Published in final edited form as:
J Res Adolesc. 2012 September ; 22(3): 542–555. doi:10.1111/j.1532-7795.2012.00786.x.

A Longitudinal Analysis of Cumulative Risks, Cumulative Promotive Factors, and Adolescent Violent Behavior

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Abstract

This study examined the effects of cumulative risk and promotive factors on violent behavior across the high school years of adolescence in a sample of predominately African American urban adolescents (n = 750). Cumulative risk and promotive factor indices represented individual characteristics, and peer, parental, and familial influences. Using growth curve modeling, we describe trajectories of cumulative risk and promotive factors and test the associations between the time-varying cumulative risk and promotive factor indices and violent behavior. Higher risk was associated with higher levels of violent behavior. Higher levels of promotive factors were associated with less violent behavior and moderated the association between risk and violent behaviors. The results support the risk-protective model of resiliency. Implications for prevention are discussed.

Youth Violence

Youth violence is a significant social and public health problem. Violence rates peak during the adolescent years, and adolescents disproportionately suffer the consequences of violence, including imprisonment, injury, and death (Centers for Disease Control and Prevention [CDC], 2009, National Adolescent Health Information Center, 2007). Males and African Americans are at particular risk for involvement in violence and related negative health and social sequelae (e.g., homicide, incarceration) (CDC, 2009; Herrenkohl, Maguin, Hill, Hawkins, Abbott, & Catalano, 2000). Nationwide, African American students are more likely than Hispanic or White students to report having been in a physical fight in the past year (CDC, 2009). Homicide is the leading cause of death among African American adolescents and young adults (CDC, 2007) and African-American youth are 15 times more likely to die of homicide than their white counterparts (CDC, 2007). Males experience greater levels and more serious forms of violence than females (Farrington et al., 2004; Loeber & Stouthamer-Loeber, 1998). Violence involvement during adolescence is a potent risk factor for ongoing violence involvement into young adulthood (Borowsky, Widome, & Resnick, 2008; Dahlberg & Potter, 2001; Herrenkohl et al., 2000). Research on risk factors for violent behavior are numerous, but fewer studies on promotive factors, and the cumulative nature of both risk and promotive factors are reported in the research literature.

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Conceptual Underpinnings

The conceptualization of the current study utilized developmental-ecological theory to examine how risk and promotive factors influence adolescent violent behavior over time. The *developmental-ecological framework* posits that individual development is influenced by the multiple social settings (e.g., family, school, and neighborhood) in which the adolescent lives (Bronfenbrenner, 1979). More recent work in youth violence builds on this theory by stressing the dynamic nature of development and stresses the importance of assessing both differences between individuals and variations within individuals (Guerra et al., 2008). Risk factors are conditions associated with a higher likelihood of negative outcomes (Kazdin, Kramer, Kessler, Kupfer, & Offord, 1997), while promotive factors (i.e., individual assets and contextual resources) operate to enhance healthy development (Fergus & Zimmerman, 2005). Researchers have proposed that promotive factors may reduce the negative effects risk pose on development through direct effects (compensatory model) or through interaction effects (risk-protective model) (Fergus & Zimmerman, 2005). The compensatory model implies that promotive factors can counteract the effect of risk factors (Garmezy, Masten & Tellegen, 1984; Masten, Garmezy, Tellegen, Pelligrini, Larkin & Larsen, 1988). The risk-protective model assumes that promotive factors buffer the negative effect of risk exposure, interacting with risks to reduce their negative effect (Rutter, 1985). Based on these tenets, an examination of youth violence must include risk and promotive factors at multiple levels and must allow for variation in both risk and promotive factors and in violent behavior over time.

Risk and Promotive Factors for Youth Violence

Research on youth violence includes risk and promotive factors present within individuals, and peer and family relationships that increase or decrease the likelihood that young people will engage in violence (Borowsky et al., 2008; Brookmeyer, Henrich, & Schwab-Stone, 2005; Farrington, 2007; Gorman-Smith, Henry, & Tolan, 2004; Herrenkohl et al., 2000; Resnick, Bearman, & Blum, 1997; Resnick, Ireland, & Borowsky, 2004; Sampson & Raudenbush, 1997; Valois, MacDonald, Fischer, & Wanzer Drane, 2002). At the individual level, attention and learning problems, antisocial behavior, hopelessness, witnessing violence and violence victimization have been associated with higher levels of aggression and violence (Bolland, 2001; Bolland, 2003; Brookmeyer, Fanti, & Henrich, 2006; Cedeno, Elias, Kelly, & Chu, 2010). On the other hand, individual level factors such as social skills, school achievement, connections to school, and a sense of hope and purpose have been deemed promotive (Borowsky et al., 2008; Cedeno, et al., 2010; DuRant, et. al., 1994; Farrell et al., 2010; Resnick et al., 2004).

Parents and family can offer both risk and protection for youth violence (Farrell et al., 2010; Ferguson & Meehan, 2010; Herrenkohl et al., 2000; Youngblade, et al., 2007; Resnick, et al., 2004; Zimmerman, Steinman, & Rowe, 1998). A quality relationship with parents that is warm, nurturing and supportive is viewed as promotive (Farrell et al., 2010; Ferguson & Meehan, 2010; Youngblade et al. 2007; Resnick et al., 2004; Zimmerman et al., 1998); whereas, family aggression and parent and family attitudes and behaviors that are favorable to violence are risk factors for youth violence (Herrenkohl et al., 2000; Youngblade et al., 2007).

