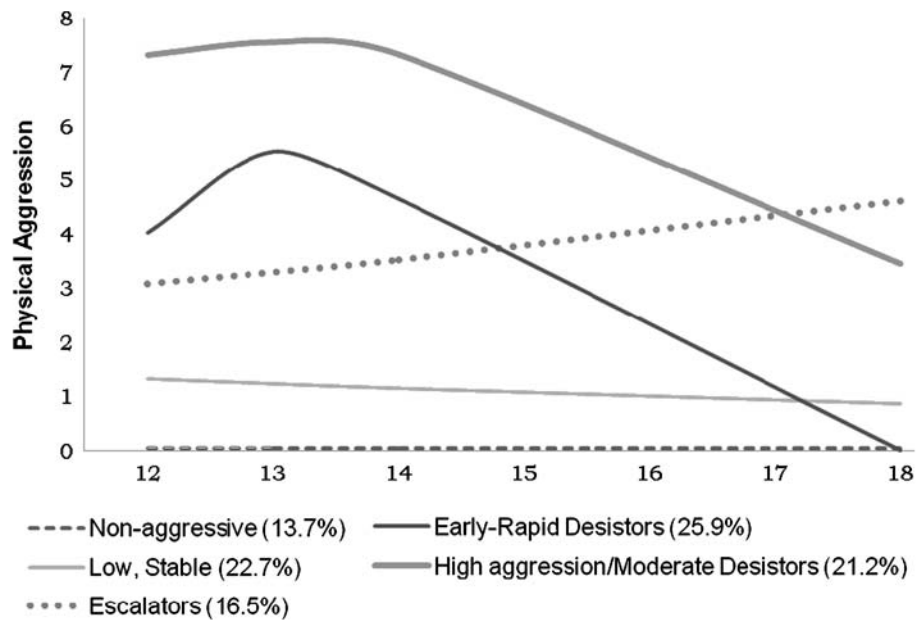
Fig. 1.
Trajectories of physical aggression among urban Hispanic youth, ages 12 to 18

Table 1

Baseline description (6th grade) of demographics and aggressive behaviors over time among urban Hispanic youth

Variable (Baseline)	n	Mean	SD	Proportion	Min	Max
Age	731	11.81	.53	–	10.51	13.64
Male	731	–	–	.49	0	1
Natural parent household	731	–	–	.71	0	1
Spanish at home	716	–	–	.67	0	1
Unsupervised time	728	1.56	1.41	–	0	4
Parental involvement	715	35.76	7.66	–	10	51
Adult drink alcohol	726	3.03	1.24	–	1	5
Sad/depressed	730	1.92	0.72	–	1	3
Peer Alcohol Use	728	0.44	0.76	–	0	4
Alcohol-related attitudes	716	7.88	3.21	–	5	25
Physical threat	731	0.49	0.69	–	0	2
Physical aggression						
Baseline	731	2.97	3.12	–	0	12
6th grade	714	3.37	3.35	–	0	12
7th grade	652	4.46	3.40	–	0	12
8th grade	517	3.67	3.33	–	0	12
12th grade	352	1.61	2.35	–	0	12

Table 2

Factors associated with trajectories of physical aggression among Hispanic youth: Unadjusted models and Adjusted for physical aggression

Variables	Non-aggressive	Low, stable		Escalators		Early-Rapid desistors		High aggression / Moderate desistors	
		UN	AD	UN	AD	UN	AD	UN	AD
		Relative risk							
Age	—	1.31	1.29	0.94	0.82	1.34	1.18	1.56	1.23
Male	—	0.96	0.92	1.87*	1.51	1.59	1.29	2.06*	1.44
Natural parent household	—	1.33	1.32	1.05	1.05	0.97	0.98	0.89	0.97
Spanish at home	—	0.64*	0.63**	0.39**	0.37***	0.59+	0.56+	0.35**	0.33**
Unsupervised time[a]	—	1.06	1.06	1.16+	1.11	1.18	1.13	1.21*	1.11
Parental involvement[b]	—	1.00	1.01	0.96	0.98	0.98	1.00	0.94*	0.97
Adult drink alcohol[c]	—	1.10	1.07	1.41**	1.24+	1.49***	1.31***	1.87***	1.53***
Sad/depressed[d]	—	1.50***	1.44**	1.91*	1.50	2.28***	1.81***	2.68***	1.83**
Peer Alcohol Use[e]	—	1.66	1.49	2.23*	1.47	2.47*	1.66	3.43+	1.91+
Alcohol-related attitudes[f]	—	1.13	1.01	1.25*	1.18+	1.25**	1.17*	1.30**	1.19*
Physical threat[g]	—	1.50+	1.20	3.36***	1.28	4.74***	2.31**	8.20***	2.46**

+
$p<.10$,

*
$p<.05$,

**
$p<.01$,

***
$p<.001$;

UN = Unadjusted, AD = Adjusted for baseline physical aggression;

[a]Range: 0–4; a higher score indicates a higher number of hours without adult supervision;

[b]Range: 10–51; a higher score indicates higher parental involvement;

[c]Range: 1–5; a higher score indicates a higher number of adults drink alcohol in their neighborhood;

[d]Range: 1–3; a higher score indicates higher number of times felt sad or depressed;

[e]Range: 0–4; a higher score indicates a higher number of peer alcohol users;

[f]Range: 5–25; a higher score indicates greater risk (e.g. lower negative expectations);

[g]Range: 0–2; a higher score indicates greater risk (e.g. higher frequency of physical threat).