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Effects of Timing of Adversity on Adolescent and Young Adult Adjustment

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Abstract

Effects of Timing of Adversity on Adolescent and Young Adult Adjustment Abstract Exposure to adversity during childhood and adolescence predicts adjustment across development. Further, adolescent adjustment problems persist into young adulthood. This study examined relations of contextual adversity with concurrent adolescent adjustment and prospective mental health and health outcomes in young adulthood. A longitudinal sample ($N = 808$) was followed from age 10 through 27. Perceptions of neighborhood in childhood predicted depression, alcohol use disorders, and HIV risk in young adulthood. Further, the timing of adversity was important in determining the type of problem experienced in adulthood. Youth adjustment predicted adult outcomes, and in some cases, mediated the relation between adversity and outcomes. These findings support the importance of adversity in predicting adjustment and elucidate factors that affect outcomes into young adulthood.

Bioecological models posit that individuals develop within multiple contexts and that development is affected by factors at many levels, including distal and proximal influences (Bronfenbrenner, Morris, Damon, & Lerner, 1998). Distal factors, such as income and neighborhood, provide the contexts in which more proximal factors affect individual development, thus shaping the environmental circumstances experienced within and across developmental domains and periods (Catalano & Hawkins, 1996; Hawkins & Weis, 1985). Previous research has shown that risk experienced during childhood has deleterious effects

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on concurrent and subsequent adjustment (e.g., Dearing, McCartney, & Taylor, 2006; Gilman, Kawachi, Fitzmaurice, & Buka, 2002). In particular, a large body of research has identified low income and poverty (Brooks-Gunn & Duncan, 1997; McLoyd, 1998) as important contextual risk factors for negative health outcomes. Additionally, the experience of contextual risk such as low family income may be associated with increased exposure to adversity, which may also contribute to adjustment problems. Adversity has been defined as contexts which are associated with increased disruption, danger, and stress (Gest, Reed, & Masten, 1999), and includes dangerous or disorganized neighborhoods (Leventhal & Brooks-Gunn, 2000), having a single parent (Macmillan, McMorris, & Kruttschnitt, 2004; Shaw & McKay, 1942), and being born to an adolescent mother (Jaffee, Caspi, Moffitt, Belsky, & Silva, 2001).

Given the important role of family income in determining broad developmental contexts, this study examined the relative effects of risk (as measured by low income) and exposure to adversity, including having been born to an adolescent parent, living in a single-parent household, and perceptions of living in a dangerous neighborhood at three different developmental time points. The relative importance of these factors may vary across development, particularly as children transition into adolescence and experience increasing independence. Further, the predictive value of contextual adversity above the direct relation of income to later adjustment may vary across development as the relative importance of environmental variables changes with increased autonomy. This investigation sought to examine how the temporal effects of adversity during childhood and adolescence may have a concurrent and lasting impact on development through young adulthood. Finally, the study examined whether the relation of prior exposure to adversity with problems in adulthood was accounted for by adolescents' adjustment at the time of risk exposure, or whether prior adversity predicted adult outcomes beyond the relation of adolescent adjustment problems with adult mental health and health outcomes. To address these aims, this study examined the timing of exposure to adversity related to low income, which may operate differently as children transition from childhood to adolescence.

Low Income and Adolescent Adjustment as Predictors of Adult Outcomes

Previous research has established a negative association between socioeconomic status (SES) and mental health problems (Wadsworth & Achenbach, 2005), with twice the rate of psychiatric diagnoses among low SES groups (Kohn, Dohrenwend, Mirotznic, & Dohrenwend, 1998). Other studies have demonstrated a robust association between living in low-income households during childhood and elevated levels of externalizing problems (Dearing et al., 2006), internalizing symptoms (Xue, Leventhal, Brooks-Gunn, & Earls, 2005), diminished physical health, and higher rates of learning disabilities and developmental delays (Brooks-Gunn & Duncan, 1997). Socioeconomic disadvantage has also been tied to increased risk for contracting human immunodeficiency virus (HIV) and other sexually transmitted infections as significant disparities across social classes have been identified in the United States (Ickovics et al., 2002; Karon, Fleming, Steketee, & De Cock, 2001). Conversely, research also suggests that increases in income can alleviate adjustment problems. Costello, Compton, Keeler, and Angold (2003) demonstrated that relief from poverty was associated with a significant decline in behavioral problems over 4 years. Further, Dearing et al. (2006) found that low family income was related to more externalizing problems, and this association was strongest for children living in chronic poverty. Persistent poverty has also been shown to relate to initiation and exacerbation of antisocial behavior problems (Macmillan et al., 2004).

Research suggests that the impact of poverty on adjustment may be greater for younger children, particularly during the preschool years (Brooks-Gunn & Duncan, 1997). An adult

follow-up of children raised in low socioeconomic households during the first 7 years of life revealed higher lifetime prevalence rate of major depression as compared with the national average (Gilman et al., 2002). The association between early adversity and depression remained after controlling for adult educational attainment, suggesting that early exposure to poverty exerts lasting effects on socio-emotional development. However, it is unclear whether the association of low income with problems later in development exerts the same lasting impact as early adversity. It is possible that the effects of low income during adolescence are exerted through other factors that are more directly experienced by adolescents, such as the level of risk in their neighborhood. Variation in the relative importance of low income at different developmental stages has been demonstrated in studies showing a temporary equalization of the impact of SES during adolescence (see Brooks-Gunn & Duncan, 1997; Lupien, King, Meaney, & McEwen, 2001).