Peer influences increase during adolescence. Peers can offer either positive or negative influence. Involvement with pro-social peers may offer positive support and role modeling for more positive behavior (Smith, Lay, Bell, & Weissberg, 2001). Association with delinquent peers increases an adolescents' risk of involvement in serious delinquency, violence, and crime (Dahlberg & Potter, 2001; Ferguson & Meehan, 2010). Peer influences

that include pressure to engage in fighting and weapon carrying also place young people at risk on involvement in violence (Lipsey & Derzon, 1998; Salzinger, Feldman, Rosario, & Ng-Mak, 2011).

While the relationship between risk and promotive factors and violence should not vary by race or ethnicity, the likelihood of exposure to risk and the accumulation of risk factors is higher for ethic minority children growing up in disadvantage (Guerra & Williams, 2006). In addition, minority adolescents growing up in disadvantage may have access to fewer resources that function to promote healthy development and reduce the risk of violence. African American families are more likely to live in poor neighborhoods with severely concentrated disadvantage and suffer the associated consequences (Wilson, 1987). For example, African American youth witness significantly higher rates of violence compared to white youth (Crouch, Hanson, Saunders, Kilpatrick, & Resnick, 2000). While African American youth are at increased risk for violent behavior, more studies on the development of violent behavior have been conducted with predominantly White samples. More studies on risk and promotive factors for youth violence in African-American youth are needed (Guerra & Smith, 2006).

While risk and promotive factors are similar for adolescent males and females, the level of risks or the availability of promotive factors may differ (Fagan et al., 2007; Logan-Greene et al., 2011). Fagan and colleagues (2007) found, for example, that boys in a large multi-community study reported higher levels of risk exposure and lower levels of protective factors than girls. In a study assessing risk and protective factors for youth violence across multiple domains, Logan-Green and colleagues (2011) also found that the levels of risk and promotive factors differed for males and females, but that the risk and protective factors themselves had the same relationship to violence regardless of gender. Based on the existing literature, gender differences exist in both rates of violence, and in experiences with risk and promotive factors.

To date, most research on the effect of risk and promotive factors on youth violence has focused on single risk and promotive factors (DuRant et al., 1994; Herrenkohl et al., 2000; Resnick et al., 2004; Valois et al., 2002). Researchers who have explored cumulative risk and promotive factors have done so either within specific ecologic domains (i.e., individual, family, school) (van der Laan et al., 2010), or by examining how cumulative risk and promotive factors at a single time point predict delinquency over time (Stouthamer-Loeber, Loeber, Wei, Farrington, & Wilstrom, 2002). Using a domain specific approach, Van der Laan and colleagues (2010) examined cumulative risks and promotive factors at the levels of individual, family and school and found support for a compensatory model of resiliency for delinquent behavior (i.e., promotive factors counteracted the effect of risk factors). Their results, however, did not support a protective model for delinquent behavior (i.e., protective factors did not moderate the effect of risk factors). Stouthamer-Loeber and colleagues (2002) examined cumulative risk and promotive effects as predictors of later serious delinquency. In their study, participants with a predominantly promotive score had almost no risk of becoming a persistent serious delinquent, while those with a predominantly risk score had a high chance of becoming persistent delinquent. An approach examining risk and promotive factors as time-varying covariates would advance our understanding of the dynamic nature of risk and promotive factors and their relationship to violent behavior during adolescence. Little is known about the cumulative effects of these factors across domains, and even less is known about the relationship between cumulative risks and promotive factors and violent behaviors among African American adolescents over time.

Guided by developmental-ecological theory, and drawing from previous research on resiliency, the purpose of our study was to: 1) examine the trajectories of cumulative risks,

cumulative promotive factors, and violent behaviors; and 2) to examine the association between cumulative risks and cumulative promotive factors and violent behaviors; and 3) to test a compensatory model and a risk-protective model of resilience for violent behavior across the high school years of adolescence in a sample of predominately African American youth using multilevel growth curve modeling. We hypothesized that risk and promotive factors fluctuate over time and vary with violent behavior. We hypothesized that higher levels of cumulative risk would be associated with higher levels of violent behaviors over time, and higher levels of cumulative promotive factors would be associated with less involvement in violent behaviors over time. We expected to find differences in the association between cumulative risk and promotive factors and violent behaviors during adolescence based on individual characteristics (e.g., completion of high school, SES, and gender).

Our study expands on previous research in the following ways. First, we examine cumulative risks and cumulative promotive factors longitudinally from a developmental-ecological and dynamic perspective. Few researchers have examined how these factors change over time and influence each other to predict adolescent outcomes in general. Second, we examine the relationship between cumulative risk and promotive factors and violent behavior over time. This strategy is novel in youth violence prevention literature as most research on the effect of risk and promotive factors on youth violence has focused either on single risk and promotive factors (DuRant et al., 1994; Herrenkohl et al., 2000; Resnick et al., 2004; Valois et al., 2002), or cumulative risk and promotive factors within specific ecologic domains (i.e., individual, family, school) (van der Laan et al., 2010). By modeling cumulative risk and promotive factors as a time-varying covariate, we are adding a new approach to understanding the relationship between risk and promotive factors and violent behavior over time. Third, we examine the relationship between cumulative risks and cumulative promotive factors and violence behavior in a sample of predominately African American adolescents. To date, much of what we know about predictors for the development of violent behavior has been learned through predominately White samples. This study will expand our understanding of the role of cumulative risk and promotive factors in the development of violent behavior among African American adolescents and enhance our ability to develop effective violence prevention strategies.

