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Violence Involvement, Substance Use, and Sexual Activity among Mexican American and European American Adolescents

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Abstract

Purpose—This study examined longitudinal associations between violence involvement, substance use, and sexual activity.

Methods—302 urban Mexican American and European American adolescents were randomly selected and recruited from the membership lists of a large health maintenance organization. Data were obtained from interviews conducted when the mean ages of adolescents were 15, 18, and 19 years.

Results—Independent of age, gender, ethnicity, family socioeconomic status, and previous levels of health risk behavior, adolescents who had been victimized by violence at age 15 were more likely to use tobacco at age 19. Adolescents who had been victimized by or perpetrated violence at age 18 had a greater number of sexual partners and were more likely to use marijuana at age 19. In addition, adolescents who had perpetrated violence at age 18 engaged in greater alcohol use at age 19. A second set of analyses showed that independent of demographics and previous violence involvement, adolescents who had used marijuana at age 15 were more likely to report violence involvement at age 19. Adolescents who had used tobacco or who had a greater number of sexual partners at ages 15 or 18 were more likely to report violent victimization at age 19.

Conclusions—Associations between violence involvement and other forms of health risk behavior are bidirectional. Adolescents involved with violence are at risk for increases in substance use and sexual behavior over time. Adolescents who engage in substance use and sexual behavior with multiple partners are also at risk for later violence involvement.

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Keywords

adolescence; violence; victimization; perpetration; substance use; sexual behavior

Peer violence, substance use, and sexual risk taking are among the most serious health issues facing adolescents. The Centers for Disease Control and Prevention estimate that roughly three quarters of a million people aged 10 to 24 years are treated in emergency rooms for violence related injuries yearly [1]. Substance use is linked with mental and behavioral health problems among adolescents [2], and half of all new sexually transmitted infections occur among youth aged 15 to 24 years [3].

Adolescents who engage in multiple risk behaviors may be especially vulnerable to negative outcomes, and thus, are an important subpopulation for prevention and intervention efforts. Cross-sectional data show that adolescents who have witnessed or been victimized by violence are more likely to engage in alcohol, tobacco, and marijuana use and to become substance use dependent [4–7]. Witnessing or being victimized by violence is also associated with sexual risk taking and related outcomes during adolescence [8–9]. This research parallels literature showing that violent perpetration is linked with substance use and sexual risk taking during adolescence [10].

Although all youth may experience negative consequences of engagement in health risk behavior, specific ethnic minority groups are disproportionately impacted. The Centers for Disease Control and Prevention report that Latino youth aged 10–24 years are 5 times more likely to be a victim of homicide in comparison to European American youth [1]. Latino adolescents also account for a disproportionately high percentage of new sexually transmitted infection cases in comparison to European American adolescents [11], and some data suggests they are more likely to experience negative health consequences of substance use [12]. The present study adds to a small literature examining associations between peer violence and other forms of health risk behavior among Latino youth [6–7]. For example, witnessing community violence was associated with greater lifetime drunkenness and likelihood of using cigarettes and marijuana among a representative sample of students in Panama, Costa Rica, and Guatemala [6]. Violent victimization was associated with greater opportunities to use marijuana among students in Mexico City [7]. In the present study, we examined longitudinal associations between peer violence involvement and other health risk behavior (substance use, sexual behavior) among Mexican American and European American adolescents living in an urban area in the United States.

A longitudinal perspective

Longitudinal research on peer violence involvement, substance use, and sexual behavior, adjusted for earlier levels of each outcome, provides information about how harmful patterns of health risk behavior may develop. Such research is distinct from studies documenting the co-occurrence of health risk behaviors cross-sectionally. The co-occurrence of different risk behaviors during adolescence is often described as a problem behavior syndrome [13], which may reflect underlying personality characteristics such as sensation seeking [9] or environmental characteristics associated with clustering of risk factors (e.g., low parental monitoring [6,28]). Longitudinal associations would suggest additional mechanisms. For example, violence involvement may lead to increases in substance use and sexual behavior over time if engagement in health risk behavior is a means of distracting oneself from or coping with stressful aspects of violence (i.e., stress-response framework [9,14–17]). Engagement in substance use and sexual activity with multiple partners may lead to increases in violence involvement over time if these health risk behaviors place adolescents in situations in which

violence is more likely to occur (i.e., vulnerability to violence framework [18–20]). Documenting longitudinal associations between peer violence involvement, substance use, and sexual behavior is a critical first step to examining whether stress-response and vulnerability to violence frameworks may account for associations between these risk behaviors.

To our knowledge, no previous studies have examined sexual risk taking as a potential precursor to peer violence involvement. Childhood aggression has been linked with adolescent sexual behavior [21] and risk taking [22], but studies have not yet examined whether violent victimization by peers predicts sexual outcomes. A body of literature has examined longitudinal associations between peer violence and substance use among adolescents. We briefly review this research below. Of note, only two studies have examined bidirectional associations between peer violence and substance use thus far, and these studies focused on violent perpetration [19,23]. Because our study focuses on violence inflicted by or against peers, we omitted studies from our review that examined domestic violence, intimate partner or dating violence, and sexual victimization or perpetration.

Involvement with peer violence may lead to increases in other health risk behaviors

One explanation of links between peer violence and other forms of health risk behavior is that adolescents may attempt to cope with violence involvement through risk behavior. Both victimization by violence and violent perpetration are linked to a range of adjustment problems among youth, including posttraumatic stress and depression [24–26]. Health risk behaviors such as substance use [9,14–17] and sexual activity [9,16–17] may temporarily reduce distress by providing a means of escape. Longitudinal associations between violence involvement and other forms of health risk behavior would strengthen the argument that health risk behavior may be a response to stressful aspects of violence involvement.