Also, it is unclear to what degree the experience of mental health problems in young adulthood is predicted by adolescent adjustment problems, or whether low income and adversity experienced during adolescence continue to affect adult mental health in ways not explained by adolescent adjustment. Research has demonstrated that the development of adjustment and mental health problems during adolescence often predicts increased problems into young adulthood (Aneshensel & Sucoff, 1996; Ingoldsby & Shaw, 2002). Specifically, Ferdinand and Verhulst (1995) found that adolescent internalizing and externalizing symptoms remained moderately stable into young adulthood. However, also of interest may be how child and adolescent behavior problems predict a variety of adulthood outcomes beyond the persistence of symptoms. Thus, antisocial behavior problems during childhood and adolescence have been linked with higher rates of concurrent and future risky sexual behavior, substance use, negative health outcomes (Rosenberg & Biggar, 1998; Tolou-Shams, Brown, Gordon, & Fernandez, 2007), and increased risk for major depression in adulthood (Kosterman et al., 2010; Mason et al., 2004). Further, engagement in risky sexual behaviors and substance use in adolescence has been shown to confer risk for disease contraction, including sexually transmitted infections such as HIV (Cerwonka, Isbell, & Hansen, 2000; Rosenberg & Biggar, 1998). Thus, longitudinal research suggests that a variety of behavioral problems in adolescence often predict adjustment into adulthood, setting the stage for a variety of negative outcomes. This study aims to examine the role of adolescent adjustment as a pathway by which low income predicts additional problems in adulthood, thereby clarifying the relative contributions of adversity and youth adjustment to adult health outcomes.

Neighborhood Effects

Neighborhoods shape developmental context and can present challenges and obstacles for families (Tolan, Gorman-Smith, & Henry, 2003). Further, research has demonstrated the importance of neighborhood in contributing to the development of adjustment problems in childhood and adolescence. Specifically, children living in disadvantaged neighborhoods exhibit higher rates of behavior problems (Schneiders et al., 2003; Stouthamer-Loeber, Loeber, Wei, Farrington, & Wikstroem, 2002). In addition, middle school students' perceptions of neighborhood disadvantage were linearly associated with concurrent alcohol, tobacco, and marijuana use (Wilson, Syme, Boyce, Battistich, & Selvin, 2005). Prior research has also supported an association between characteristics of disadvantaged neighborhoods and an increased risk of exhibiting antisocial behaviors (Duncan, Brooks-Gunn, & Klebanov, 1994) and risky sexual behavior in adolescence (Aneshensel & Sucoff, 1996).

Importantly, the effects reviewed here appear to be related specifically to neighborhood-level variables. In fact, Leventhal and Brooks-Gunn (2000) have demonstrated that the

effects of neighborhood disadvantage persist above familial income. The current investigation partitions adversity experienced as a result of living in a low-income family environment from children's perceptions of neighborhood disadvantage. Additionally, the effects of neighborhood disadvantage may not be equal across development as research has demonstrated that the association of behavior problems and neighborhood disadvantage increases in magnitude as children transition into adolescence (Ingoldsby et al., 2006; Schneiders et al., 2003). This developmental shift corresponds with increases in autonomy and independence, as well as a rise in the amount of time children spend outside of the home.

Single-parent Status

Research has illustrated that single-parent families are more likely to experience socioeconomic disadvantage (Brooks-Gunn & Duncan, 1997; Macmillan et al., 2004). In addition, children from single-parent households (as a result of divorce or having never been married) may experience more stress due to the increased demands placed on their caregivers who do not have the aid of a partner (Dearing et al., 2006). Children from single-parent families have been found to be at increased risk for behavioral and emotional problems (Hetherington, Bridges, & Insabella, 1998), and Macmillan et al. (2004) demonstrated that changes to the family structure (e.g., separation or divorce) may contribute to these problems. However, these effects were diminished when controlling for the associated reduction in family income. In line with these findings, one question examined in this investigation is what effect single-parent status may have on adjustment after associated risk factors (e.g., family income) are considered.

Children of Adolescent Mothers

Adolescent mothers are more likely to experience low SES, residential instability, and single-parent status, and research has demonstrated that the negative impact of adolescent motherhood on children is partly accounted for by these sociodemographic factors (Jaffee et al., 2001). In addition, adolescent mothers tend to demonstrate more antisocial and substance use problems themselves (Rhule, McMahon, & Spieker, 2004), potentially conferring increased risk for behavior problems on their children through socialization or modeling of problem behaviors. Children of adolescent mothers are at risk for adjustment problems in a variety of domains, including conduct and emotional problems (Brooks-Gunn & Furstenberg, 1986; Jaffee et al., 2001; Rhule, McMahon, Spieker, & Munson, 2006). These youth may be at particular risk for engaging in antisocial behaviors such as delinquency and substance abuse as they approach adolescence, and this increased risk for behavior problems is likely to continue into young adulthood, with children of adolescent mothers at 2 to 3 times the risk for many negative outcomes by the time they reach adulthood (Jaffee et al., 2001). As the risks for a child born to an adolescent mother have the potential to affect adjustment across development, this investigation will consider the role of having been born to an adolescent mother in examining effects of income, single-parent status, and neighborhood risk on youth adjustment and adult mental health outcomes.