Method

Sample

This study is based on 4 years of data collected as part of a longitudinal study of youth from mid-adolescence (i.e., high school years) to young adulthood. Data were collected from 850 adolescents at-risk for high school dropout at the beginning the ninth grade in four public high schools in a Midwestern city. To be eligible for the study, participants had a grade point of 3.0 or lower at the end of the eighth grade, were not diagnosed by the school as having emotional or developmental impairments, and self-identified as African American, White, or Bi-racial (African American and White). Waves 1 through 4 correspond to the participants' high school years. One hundred and one participants were excluded due to missing data. Of the remaining 750 participants, fifty-one percent were male; seventy-nine percent were African American.

Data Collection

Structured face-to-face interviews were conducted with students in school or in a community setting if the participants could not be found in school. Interviews averaged 60 minutes. After the interview portion of the protocol, participants completed a self-administered paper and pencil questionnaire about alcohol and substance use, sexual

behavior and other sensitive information. The study had a 90% response rate over the four Waves of data collection. The University of Michigan's Institutional Review Board approved the study design and procedures (UM-IRB#H03-0001309).

Measures

Level 1 variables

Violent behavior: Four items, indicating how often participants had engaged in each behavior during the preceding 12 months, were used to assess violent behavior in year 1: gotten into a fight at school or at work, taken part in a group fight, hurt someone badly enough to need bandages or a doctor, and used a knife, gun or some other thing (like a club) to get something from a person. Response options ranged from 1 (*0 times)* to 5 (*4 or more times)*. We computed a mean composite score with higher scores indicating more violent behavior (α = .62). In waves 2 - 4, the item *gotten into a fight at school or at work* was split into 2 items: *gotten into a fight at school* and *gotten into a fight outside of school*, creating a 5 item measure of violent behavior. Cronbach α for this measure in waves 2 - 4 ranged from .71 −.74. The mean for violent behavior in Year 1 was .44 (SD = .66), in Year 2 was . 51 (SD = .71), in Year 3 was .36 (SD = .60), and in Year 4 was .32 (SD = .59).

Risk and promotive composite indices: Using procedures similar to those by other researchers (Bowen & Flora, 2002; DeWit, Silverman, Goodstadt, & Stoduto, 1995; Newcomb & Felix-Ortiz, 1992; Ostaszewski & Zimmerman, 2006), we created risk and promotive factor indices. Promotive and risk factors include individual characteristics and peer, parental, and familial influences. Variables were identified and assigned as either promotive or risk factors based on previous adolescent violence literature (Borowsky et al., 2008; Brookmeyer et al., 2005; Farrington, 2007; Gorman-Smithet al., 2004; Herrenkohl et al., 2000; Resnick et al., 1997; Resnick et al., 2004; Sampson & Raudenbush, 1997; Valois, et al., 2002) and based on their correlation with the outcome variable (violent behavior). Risk and promotive factors included were correlated with violent behavior in our sample.

Table 1 indicates the risk and promotive factors across levels of analysis. Nine variables were selected for study as promotive factors: self-acceptance (Stein, Newcomb, & Bentler, 1986), positive attitude about school (Hawkins, Catalano & Miller, 1992), school relevance, future expectations, friends' support (Procidano & Heller, 1983), friends' positive influences, friends' participation in positive activities, parent support (Procidano, & Heller), and family participation in recreational or fun events (Moos & Moos, 1981). Eleven variables selected as risk factors: approval of violence, observed violence, victimization, hopelessness about the future, non-violent delinquency, weapon carrying, friends' negative influence (Stacy, Newcomb, & Bentler, 1992; Dielman, Butchart, & Shope, 1991), friends' aggressive or delinquent behaviors, friends who are suspended from school, weapon carrying by resident adults, and weapon carrying by non-family adults.

To create the risk and promotive composite factors, we first standardized the original items. The upper 16% of the distribution of each of item (greater than 1 standard deviation from the mean) was designated as high levels of either a promotive factor or a risk factor, depending on the items, the middle 68% was identified as average levels of promotion or risk, and the lower 16% identified as low or no promotion or risk. Each participant was given a score of 2 if their score on the variable is equal to or above the upper 16% cut point, a 1 if their score was in the middle 68% of the distribution and a zero if their score was in the lower 16% of the distribution. We selected this method as a way to identify extremes for each variable. Similar methods for identifying cutpoints have been used in other studies of youth violence and delinquency (Stouthamer-Loeber et al., 2002). Cumulative indices were computed by summing the promotive and risk factors, respectively, for each individual. The

range for the cumulative promotive factor is 0 to 18, and the range for the cumulative risk factors is 0 to 22. The mean for the cumulative promotive factor index in Year 1 was 9.61 (SD = 2.50), in Year 2 was 9.62 (SD = 3.32), in Year 3 was 9.12 (SD = 3.56), and in Year 4 was 7.99 (SD = 3.51). The mean for the cumulative risk index was 10.90 (SD = 2.34) in Year 1, 10.65 (SD = 3.12) in Year 2, 10.22 (SD = 3.65) in Year 3, and 9.98 (SD = 3.86) in Year 4.