Longitudinal studies have documented that childhood aggression is associated with greater alcohol, tobacco, and marijuana use during adolescence [e.g., 22,27]. Additional studies have examined whether different types of peer violence during adolescence predict substance use. Rural children who witnessed violence by the middle of 6th grade were more likely to initiate tobacco or alcohol use by the year end [28]. Urban youth aged 9–13 years who reported greater victimization were more likely to report ever using alcohol when assessed one year later [29]. Adolescents may engage in substance use as a response to violent encounters that are not purely characterized by victimization. Non-smoking 7th–12th grade adolescents who engaged in perpetration were more likely to have initiated tobacco use when assessed one year later [30]. Perpetration was associated with increases in alcohol and marijuana use in a community sample of urban 7th grade boys followed across 6 years [23]. Studies have not examined whether victimization by peers predicts sexual behavior or risk taking. However, childhood aggression predicted reported pregnancies during adolescence among one sample of urban males [21]. Childhood aggression among urban 4th–6th grade girls predicted number of sexual partners 6 years later [22].

Health risk behavior may lead to increases in peer violence involvement

A second conceptualization of links between risk behaviors is that substance use and sexual behavior with multiple partners may place adolescents at greater risk for violence involvement. Substance use may disinhibit aggressive impulses and compromise youth's ability to recognize and safely negotiate situations in which violence may occur [19]. Adolescents with multiple sexual partners may be at greater risk for experiencing conflict with peers due to unresolved previous relationships, jealousy, and related tensions [20]. It is also possible that adolescents who engage in health risk behavior may increasingly spend time with peers who are engaging

in multiple forms of risk, including violence. Longitudinal associations between substance use or sexual activity and later violence involvement would strengthen the argument that specific health risk behaviors may place adolescents in situations in which violence is more likely to occur.

To our knowledge, previous studies have not examined sexual risk taking as a potential precursor to peer violence. Several longitudinal investigations have examined links between substance use and violence involvement. Alcohol and marijuana use are associated with increases in violent perpetration [19,23,31–32], although associations between marijuana use and violent perpetration are often inconsistent or non-significant when adjusting for alcohol use [19,23,32]. In an earlier investigation of the present study's sample, alcohol use at age 14 years was associated with violence involvement one year later, but the violence involvement measure did not distinguish between victimization and perpetration [author citation]. Mechanisms besides disinhibition may link substance use with subsequent violence involvement. Ellickson and colleagues found that tobacco use was associated with violent perpetration across a 10-year period among adolescents and young adults [18,33]. Although these studies did not adjust for early levels of violent perpetration, findings are consistent with the idea that adolescents who engage in health risk behavior may become more exposed to situations in which violence is likely to occur, perhaps due to peer-related mechanisms. Some data also suggests that substance use is associated with increases in violent victimization over time. In a longitudinal study of young adults aged 23 years at baseline, marijuana use among men and heavy alcohol use among women were associated with increases in victimization across the next 6 years [34].

Study contributions

The present study examines longitudinal associations between peer violence involvement (victimization, perpetration) and engagement in other forms of health risk behavior (sexual activity; alcohol, marijuana, and tobacco use) among adolescents across a 4-year period. We hypothesized that associations between violence involvement and other health risk behaviors would be bidirectional. To add to a small literature on this topic among Latino youth [6–7], our study included both Mexican American and European American adolescents and examined whether associations between study variables differed by ethnicity.

Methods

Procedure

Adolescents were part of a larger investigation examining the impact of parental conflict on adolescent functioning. A computer program randomly selected members of a large health maintenance organization (HMO) from adults who had a dependent child between the ages of 12 and 15. The study protocol was approved by the Institutional Review Boards of the University and HMO. Parents were sent letters introducing the research. Families were eligible to participate if the adolescent was between 12 and 15 years of age, if the adolescent's biological parents were residing together, if all three family members were either Mexican American or U.S. born European American, if the adolescent had no severe learning disability, and if the mother, father, and adolescent agreed to participate. Seventy-three percent of eligible families participated. Participation rates did not differ by ethnicity. Participants were interviewed at three time points separated by 6-month intervals. At the last time point (Year One; N=302; 99% retention rate), adolescents completed questions about peer violence involvement.

Four years after initial recruitment, families were asked to participate in additional interviews separated by a 1-year interval (Years Four and Five). Retention rates were 82% for Year Four and 74% for Year Five. Participants who remained in the study did not differ from non-

participants in terms of ethnicity, gender, and parents' country of origin, occupation, number of children, or divorce rate. Year Five interviews were completed in December 2000. Participants provided informed consent.

Participants

At Year One (N=302), Year Four (N=247), and Year Five (N=223), respectively, 151, 126, and 109 Mexican American adolescents and 151, 121, and 114 European American adolescents completed interviews. The mean (standard deviation) age of adolescents at each time point was as follows: Year One – 15.1 (1.1); Year Four – 18.3 (1.2); Year Five – 19.4 (1.2). Fifty-four percent of adolescents were male. At baseline, Mexican American parents reported an average of 8 years of education ($SD=4$), while European American parents reported an average of 16 years ($SD=2$). The average Hollingshead [35] occupational score (possible range, 1 to 9) was 6.7 ($SD=1.5$) for European American parents, corresponding to small business owners and managers, while the average score was 3.3 ($SD=1.8$) for Mexican American parents, corresponding to semiskilled workers. Family socioeconomic status was calculated by averaging across four standardized variables: years of education and occupation score for each parent.