Level 2 variable

Demographic characteristics: In Wave 1, participants reported their month and year of birth, race, and gender. Socioeconomic status was assessed based on the highest occupational prestige score for either of the participants' parents (Nakao & Treas, 1990). The highest occupational group received a prestige score of 64.38 (professional), and the lowest group received a score of 29.28 (private household worker). Parents of youth were mostly *blue-collar* workers from local factories (M = 39.81; SD = 10.48). Participants self-reported their race as Black or African American, White or Caucasian, or Mixed (African-American and White).

Data Analytic Strategy

We conducted preliminary attrition analyses across all study variables comparing participants with complete data (n = 750) to those who were excluded from this study (n = 101). Descriptive statistics for violence were calculated by sex for each wave of data; t-tests were used to examine differences by sex. We used HLM 6.08 (Scientific Software International, 2009) to model cumulative risk, cumulative promotive factors, and violence over time. While a repeated measures regression performs list-wise deletion for cases with missing values in one or more data points, HLM maximizes all available data because its algorithms do not require information across all Waves in order to compute growth estimates for each participant (Raudenbush & Bryk, 2002). Multilevel modeling allows the total variance to be divided into within-individual variation (Level One Model; i.e., change in violence over time) and between-individual variation (Level Two Model; i.e., person-centered characteristics).

We first modeled the change in cumulative risk and cumulative promotion over time, respectively, using an age-centered approach starting at age 14. This approach models the change over time for every year increase since age 14 across adolescence. We examined linear, quadratic, and cubic models of change in cumulative risks and promotive factors over time. If the intercept or growth terms varied between individuals, we explored whether individual characteristics (i.e., race, SES, or sex) explained the variation in risk or promotive factors over time. These variables were were dropped from analyses if they were non-significant.

We then examined violence over time age-centered at age 14. After modeling the linear and non-linear growth of violence, we examined if the trajectories varied by person-centered characteristics. If these variables were non-significant, they were dropped from the analyses.

To test the association between cumulative risk and promotive factors and involvement in violent behaviors over time, we entered each time-varying covariate into the growth curve model. Following a hierarchical, stepwise regression approach, we first entered the cumulative risk score (Model 2), followed by the cumulative promotive score (Model 3) (to test a compensatory model). We then created a risk-promotive interaction term to acknowledge the possibility that the association between risk factors and promotive factors could have combined effects of violent behavior over time (to test the risk-protective model). Given our interest in understanding whether person-centered characteristics would

modify these time-varying relationships, we also tested for differences in the slopes of cumulative risks and cumulative promotive factors, respectively, across our socio-demographic variables (i.e., race, SES, gender).

Results

Attrition

In comparing participants included in this analysis with those omitted from it, we found no differences for violent behavior ($t_{(846)} = .77$; *n.s.*) or cumulative risks ($t_{(849)} = .72$; *n.s.*) at baseline; however, those who remained in the study had higher cumulative promotive scores than those omitted from the study ($t_{(849)} = -2.43$; $p \leq .01$). Adolescent males were more likely to be excluded from our analyses than females ($\chi^2_{(1)} = 3.67$; $p = .05$). In comparing male participants included in this analysis with those omitted from it, we found no baseline difference for violent behavior ($t_{(421)} = .34$; *n.s.*), cumulative risk ($t_{(423)} = 1.08$; *n.s.*), or cumulative promotive factors ($t_{(423)} = -1.20$; *n.s.*). We also compared female participants included in this analysis with those omitted and found no differences for violent behavior ($t_{(423)} = 1.08$; *n.s.*) or cumulative risks ($t_{(423)} = .72$; *n.s.*) at baseline; however, females included in the analysis had higher baseline levels of cumulative promotive factors ($t_{(423)} = -1.82$; $p \leq .05$) than females excluded from the analysis.

Cumulative risks—On average, participants reported moderate levels of participation in risk behaviors (B = 10.01, *SE* = 0.19; $p \leq .001$.) (Table 2). African American youth reported higher levels of risk (B = 0.46, SE = 0.16; p ≤ .01) at age 14 than their white counterparts. Furthermore, males reported higher levels of cumulative risks than females at age 14 (B = 0.37, SE = 0.13; p ≤ .01). Even after accounting for variation based on race and gender, random variation remained on the mean score at age 14 ($\chi^2_{(703)} = 1251.99$; p ≤ .001).

A cubic model provided the best fit for change in cumulative risks during adolescence. Overall, the number of cumulative risk factors increased initially with age, stabilized in later adolescence, and increased as youth transitioned into young adulthood. We did not find differences in change over time by person-centered characteristics, but random variation on the linear and quadratic slope remained ($\chi^2_{(705)}$=829.13; $p \leq .001$ and $\chi^2_{(705)}$=783.41; $p \leq .05$, respectively).

Cumulative promotive factors—On average, participants also reported moderate levels of promotive factors (B = 8.78, *SE* = 0.18; $p \leq .001$) (Table 2). African American youth reported higher levels of promotive factors at baseline (age 14) than white or mixed race youth. Even after accounting for variation based on race, random variation still existed on the mean score at age 14 (baseline) ($\chi^2_{(733)} = 1577.77$; p ≤ .001). We found no change by gender or SES at baseline.

Change in cumulative promotive factors during adolescence was best modeled with a quadratic model. Overall, the number of cumulative promotive factors increased initially (B = 0.70, *SE* = 0.10; $p \leq .001$); and then decreased during later adolescence (B = −0.21, SE = 0.02; p ≤ .001). We found no differences in change of promotive factors over time based on person-centered characteristics (i.e., SES, gender, or race); however, some random variation in the slope remained unexplained ($\chi^2_{(734)} = 962.22$; p ≤ .001).

Violent behavior—On average, participants reported between 0 and 1 acts of violence (B = .30, *SE* = .04; $p \leq .001$) at age 14. Differences in initial level of violent behaviors varied by person-centered characteristics (Table 3). At baseline, males reported more involvement in violence than their female counterparts (B = .19, *SE* = .04; $p \leq .001$). African American youth reported higher levels of violence than their white and mixed race counterparts (B = .

12, SE = .04; $p \leq .01$). Socioeconomic status was not associated with violent behavior at baseline. Even after accounting for variation based on gender, random variation remained on the mean score at age 14 ($\chi^2_{(732)}$ = 1534.33; p ≤ .001). Overall, violent behavior decreased with age (B = −0.03, SE = 0.01; $p \leq .001$). While sex, race, and SES were not associated with violent behaviors over time, random variation in change over time remained ($\chi^2_{(734)}$=924.97; $p \leq .001$).

Violent behavior & cumulative risks (Risk effects)—When we included cumulative risk as a time-varying covariate, we found violent behavior increased across adolescence for every unit increase in cumulative risk (B = .11, SE = 0.01; $p \leq .001$). This association, however, varied by gender. Boys reported more violence than girls with every unit increase in cumulative risk over time (B = .04, SE = 0.01; $p \leq .001$), but after accounting for variation based on gender, random variation in risk over time remained ($\chi^2_{(670)}$ =890.13; p ≤ .001).

Compensatory model—We then included youth's cumulative promotive factors as a time-varying covariate, and found that violent behavior decreased across adolescence for every unit increase in youth's cumulative promotive factors (B = −0.01, SE = 0.004; $p \leq .05$). Cumulative promotive factors did not vary by person-centered characteristics.

Risk-protective model—Finally, we added a cumulative risk-promotive interaction term to the model to assess for a non-proportional association between cumulative risks and promotive factors. In the prior models, intercept and cumulative risks varied by race and gender, so random effects for the intercept and risk were included in this model. After accounting for the main effects of cumulative risks and promotive factors, we noted the presence of a multiplicative effect on violent behavior (B = −0.01, SE = 0.003; $p \leq .05$).

As shown in Figure 1, for both males and females, violent behavior decreased across the adolescent years. Nevertheless, we found variation in the trajectories of violent behavior based on youth's cumulative risk and promotive factors. Youth with higher cumulative risks (1 SD above the mean) had higher levels of violence at baseline and over time than youth with lower cumulative risks (1 SD below the mean). Youth who reported higher cumulative promotive factors (1 SD above the mean) exhibited lower levels of violence at baseline and over time than youth who had lower cumulative promotive factors (1 SD below the mean). We outline the cumulative risk and promotive interaction term by describing four groups: High Risk-High Promotive, High Risk-Low Promotive, Low Risk-High Promotive, and Low Risk-Low Promotive. Among youth with higher cumulative risks, the presence of more promotive factors buffered their mean violent behavior score over time when compared against those with high cumulative risks and fewer promotive factors. Among youth with lower cumulative risks, we found comparable violent behavior scores between those reporting low and high cumulative promotive factors, respectively.

Discussion

Our results support a developmental-ecological framework that stresses the dynamic nature of development (Guerra et al., 2008). We found that individual and contextual variables explained variations in behavior change within individuals. We also found that variations in risk and promotive factors explained violent behavior over time. Higher levels of cumulative risk were associated with higher levels of violent behaviors over time and higher levels of cumulative promotive factors were associated with less violent behaviors over time. Yet, after accounting for the main effects of cumulative risks and promotive factors, we also found that cumulative promotive factors moderated the negative effects of cumulative risks on youth violent behavior. Contrary to past findings reporting only a compensatory model

(e.g., van der Laan et al., 2010), our findings support a risk-protective factor model of resiliency. Cumulative promotive factors were protective, moderating the relationship between cumulative risks and violent behavior in the presence of higher levels of cumulative risks. In the presence of lower levels of cumulative risks, however, level of cumulative promotive factors did not have as great of an effect on the presence of violent behavior. These results suggest that for all youth, but particularly for youth with more risk factors, promotive factors across ecological domains can have a positive and lasting effect on adolescent violent behavior.

We anticipated differences in the association between cumulative risk and promotive factors and violent behaviors over time based on individual demographic characteristics. While we found gender differences at baseline and in cumulative risk, gender was not associated with change in violent behavior or cumulative promotive factors over time. Our findings may reflect changes in violent behavior among females. While previous researchers argue that females tend to use more relational, verbal and indirect aggression rather than physical aggression, (Bjorkqvist et al 1992, Cairns et al 1989; Crick 1995, Crick & Grotpeter 1995), female adolescent violence has increased (OJJ, 2008). Yet, while national statistics point to increases in violence and delinquency among female adolescents, this may be an artifact of changes in police and court practices rather than actual increases in the behavior itself. In addition, it may be that gender differences in violent behavior were captured at baseline, and there may not be gender differences in change in violent behavior over time.