Measures

To facilitate presentation and interpretation of data, we refer to time points by the mean age of adolescents at that time point (Age 15, Age 18, and Age 19 correspond to Year 1, Year 4, and Year 5).

Violence involvement—Peer violence involvement was assessed using a 12-month time frame. Items differed between assessments at Age 15 and Ages 18 and 19 (see Table 1). Items were developed based on focus groups and existing measures of violence exposure [36]. Because the majority of adolescents did not report violence involvement, dichotomous (no/yes) victimization and perpetration variables were created for each time point.

Sexual behavior—At Age 15, adolescents indicated whether they had ever engaged in vaginal or anal sex (no/yes). At Age 18, adolescents reported the number of lifetime partners with whom they had had sexual intercourse. At Age 19, number of partners in the previous year was examined. Nationally representative data show that sexually active adolescents with a greater number of lifetime partners are at greater risk for contracting sexually transmitted infections [37].

Substance use—Time frames for the assessment of substance use variables are presented in Table 2. At each time point, adolescents completed four items from the Drinking Styles Questionnaire [38] (see Table 2). We standardized and averaged across items to create an alcohol use composite score (alphas=.95, .95, and .94 at Ages 15, 18, and 19, respectively). Adolescents also indicated whether they had used tobacco or marijuana.

Data Analyses

Preliminary analyses examined distributions of and correlations between study variables, and whether data suggested that violence involvement is distinct from other forms of health risk behavior. Regression analyses examined whether (1) violence involvement predicted substance use and sexual activity, controlling for previous levels of engagement in substance use or sexual activity, respectively, and whether (2) substance use and sexual activity predicted violence involvement, controlling for previous levels of violence involvement. Linear regressions were performed on continuous outcome variables. Logistic regressions were performed on categorical outcome variables. Age, gender, ethnicity, and family socioeconomic status were

included as covariates in all analyses. Age 18 predictors are adjusted for the corresponding variable at Age 15. Footnotes to Table 4 and Table 5 describe this analytical approach in greater detail. Potential interactions between ethnicity and predictors were also examined.

Results

Distributions of study variables

The percentage of participants reporting violence involvement items is presented in Table 1. Mexican American adolescents were more likely to report several types of violence in comparison to European Americans, but each difference became non-significant when adjusting for socioeconomic status. Of the 222 adolescents who completed surveys at all time points, 46%, 29%, 15%, and 10% reported any victimization at zero, one, two, and all time points, respectively; the corresponding percentages for any perpetration were 54%, 24%, 14%, and 8% (not shown in table).

Distributions of substance use and sexual behavior variables are presented in Table 2. At Age 15, 60% of adolescents had ever used alcohol (not shown in table). The number of lifetime sexual partners reported at Age 18 ranged from 0 to 30 (44% reported 0 partners; median=1). At age 19, the number of sexual partners in the past 12 months ranged from 0 to 38 (32% reported 0 partners; median=2). The natural log of number of sexual partners at Ages 18 and 19 was examined in analyses. Table 2 shows that in comparison to European Americans, Mexican American adolescents were more likely to report sexual experience at age 15 and less likely to report alcohol use at ages 18 and 19. These differences were no longer statistically significant after adjustment for socioeconomic status.

Correlations between study variables

Within and across time points, violence involvement, substance use, and sexual activity variables were significantly associated with one another (see Table 3).

Examining whether violence is distinct from sexual activity and substance use

We conducted principal components analyses of study variables within each time point, utilizing Varimax rotation with Kaiser normalization. Two components emerged, corresponding to violence involvement (victimization, perpetration) and other forms of health risk behavior (sexual activity, alcohol, marijuana, and tobacco use). The violence involvement component explained 25%, 29%, and 30% of variance in responses at Ages 15, 18, and 19, respectively, while the sexual activity and substance use composite explained 40%, 38%, and 39% of variance.

Peer violence as a predictor of substance use and sexual activity

Table 4 shows that adolescents who were victimized by violence at Age 15 were more likely to use tobacco at Age 19 in comparison to adolescents who were not victimized (see Step 1 of Model 1). Adolescents victimized by violence at Age 18 reported a greater number of sexual partners and were more likely to use marijuana at Age 19 (see Step 2 of Model 1). Model 2 shows that adolescents who perpetrated violence at age 18 reported a greater number of sexual partners, engaged in greater alcohol use, and were more likely to use marijuana at Age 19 in comparison to non-perpetrators (see Step 2).

Substance use and sexual activity as predictors of peer violence

Table 5 shows that sexual behavior, marijuana use, and tobacco use at Age 15 predicted violent victimization and perpetration at Age 19 (see Step 1 of Models 1, 3, and 4). Engagement in sexual behavior and tobacco use at Age 18 predicted violent victimization at Age 19 (see Step

2 of Models 1 and 4). Associations between alcohol use and subsequent violence involvement did not reach statistical significance.

Potential ethnic differences

Potential interactions between predictors and ethnicity were examined for each of the predictors included in Models 1–2 of Table 4 and Models 1–4 of Table 5. Of the resulting 32 interaction tests, only one was significant at $p < .05$. We do not report this result because it may be due to chance ($1/32 = .03$). The linear regression output of SPSS includes calculations of power based on observed associations between study variables. Power ranged between .05 and .63 for interactions, in contrast to higher levels of power observed for main effects.

Discussion

In this longitudinal study, Mexican American and European American adolescents who were involved with peer violence engaged in greater substance use and sexual activity over time. Substance use and sexual activity also predicted involvement with peer violence over time. The present study's findings may be integrated with existing literature to suggest potential mechanisms linking peer violence with substance use and sexual behavior in a bidirectional fashion.

Stress-response framework

Independent of demographic variables and previous levels of health risk behavior, adolescents who had been victimized by violence or perpetrated violence reported increases in substance use and number of sexual partners over time. It is possible that adolescents may have engaged in health risk behavior as a temporary escape from stressful aspects of violence involvement. Previous research shows that violent victimization and perpetration are both linked with adjustment problems [24–26] and that some individuals are motivated to engage in substance use [9,14–17] and sexual behavior [9,16–17] as a means of coping with stressful life circumstances. Further research is needed to demonstrate whether longitudinal associations between violence involvement and other forms of health risk behavior are mediated by cognitive and affective responses to violence, including motivations to engage in risk behavior as a means of coping with violence.

Interestingly, adolescents who were victimized by violence at Year 1, when the mean age of adolescents was 15 years, were more likely to use tobacco by the end of the study in comparison to non-victimized adolescents. Victimization by violence at Year 4, when the mean age of adolescents was 18 years, was associated with having a greater number of sexual partners and with greater likelihood of using marijuana by the end of the study. An area for further research is whether adolescents at different developmental stages select different types of health risk behaviors as a potential means of coping with violent victimization. Developmental considerations may also be important to understand links between violent perpetration and health risk behavior. Violent perpetration at age 18 years, but not 15 years, was associated with health risk behavior at the end of the study. The types of violent perpetration that occur in late adolescence may be less normative and more indicative of stress or psychopathology than the types of perpetration that occur in middle adolescence.

Vulnerability to violence framework

Our findings show that adolescents who have sexual experience or who have used tobacco or marijuana by middle adolescence (mean age 15 years) are at increased risk for violence involvement by late adolescence. Adolescents who began the study with sexual experience may have reported subsequent violence involvement due to conflict, jealousy, or tensions with

peers as a result of unresolved relationships [20]. Additional research is needed to confirm this possibility.

Although some research suggests that disinhibition due to substance use (e.g., alcohol) may lead to violence involvement [e.g., 19], the present study's findings suggest that other mechanisms are important. Associations between alcohol use at mean age 18 years and subsequent violence involvement only reached marginal significance. Significant associations between tobacco and marijuana use and subsequent violence involvement are similar to the findings of Ellickson and colleagues [18,33], who reported that tobacco use was associated with violent perpetration across a 10-year period among adolescents and young adults. Ellickson and colleagues suggested that peer interactions may simultaneously expose adolescents to tobacco and violence [18]. However, their studies did not adjust for early levels of violent perpetration. Our results suggest that tobacco and marijuana use are associated with both violent perpetration and victimization over time, even after adjusting for earlier violence involvement. Findings are consistent with the idea that adolescents who engage in health risk behavior increasingly spend time with peers who are engaging in multiple forms of risk, including violence. Adolescents may also exchange less risky peer groups for more risky groups over time. This may be particularly likely to occur if a given health risk behavior is not yet "mainstream" among one's cohort of youth. In support of this idea, marijuana use at mean age 15 years, but not 18 years, was associated with greater likelihood of violence involvement by the end of the study. Further research is needed to examine peer-related mechanisms.

Ethnicity and health risk behavior

It is a strength of the present study that we included Mexican American adolescents, an understudied ethnic minority group at potentially greater risk for negative consequences from health risk behavior [1,11–12]. Our findings add to literature showing that violence involvement is associated with other forms of health risk behavior among Latino youth [6–7]. Our lack of statistically significant interactions between study variables and ethnicity may reflect our adjustment for socioeconomic status, or inadequate power to detect ethnic differences in the strength of associations between violence involvement, substance use, and sexual behavior that are independent of socioeconomic status. Tests of interactions in field settings often have low power [40]. It is also possible that we did not observe interactions between ethnicity and study variables because all participants' families belonged to the same HMO, which may be indicative of shared types of security across families.

Study limitations

Limitations of the present study include our reliance on adolescents' self-report of data. Results of the present study cannot be generalized to adolescents from single-parent homes or to adolescents without health insurance. The present study represents a conservative test of associations between violence involvement, substance use, and sexual behavior; stronger effects might be found among adolescents with families that are less stable in composition or that are uninsured. Differences in socioeconomic status between Mexican American and European American families may be indicative of other differences that were not measured and adjusted for in analyses. An additional limitation is that we did not have information about constructs that may have explained links between violence involvement and other health risk behavior (e.g., peer deviance, perceived stress).

Conclusions

Our findings lend support to the idea that health promotion efforts should adopt a comprehensive approach to adolescent engagement in health risk behavior. Prevention and intervention efforts would be informed by establishing whether stress-response and

vulnerability to violence mechanisms partly account for longitudinal associations between health risk behaviors among youth. For example, avoiding harmful patterns of substance use and risky sexual behavior may seem unimportant to adolescents who are coping with a violent environment or other stressful life circumstances. In this instance, it would be critical for health promotion programs to promote adaptive ways of coping with stressors and to provide supports for adolescents. Further research is also needed to understand how substance use and sexual behavior may make adolescents more vulnerable to violent environments. The present study suggests that violence involvement, substance use, and sexual behavior not only co-occur, but influence one another over time. Investigating the mechanisms that link violence involvement with other forms of health risk behavior is a promising area of further research.