Our findings differ from previous research suggesting some gender differences in promotive factors (Graves, 2007; Whitney, Renner, & Herrenkohl, 2010; Hartman, Turner, Daigle, Exum, & Cullen, 2009; Stueve, O'Donnell, & Link, B., 2001). One reason our results may differ from previous research is that we studied cumulative effects and most other studies included risk and promotive factors singularly. While Fagan and colleagues (2007) found that boys reported lower levels of protective factors than girls, they did not include a range of promotive factors across ecological domains. It is possible that the cumulative measure in our study included variables that may be more salient for males thereby washing out gender differences. Our findings were more similar to Hartman et al. (2009) who found that while males and females relied on different protective factors to foster resiliency, the accumulation of protective factors appears to be equally important for both males and females.

Neither race nor SES were associated with change in violent behavior or cumulative promotive factors over time. We may not have found effects for race because SES in our sample was somewhat limited. It is likely that SES, and not race, may be more relevant for violent behavior and the developmental-ecological variables we studied. It is likely we did not find SES effects because our sample was largely homogenous on this variable (lower SES overall). The limited variation in SES, therefore, may have reduced the potential correlation others have found for SES and violent behavior. It is also plausible that our measure of SES (based on the prestige score) may not have been sufficiently robust to capture existing variability.

Notably, cumulative risk and promotive factors had somewhat different trajectories over time. While this may be due to the variables that composed the cumulative scores, it is also possible that risk and promotive factors do not behave the same way over time. It is possible that risks show an increase after a slight decrease over time because of their delayed effects. Hopelessness about the future (a risk factor), for example, may wane as one ages, but increase again as one begins to realize limited educational and employment opportunities after high school. Another explanation is that early risks may have delayed consequences. Family conflict, for example, may have a delayed effect until youth develop their own intimate relationship. Our findings suggest that risk factors fluctuate during adolescence so

research that explores the adult transition may help shed light on this important developmental period when some of these factors may have waning influences.

The pattern for cumulative promotive factors, increasing then steadily decreasing, may be due to maturation. As youth age and begin the next phase of their life, for example, positive attitudes about school may be less relevant while doing well in college or securing meaningful employment becomes the focus. Similarly, another indicator in the cumulative promotive factor index is family support, but this variable may also wane somewhat as youth transition to adulthood. The promotive factors selected in this study may have been less relevant for our participants as they emerged from adolescence (Guerra et al., 2008). This study highlights the importance of promotive factors for helping youth overcome risks they face. The promotive factors in our study are assets consistent with the characteristics youth need to thrive in the positive youth development literature (Lerner, Fisher, &Weinberg, 2000; Roth, Brooks-Gunn, Murray, & Foster,1998). Nevertheless, further research that focuses on the mechanisms by which assets and resources operate to promote positive youth development over time among African American adolescents is a logical next step.

Several limitations of this study should be noted. First, our sample included urban, African American youth who were at risk for negative outcomes because of low school achievement in eighth grade. Thus, our findings may not be generalizable to all urban youth, but our results may be especially relevant for urban African American youth who may be at particularly high risk for negative outcomes. Second, our study is based on self-report of violent behavior which may over or underestimate outcomes. Yet, youth violence can be a challenging behavior to measure. For example, police reports are thought to underestimate youths' involvement in violence. We relied on a commonly used measure (Resnick et al., 2004), but future studies should consider methods for obtaining more precise assessments of youth violence. Third, our cumulative indices for risk and promotive factors were created with all itemsand sub-scales receiving equal weight. It may be that different risk or promotive factors, or specific ecologic domains, may offer varying levels of risk or protection. A more in-depth examination of this issue may be warranted. In addition, while our aggregated approach does inform the goal of preventing youth violence, there is a certain loss of information on specific risk and promotive factors. Research examining specific individual predictors of youth violence continues to be important as it aids in identifying very specific targets for intervention programs. Finally, unexplained variation in age and risk remained in our model. While we included demographic characteristics (i.e., sex, race-ethnicity, and SES), we may have excluded other variables that would help explain these relationships over time. Future research that includes additional risk and promotive factors may help explain more variation in violent behavior over time and provide more detailed and nuanced analysis of the effects of risk and promotive factors for violent behavior. Future research using a latent class approach might be useful to better understand the characteristics of adolescents in different risk-promotive groups and how their violent behaviors change over time.

Despite these limitations our study added to our understanding of adolescent development and youth violence in unique and significant ways. First, our study makes a significant contribution to the youth violence literature by examining risk and protective factors and the development of violent behavior in sample of predominately African American youth. Second, we examined cumulative risks and cumulative promotive factors longitudinally. Few researchers have examined how these factors change over time and influence each other to predict adolescent outcomes in general. Third, we examine the relationship between cumulative risk and promotive factors and violent behavior over time. This strategy is novel in youth violence prevention literature as most research on the effect of risk and promotive

factors on youth violence has focused either on single risk and promotive factors (DuRant et al., 1994; Herrenkohl et al., 2000; Resnick et al., 2004; Valois et al., 2002), or cumulative risk and promotive factors within specific ecologic domains (i.e., individual, family, school) (van der Laan et al., 2010). We know of no longitudinal study that modeled adolescent violent behavior over time as a time-varying covariate. Our results suggest that promotive factors can help reduce the burden of cumulative risk for youth violence.

Our results also suggest that prevention efforts to enhance promotive factors may help youth overcome the debilitating effects of persistent and snowballing risks they experience. Our findings support the need to consider how skills and competencies develop across multiple and intersecting developmental contexts including families, peers, and communities (Eccles & Gootman, 2002; Guerra & Leidy, 2008; Smith & Hasbrouck, 2006). Interventions that include asset building strategies to promote the characteristics needed for healthy development (cognitive and behavioral competence, confidence, positive social connections, character, and caring), while engaging youth in positive social activities with their families and other supportive adults in their community, may help youth envision a more hopeful future for themselves, expose them to positive role models, and increase their chances to overcome the negative consequences of the risks they will inevitably face (Smith & Hasbrouck, 2006; Sullivan, Farrell, Bettencourt, & Helms, 2008; Zimmerman et al, 2011). For African American youth, multi-level, culturally-based programs that focus on strengthening family relationships, engage youth in their community, and influence cultural pride and ethnic identity show promise in reducing violence in African American youth (e.g., Fathers and Sons) (Caldwell et al, 2010; Wright & Zimmerman, 2006). Our findings support the need for and continued development of strength-based, culturally relevant interventions and policies for youth violence prevention.

Acknowledgments

This research was supported by a NIDA grant (R01-DA07484; PI: Marc. A. Zimmerman). Dr. Bauermeister is supported by a Career Development Award from the National Institute of Mental Health (K01-MH087242). Dr. Stoddard was previously a Research Fellow supported by the University of Michigan School of Nursing's Health Promotion-Risk Reduction Interventions with Vulnerable Populations Training Program (Project No.: 5T32NR007073-18, PI: Antonia M. Villarruel). Views expressed in this manuscript do not necessarily represent the views of the funding agencies.

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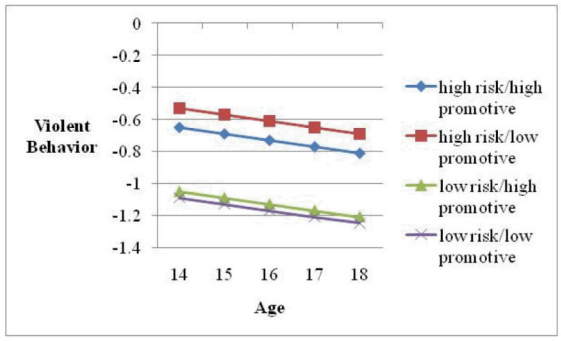
A.



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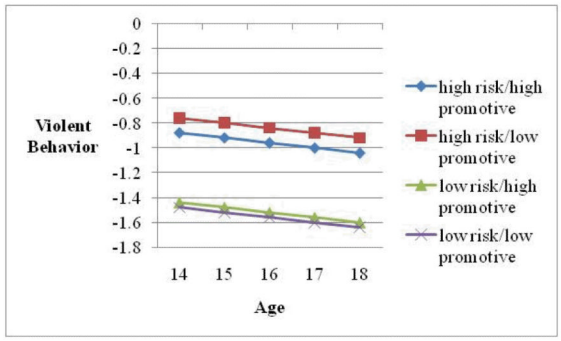

Figure 1.
Risk-protective model (Model 6) by gender. A. Female; B. Males. For both risk and promotive factors, high refers to 1 standard deviation above the mean, low refers to 1 standard deviation below the mean.

Table 1

Descriptive Statistics and Individual Measures for Cumulative Risk and Promotive Factors

Factor (number of items)	Wave 1 M (SD)	Wave 2 M (SD)	Wave 3 M (SD)	Wave 4 M (SD)	α	Sample item
Risk - Individual						
Approval of violence to solve problems (or attitude about violence) (3 or 4 item)	1.63(.69)	1.56(.62)	1.46(.59)	1.43(.55)	.62-.74	Fighting is the best way to solve problems (4-pt Likert, 1 = strongly disagree, 4 = strongly agree)
Observed violence (2)	2.22(1.18)	2.15(1.21)	1.92(1.10)	1.74(1.04)	.60-.80	Seen someone get shot, stabbed or beaten up (5-pt Likert, 1 = 0 times, 5 = 4+ times).
Victim of violence (3)	1.47(.63)	1.38(.57)	1.33(.55)	1.30(1.04)	.54-.55	Had someone physically assault or hurt you (5-pt Likert, 1 = 0 times, 5 = 4+ times)
Hopelessness about future (1)	1.59(1.03)	1.88(1.25)	1.77(1.20)	1.76(1.21)	NA	During the past week, have you felt hopeless about the future (5-Likert, 1 = Not at all, 5 = Extremely)
Nonviolent delinquency(10)	1.31(.49)	1.33(.52)	1.27(.48)	1.24(.46)	.83-.84	During the past 12 months, how often have you taken something a store without paying for it. (5-pt Likert scale, 1 = 0 times, 5 = 4+ times)
Weapon carrying (2)	1.29(.70)	1.33(.75)	1.33(.78)	1.30(.73)	.45-.59	During the past 12 months, how often have you carried a knife or razor? (5-pt Likert scale, 1 = 0 times, 5 = 4+ times)
Risk: Peer						
Friends negative influence (19)	1.75(.52)	1.90(.57)	1.97(.66)	1.98(.67)	.88-.90	How many of your friends drink beer or wine at least once a month?
Friends aggressive or del behavior (5)	1.87(.76)	1.88(.75)	1.73(.68)	1.71(.70)	.72-75	How many of your friends get into fights? (5-pt Likert scale, 1 = none, 5 = all).
Friends who cut/suspended/drop out of school (3)	2.36(.85)	2.51(.87)	2.31(.83)	2.32(.85)	.62-.64	How many of your friends cut class – just don't go? (5-pt Likert scale, 1 = none, 5 = all).
Risk: Family/Adults						
Knife/gun carrying by adult you live with (2)	1.20(.54)	1.19(.52)	1.16(.47)	1.14(.47)	.34-.46	Does the most important person raising you carry a knife or razor? (5-pt Likert scale, 1 = never, 5 = very often).
Weapon carrying by non-family adults (2)	2.63(.55)	1.72(.96)	1.63(.84)	1.54(.76)	.74-.76	Not including parents or the adults you live with how many other adults do you know who carry a knife or razor? (5-pt Likert scale, 1 = none, 5 = all)
Promotive: Individual						
Positive attitude about school (7)	2.79(.64)	2.82(.63)	2.93(.61)	2.91(.64)	.75-.77	Most mornings I look forward to going to school (4-pt Likert scale, 1 = strongly disagree, 4 = strongly agree). (Hawkins, Catalano & Miller, 1992)
School relevance (3)	3.62(.80)	3.40(.87)	3.41(.91)	3.45(.91)	.52-.62	Last year, how often did you feel your schoolwork was useful? (5-pt Likert, 1 = almost always, 5 = rarely)
Future expectation re: college	4.25(1.06)	3.47(1.31)	3.53(1.31)	3.50(1.36)	NA	How likely is it that you will go to trade school or