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References

- Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. Web-based Injury Statistics Query and Reporting System (WISQARS) [Online]. 2007 [Accessed July 9]. Available at: <http://www.cdc.gov/ncipc/wisqars/default.htm>
- Substance Abuse and Mental Health Services Administration. The relationship between mental health and substance abuse among adolescents. Rockville, MD: SAMHSA; 1999.
- Weinstock H, Berman S, Cates W. Sexually transmitted diseases among American youth: Incidence and prevalence estimates, 2000. *Perspect Sex Reprod Health* 2004;36:6–10. [PubMed: 14982671]
- Brady SS. Lifetime community violence exposure and health risk behavior among young adults in college. *J Adolesc Health* 2006;39:610–613. [PubMed: 16982403]
- Kilpatrick DG, Acierno R, Saunders BE, et al. Risk factors for adolescent substance abuse and dependence: Data from a national sample. *J Consul Clin Psychol* 2000;68:19–30.
- Kliwer W, Murrelle L, Prom E, et al. Violence exposure and drug use in Central America youth: Family cohesion and parental monitoring as protective factors. *Journal of Research on Adolescence* 2006;16:455–478.
- Ramos-Lira L, Gonzalez-Forteza C, Wagner FA. Violent victimization and drug involvement among Mexican middle school students. *Addiction* 2006;101:850–856. [PubMed: 16696629]
- Berenson AB, Wiemann CM, McCombs S. Exposure to violence and associated health-risk behaviors among adolescent girls. *Arch Pediatr Adolesc Med* 2001;155:1238–1242. [PubMed: 11695933]
- Brady SS, Donenberg GR. Mechanisms linking violence exposure to health risk behavior in adolescence: Motivation to cope and sensation-seeking personality. *J Am Acad Child Adolesc Psychiatry* 2006;45:673–680. [PubMed: 16721317]
- Orpinas PK, Basen-Engquist K, Grunbaum J, Parcel GS. The co-morbidity of violence-related behaviors and health-risk behaviors in a population of high school students. *J Adolesc Health* 1995;16:216–225. [PubMed: 7779832]
- Centers for Disease Control and Prevention. Diagnosis of HIV/AIDS—32 states, 2000–2003. *MMWR* 2004;53:1106–1110. [PubMed: 15573027]
- Wallace JM. The social ecology of addiction: Race, risk, and resilience. *Pediatrics* 1999;103:1122–1127. [PubMed: 10224199]

13. Jessor, R.; Donovan, JE.; Costa, F. Personality, perceived life chances, and adolescent behavior. In: Hurrelmann, K.; Hamilton, SF., editors. *Social Problems and Social Contexts in Adolescence: Perspectives across Boundaries*. New York: Aldine de Gruyter; 1996. p. 219-233.
14. Tschann JM, Flores E, Pasch LA, Marin BV. Emotional distress, alcohol use, and peer violence among Mexican American and European American adolescents. *J Adolesc Health* 2005;37:11–18. [PubMed: 15963902]
15. Wills TA, Sandy JM, Yaeger AM, et al. Coping dimensions, life stress, and adolescent substance use: A latent growth analysis. *J Abnorm Psychol* 2001;110:309–323. [PubMed: 11358025]
16. Cooper ML, Shapiro CM, Powers AM. Motivations for sex and risky sexual behavior among adolescents and young adults: A functional perspective. *J Pers Soc Psychol* 1998;75:1528–1558. [PubMed: 9914665]
17. Stein JA, Nyamathi A. Gender differences in relationships among stress, coping, and health risk behaviors in impoverished, minority populations. *Personality and Individual Differences* 1999;26:141–157.
18. Ellickson PL, Tucker JS, Klein DJ. High-risk behaviors associated with early smoking: Results from a 5-year follow-up. *J Adolesc Health* 2001;28:465–473. [PubMed: 11377990]
19. Mulvey EP, Odgers C, Skeem J, et al. Substance use and community violence: A test of the relation at the daily level. *J Consult Clin Psychol* 2006;74:743–754. [PubMed: 16881782]
20. Shackelford TK, Buss DM. Betrayal in mateships, friendships, and coalitions. *Pers Soc Psychol Bull* 1996;22:1151–1164.
21. Miller-Johnson S, Winn DC, Coie JD, et al. Risk factors for adolescent pregnancy reports among African American males. *Journal of Research on Adolescence* 2004;14:471–495.
22. Prinstein MJ, La Greca AM. Childhood peer rejection and aggression as predictors of adolescent girls' externalizing and health risk behaviors; A 6-year longitudinal study. *J Consult Clin Psychol* 2004;72:103–112. [PubMed: 14756619]
23. White HR, Loeber R, Stouthamer-Loeber M, Farrington DP. Developmental associations between substance use and violence. *Dev Psychopathol* 1999;11:785–803. [PubMed: 10624726]
24. Ozer EJ, Weinstein RS. Urban adolescents' exposure to community violence: The role of support, school safety, and social constraints in a school-based sample of boys and girls. *J Clin Child Adolesc Psychol* 2004;33:463–476. [PubMed: 15271604]
25. Gorman-Smith D, Tolan PH. The role of exposure to community violence and developmental problems among inner-city youth. *Dev Psychopathol* 1998;10:101–116. [PubMed: 9524810]
26. Vermeiren R, Schwab-Stone M, Ruchkin VV, et al. Suicidal behavior and violence in male adolescents: A school-based study. *J Am Acad Child Adolesc Psychiatry* 2003;42:41–48. [PubMed: 12500075]
27. Harachi TW, Fleming CB, White HR, et al. Aggressive behavior among girls and boys during middle childhood: Predictors and sequelae of trajectory group membership. *Aggressive Behavior* 2006;32:279–293.
28. Sullivan TN, Kung EM, Farrell AD. Relation between witnessing violence and drug use initiation among rural adolescents: Parental monitoring and family support as protective factors. *J Clin Child Adolesc Psychol* 2004;33:488–498. [PubMed: 15271606]
29. Taylor KW, Kliewer W. Violence exposure and early adolescent alcohol use: An exploratory study of family risk and protective factors. *Journal of Child and Family Studies* 2006;15:207–221.
30. Scal P, Ireland M, Borowsky IW. Smoking among American adolescents: A risk and protective factor analysis. *J Community Health* 2003;28:79–97. [PubMed: 12705311]
31. Resnick MD, Ireland M, Borowsky I. Youth violence perpetration: What protects? What predicts? Findings from the National Longitudinal Study of Adolescent Health. *J Adolesc Health* 2004;35:e1–e10.
32. Blitstein JL, Murray DM, Lytle LA, Birnbaum AS, Perry CL. Predictors of violent behavior in an early adolescent cohort: Similarities and differences across genders. *Health Educ Behav* 2005;32:175–194. [PubMed: 15749965]
33. Orlando M, Tucker JS, Ellickson PL, Klein DJ. Concurrent use of alcohol and cigarettes from adolescence to young adulthood: An examination of developmental trajectories and outcomes. *Subst Use Misuse* 2005;40:1051–1069. [PubMed: 16040368]

34. Martino SC, Collins RL, Ellickson PL. Substance use and vulnerability to sexual and physical aggression: A longitudinal study of young adults. *Violence Vict* 2004;19:521–540. [PubMed: 15844723]
35. Hollingshead, AB. Four-factor index of social status. New Haven, Connecticut: Department of Sociology, Yale University; 1975.
36. Centers for Disease Control. Behaviors related to unintentional and intentional injuries among high school students – United States, 1991. *MMWR* 1992;760–762. [PubMed: 1406568]
37. Kelley SS, Borawski EA, Flocke SA, Keen KJ. The role of sequential and concurrent sexual relationships in the risk of sexually transmitted diseases among adolescents. *J Adolesc Health* 2003;32:296–305. [PubMed: 12667734]
38. Christiansen BA, Smith GT, Roehling PV, Goldman MS. Using alcohol expectancies to predict adolescent drinking behavior after one year. *J Consult Clin Psychol* 1989;57:93–99. [PubMed: 2925979]
39. Cohen, J. *Statistical power analysis for the behavioral sciences*. Hillsdale, New Jersey: LEA; 1988.
40. McClelland GH, Judd CM. Statistical difficulties of detecting interactions and moderator effects. *Psychol Bull* 1993;114:376–390. [PubMed: 8416037]

Table 1
Percentage of adolescents reporting violence involvement at each time point, within the total sample and ethnic groups.¹

	Mean Age 15 (N=302)		Mean Age 18 (N=247)		Mean Age 19 (N=223)	
	Total	Mex.	Total	Mex.	Total	Mex.
Any Violence Involvement	53.3 ^d	60.3	34.8	28.9	21.1	21.1
Any Victimization by Violence	44.7	47.0	29.1	24.0	18.8	18.3
Other kids started a fight with you	29.3 ^d	35.6	---	---	---	---
You were jumped or attacked by another kid or group	14.9	13.9	---	---	---	---
Another kid threatened to hit or hurt you in the past month	30.2	27.3	---	---	---	---
Got into a fight that someone else started	---	---	18.2 ^d	10.7	8.5	8.8
Been jumped or attacked by another teenager or group	---	---	16.6 ^d	10.7	6.7	7.3
Got hurt in a fight with another teenager or group	---	---	14.2	11.6	8.1	10.5
You were beaten up by another teenager or group	---	---	10.1 ^d	5.8	7.2	7.3
Had a knife pulled on you by another teenager	---	---	9.7	8.3	5.4	7.3
Had a gun pulled on you by another teenager	---	---	6.1 ^d	1.7	4.5	7.3
You were threatened with a club, bottle, or screwdriver	---	---	13.4	11.6	6.7	10.1
A teenager hurt you with a club, bottle, or screwdriver	---	---	5.7 ^d	2.5	2.2	3.7
A teenager stabbed or hurt you with a knife	---	---	1.2	0.8	0.9	0.9
A teenager fired a gun at you	---	---	2.8	0.8	3.1	6.4
Any Perpetration of Violence	35.1 ^d	47.0	28.3 ^d	19.0	15.2	18.3
You started a fight with other kids	13.7 ^d	18.1	---	---	---	---
You were part of a group of kids that jumped somebody	9.9 ^d	15.2	---	---	---	---
You threatened to hit or hurt another kid in the past month	26.9	30.0	---	---	---	---
Got into a fight that you started	---	---	19.0 ^d	13.2	5.4	7.3
Jumped or attacked another teenager or group	---	---	23.1 ^d	15.7	4.0	6.4
Hurt another teenager or group of teenagers in a fight	---	---	5.3	3.3	9.0	10.1
Beat up another teenager	---	---	18.2 ^d	9.9	9.0	12.8
You pulled a knife on another teenager	---	---	3.6	1.7	2.2	2.8
You pulled a gun on another teenager	---	---	2.4	1.7	1.3	2.7
You threatened a teenager with a club, bottle, or screwdriver	---	---	7.3 ^d	3.3	4.5	6.4
You hurt a teenager with a club, bottle, or screwdriver	---	---	4.5	1.7	2.2	4.6
You stabbed or hurt another teenager with a knife	---	---	0.4	0.0	0.9	0.9
You fired a gun at another teenager	---	---	0.8	0.0	1.8	3.7

¹ Unless otherwise indicated, violence involvement items were assessed using a 12-month time frame. "Any violence involvement" indicates that the participant was victimized by and/or perpetrated violence within the past year.