Factor (number of items)	Wave 1 M (SD)	Wave 2 M (SD)	Wave 3 M (SD)	Wave 4 M (SD)	α	Sample item
						college? (5-pt Likert, 1 = not at all likely, 5 = very likely)
Self-acceptance (4)	4.46(.73)	4.42(.74)	4.52(.66)	4.45(.72)	.59-.67	I have always felt that I could make of my life pretty much what I wanted to make of it. (5-pt Likert, 1 = not true, 5 = very true) (Stein, J.A., Newcomb, M.D., & Bentler, P.M., 1986)
Promotive: Peers						
Friends support (5)	3.14(.95)	3.38(.95)	3.34(.93)	3.30(.97)	.54-.87	I rely on my friends for emotional support. (5-pt Likert scale, 1 = none, 5 = all). (Procidano, M.E. & Heller, K., 1983)
Friends positive influences (5)	1.75(.52)	2.58(.76)	2.54(.75)	2.54(.78)	.64-.73	How many of your friends plan to go to college?
Friend's participation in positive activities (3)	2.40(.74)	2.38(.77)	2.35(.79)	2.36(.81)	.41-.65	How many of your friends take part in school clubs or athletics? (5-pt Likert scale, 1 = none, 5 = all).
Promotive: Family						
Parental support (6)	3.90(1.02)	4.12(.85)	4.20(.85)	4.12(.87)	.87-.90	My mother/father is good at helping me solve problems. (5-pt Likert scale, 1 = not ture, 5 = very true). (Procidano, M.E. & Heller, K., 1983)
Family participation in recreational or fun events (2-4)	2.80(.69)	2.23(.75)	2.21(.77)	2.13(.73)	.71-.89	We go to movies, sports events, or do other fun activities together as a family. (4-pt Likert scale, 1 = hardly ever, 4 = often). (Moos, R.H. & Moos, D.S., 1981)

Table 2

Growth Curve Models for Cumulative Risks and Cumulative Promotive Factors Across Adolescence

	Model 1 (Risk)		Model 2 (Promotive)	
	b(se)	***p***	**b(se)**	***p***
Base, π_0	10.01(.17)	***	8.78(.18)	***
Gender, b_{02}	0.37(.13)	**		
Black, b_{01}	0.46(.14)	***	0.86(.18)	***
Mean linear change per year, π_1				
Age, b_{20}	0.61(.17)	***	0.70(.10)	***
Mean squared change per year, π_2				
Age, b_{20}	−0.21(.08)	**	−0.21(.02)	***
Mean cubed change per year, π_3				
Age, b_{30}	0.02(.01)	*		

* $p \leq .05$,

** $p \leq .01$,

*** $p \leq .001$

Table 3

Growth Curve Model for Violent Behavior Across Adolescence

	Model 3 (violence)		Model 4 (risk)		Model 5 (compensatory model)		Model 6 (risk-protective model)	
	b(se)	***p***	**b(se)**	***p***	**b(se)**	***p***	**b(se)**	***p***
Base, π_0	0.30(.04)	***	−0.89(.08)	***	−0.82(.09)	***	−0.85(.08)	***
Gender, b_{01}	0.19(.04)	***	−0.33(.11)	**	−0.32(.11)	**	−0.31(.11)	**
Black, b_{02}	0.12(.04)	**	0.02(.02)		0.03(.02)		0.03(.02)	
Risk, π_1			0.11(.01)	***	0.11(.01)	***	0.12(.01)	***
Gender, b_{11}			0.04(.01)	***	0.04(.01)	***	0.04(.01)	***
Linear change per year, π_2								
Age, b_{20}	−0.03(.01)	***	−0.04(.01)	***	−0.04(.01)	***	−0.04(.01)	***
Promotive, π_3					−0.01(.004)	*	−0.01(.003)	*
Risk/Promotion interaction, π_4							−0.006(.003)	*
Model fit (−2 LL)	4800.98		3265.40		3272.27		3269.03	

* $p \leq .05$,

** $p \leq .01$,

*** $p \leq .001$