^d Logistic regression analyses showed that the percentage of adolescents reporting violence varied by ethnicity ($p < .05$). In each of these instances, the difference between European American and Mexican American adolescents was no longer statistically significant when adjusting for socioeconomic status.

Table 2
Distributions of health risk behavior variables at each time point, within the total sample and ethnic groups.¹

	Mean Age 15 (N=302)		Mean Age 18 (N=247)		Mean Age 19 (N=223)	
	Total	Mex.	Total	Mex.	Total	Mex.
Categorical Variables, % yes						
Used tobacco	47.7%	46.4%	65.3%	67.5%	44.6%	38.2%
Used marijuana	37.4%	40.4%	50.4%	48.4%	55.8% ^a	46.4%
Vaginal or anal sex	18.9% ^a	12.7%	--	--	--	--
Continuous Variables, M (SD)						
Alcohol use composite ²	0.0 (0.9)	0.0 (0.9)	0.0 (0.9) ^a	-0.2 (0.9)	0.0 (0.9) ^a	-0.2 (1.0)
How often did you drink alcohol?	2.3 (1.4)	2.4 (1.4)	3.4 (1.6) ^a	3.0 (1.6)	3.7 (1.4) ^a	3.4 (1.4)
How much alcohol did you drink at one time?	2.4 (1.6)	2.4 (1.5)	3.5 (1.7) ^a	3.2 (1.8)	3.9 (1.5)	3.8 (1.7)
How often did you get drunk?	1.6 (1.2)	1.7 (1.2)	2.4 (1.6) ^a	2.0 (1.4)	2.8 (1.7) ^a	2.4 (1.6)
What is the most alcohol you drank at one time?	2.4 (1.7)	2.5 (1.6)	3.6 (1.8) ^a	3.3 (1.9)	4.1 (1.6)	4.0 (1.8)
Number of sexual partners (untransformed)	--	--	2.4 (4.3)	2.4 (4.5)	2.4 (3.7)	2.5 (4.4)

¹Time frames for the assessment of study variables were as follows: "Ever" used for tobacco use, marijuana use, and vaginal or anal sex at mean age 15. "Lifetime" used for number of sexual partners at mean age 18. "Past 6 months" used for alcohol use at mean age 15 and for all substance use variables at mean age 18. "Past 12 months" used for all variables at mean age 19.

²Response stems for individual alcohol use items were as follows: *How often did you drink alcohol?* 1 – Didn't have even a sip or taste of alcohol, 2 – Had only a few sips, 3 – Once or twice, 4 – Once or twice a month, 5 – Once or twice a week, 6 – Almost every day; *How much alcohol did you drink at one time?* 1 – Didn't drink alcohol at all, 2 – Usually had just a sip or taste, 3 – 1 beer/drink or less, 4 – Between 2–3 beers/drinks, 5 – Between 4–8 beers/drinks, Usually more than 9 beers/drinks; *How often did you get drunk?* 1 – Didn't get drunk, 2 – Once or twice, 3 – 3–4 times, 4 – About once a month, 5 – About once a week, 6 – More than once a week; *What is the most alcohol you drank at one time?* 1 – Didn't drink any alcohol, 2 – Had less than 1 beer/drink, 3 – Had 1–2 beers/drinks, 4 – Had 3–5 beers/drinks, 5 – Had 6–12 beers/drinks, 6 – Had between a pint and a fifth of liquor, or 12–23 beers, 7 – Had over a fifth of liquor, or a case or more of beer. The alcohol use composite is the mean of the standardized values for each of the four individual alcohol use items.

^aAnalyses showed that report of this variable differed by ethnicity ($p < .05$). In each of these instances, the difference between European American and Mexican American adolescents was no longer statistically significant when adjusting for socioeconomic status.

Table 3

Correlations between study variables.¹

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.
Mean Age 15																	
1. Vict																	
2. Perp	.42***																
3. Sex	.19**	.22***															
4. Alc	.33***	.23***	.32***														
5. Mar	.19**	.31***	.25***	.56***													
6. Tob	.19**	.25***	.27***	.53***	.57***												
Mean Age 16																	
7. Vict	.34***	.26***	.12+	.19**	.21**	.14*											
8. Perp	.27***	.22***	.17***	.22***	.21***	.17***	.68***										
9. Sex	.15*	.30***	.47***	.45***	.47***	.39***	.28***	.32***									
10. Alc	.10	.12+	.24*	.48***	.36***	.43***	.29***	.26***	.41***								
11. Mar	.12+	.18**	.16**	.32***	.38***	.36***	.23***	.24***	.38***	.49***							
12. Tob	.12+	.21***	.24***	.38***	.48***	.60***	.18***	.17***	.42***	.45***	.43***						
Mean Age 17																	
13. Vict	.18**	.19**	.24***	.16*	.28***	.24***	.35***	.45***	.29***	.25***	.16*	.29***					
14. Perp	.20**	.27***	.28***	.15*	.28***	.22***	.38***	.44***	.31***	.25***	.20***	.25***	.71***				
15. Sex	.16*	.23***	.28***	.34***	.38***	.31***	.41***	.38***	.71***	.44***	.45***	.46***	.38***	.36***			
16. Alc	.12+	.15*	.25***	.41***	.33***	.45***	.27***	.30***	.44***	.63***	.46***	.49***	.34***	.35***	.46***		
17. Mar	.22**	.17*	.19**	.35***	.41***	.42***	.29***	.26***	.38***	.42***	.55***	.47***	.25***	.25***	.50***	.57***	
18. Tob	.22	.13+	.23	.38***	.35***	.44***	.20***	.23***	.27***	.39***	.25***	.56***	.32***	.25***	.39***	.44***	.43***

¹ Abbreviations are as follows: Vict – any victimization by violence; Perp – any perpetration of violence; Sex – sexual behavior; Ale – alcohol use composite; Mar – marijuana use; Tob – tobacco use. Correlations are adjusted for age, gender, ethnicity, and family socioeconomic status.

+ p<.10

* p<.05

** p<.01

*** p<.001

Regression of age 19 health risk behavior on previous violence involvement.^{1,2}

Table 4

	Number of Sexual Partners		Alcohol Use Composite		Risk Behavior in Past 12 Months (Assessed at Age 19)		Used Marijuana		Used Tobacco	
	Beta	η ²	Beta	η ²	Odds Ratio	[95% CI]	Odds Ratio	[95% CI]	Odds Ratio	[95% CI]
Model 0										
Age	.02	.00	-.08	.01	0.72 ⁺	[0.51,1.02]	0.71 [*]	[0.52,0.97]		
Male Gender	.08	.01	.13 [*]	.02	1.92 ⁺	[0.98,3.88]	0.91	[0.47,1.79]		
European American	-.09	.00	.00	.00	1.69	[0.59,4.89]	2.79 [*]	[1.02,7.64]		
Ethnicity										
Socioeconomic Status	.06	.00	.11	.01	1.54	[0.84,2.84]	1.08	[0.62,1.90]		
Age 15 Risk Behavior	-.09	.01	.13 [*]	.01	4.16 ^{***}	[1.86,9.28]	2.09 ⁺	[0.98,4.48]		
Age 18 Risk Behavior	.76 ^{***}	.47	.59 ^{***}	.30	10.64 ^{***}	[5.20,21.79]	22.76 ^{***}	[7.51,69.01]		
Model 1										
Step 1	.02	.00	.05	.00	2.03 ⁺	[0.99,4.17]	2.52 [*]	[1.24,5.11]		
Step 2	.22 ^{***}	.05	.06	.00	2.85 [*]	[1.15,7.06]	1.31	[0.58,2.96]		
Model 2										
Step 1	.06	.00	.06	.00	1.11	[0.52,2.38]	1.07	[0.53,2.17]		
Step 2	.19 ^{***}	.03	.11 [*]	.01	2.63 ⁺	[1.09,6.38]	2.23 ⁺	[0.97,5.10]		

¹ Beta coefficients are presented from linear regressions of number of sexual partners and the alcohol use composite on predictors. Eta Squared (η²) values are presented as a measure of effect size. Eta Squared represents the proportion of variance in an outcome that is accounted for by a specific predictor. According to Cohen [39], values of .01, .06, and .14 correspond to small, medium, and large effect sizes, respectively. Odds ratios are presented from logistic regressions of marijuana use and tobacco use on predictors.

² Models 1–2 control for age, gender, ethnicity, socioeconomic status, and level of risk behavior at ages 15 and 18. Step 1 of Models 1–2 show the effect of violence involvement at age 15 on health risk behavior at age 19, while Step 2 of Models 1–2 show the additional effect of violence involvement at age 18 on health risk behavior at age 19.

⁺ p<.10
^{*} p<.05
^{**} p<.01
^{***} p<.001

Regression of age 19 violence involvement on previous health risk behavior.¹

Table 5

	Violence Exposure in Past 12 Months (Assessed at Age 19)	
	Victimization Odds Ratio [95% CI]	Perpetration Odds Ratio [95% CI]
Model 0		
Age	0.96	[0.67,1.36]
Male Gender	2.13 ⁺	[0.92,4.94]
European American Ethnicity	1.87	[0.61,5.69]
Socioeconomic Status	0.79	[0.42,1.50]
Age 15 Violence Involvement	1.44	[0.63,3.31]
Age 18 Violence Involvement	5.55 ^{***}	[2.44,12.55]
Age 15 Ever had Sex	3.65 [*]	[1.36,9.81]
Age 18 Number of Lifetime Sexual Partners	1.75 [*]	[1.03,2.96]
Age 15 Alcohol Use Composite	1.38	[0.88,2.18]
Age 18 Alcohol Use Composite	1.72 ⁺	[0.99,3.01]
Age 15 Used Marijuana	3.04 ^{**}	[1.34,6.89]
Age 18 Used Marijuana	1.26	[0.53,3.02]
Age 15 Used Tobacco	3.24 ^{**}	[1.43,7.34]
Age 18 Used Tobacco	11.54 ^{**}	[2.23,59.76]
Model 1		
Step 1		
Step 2		
Model 2		
Step 1		
Step 2		
Model 3		
Step 1		
Step 2		
Model 4		
Step 1		
Step 2		

¹ Odds ratios are presented from logistic regressions of victimization by violence and violent perpetration on predictors. Models 1–4 control for age, gender, ethnicity, socioeconomic status, and violence involvement (victimization or perpetration) at ages 15 and 18. Step 1 of Models 1–4 show the effect of health risk behavior at age 15 on violence involvement at age 19, while Step 2 of Models 1–4 show the additional effect of health risk behavior at age 18 on violence involvement at age 19.

⁺ p<.10

^{*} p<.05

^{**} p<.01

^{***} p<.001