Indicators of Adult Health Outcomes

Major depression and alcohol use disorders are among the largest public health problems in the United States (U.S.) (Kessler et al., 2005). Estimates for lifetime prevalence of depression are approximately 17%, and for alcohol use disorders between 12% and 17% (Hasin, Stinson, Ogburn, & Grant, 2007; Kessler et al., 2005). In addition, the median age of onset for mental health problems is between the ages of 25 and 32 for depression and between 19 and 23 for substance use disorders (Kessler et al., 2005). HIV also continues to be a major public health problem in the United States and throughout the world, with stable

incidence estimates in recent years despite increased education about prevention (Morris et al., 2006). Recent prevalence estimates suggest that HIV diagnoses are disproportionately made in adults younger than age 25 (Ellickson, Collins, Bogart, Klein, & Taylor, 2005; Griffin, Botvin, & Nichols, 2006; Morris et al., 2006). The elevated risk in young adulthood may result from engagement in risky and problematic behaviors and health disparities associated with socioeconomic status (Ellickson et al., 2005; Ickovics et al., 2002).

As summarized above, mental health and related health outcomes research has demonstrated that later problems may be predicted by early exposure to adversity, as well as experiences of adolescent adjustment problems (Aneshensel & Sucoff, 1996; Ingoldsby & Shaw, 2002; Kosterman et al., 2010; Mason et al., 2004). This study aimed to clarify processes by which problems in adulthood develop by examining the relative contribution of exposure to contextual risk factors and adjustment problems simultaneously and across adolescent development.

Timing of Effects

It is important to consider the evolving role of contextual risk factors across development as environmental variables may differentially shape behavior through concurrent effects on adjustment or longitudinal effects later in life. Previous research has identified that early exposure to poverty and contextual risk is associated with concurrent maladjustment and with a higher lifetime prevalence of major depression (Gilman et al., 2002; Xue et al., 2005). However, the impact of initial exposure to and stability of risk on late adolescent and young adult outcomes is less clear. For example, the transition from middle childhood through adolescence is characterized by a marked increase in autonomy that presents a growing opportunity for contextual factors outside the home to produce a lasting effect on development as children begin to interact with their environments outside of the family context. Moreover, research conducted by Forehand, Biggar, and Kotchick (1998) suggests that researchers should consider the possibility of delayed effects on adjustment, as their investigation revealed deferred, but not concurrent, effects of familial risk factors on adolescent adjustment. These studies suggest the need for additional research to consider the timing of risk factors (e.g., neighborhood risk) on adjustment into young adulthood.

This Study

The current study aimed to examine the effects of contextual risk factors associated with adversity on concurrent and prospective indicators of adjustment. The investigation also examined the temporal effects of these risks by considering adversity during middle childhood, early adolescence, and late adolescence. These analyses allowed for examination of possible time-specific effects of exposure to poverty, dangerous neighborhoods, or a single-parent household, as well as effects of having been born to an adolescent mother. Effects on major depression, alcohol abuse or dependence, and HIV risk in early adulthood were examined as these represent considerable mental health and health problems for young adults in the U.S.

Consistent with the studies reviewed above, we predicted that higher levels of contextual risk and adolescent adjustment problems would be related prospectively to higher levels of young adult depression, alcohol abuse or dependence, and HIV risk. Moreover, we hypothesized that adolescent adjustment problems would account for the relations between contextual risk experienced during childhood and adolescence and young adult mental health and behavior problems. Finally, we hypothesized that exposure to neighborhood disadvantage during adolescence would be a particularly important predictor of concurrent

and later adjustment and mental health problems as adolescence is associated with increased exposure to contextual risk factors outside of children's immediate family.

Method

Participants

This study used data from the Seattle Social Development Project (SSDP), a longitudinal investigation of youth and young adult development. The study included 808 participants (411 males and 396 females) originally derived from 18 Seattle elementary schools and followed from the time they entered fifth grade ($M = 10.08$ years, $SD = .52$) in 1985 through age 27. Participating elementary schools were selected to oversample students from high-crime neighborhoods. From the eligible population of students (1,053), 808 (77%) consented to participate in the longitudinal study (one outlier with logically inconsistent responses was subsequently dropped from analyses). The sample was at high risk as more than half (52%) of the participants were from families in poverty, as indicated by family participation in the School Free Lunch Program between the ages of 10 and 12 years. In addition, 25% of the sample self-identified as African American, 18% as Asian, 6% as American Indian, and 51% as Caucasian.

Procedure

Annual assessments were conducted with participating parents and youth between 1985 and 1991. The first assessment in the fifth grade was conducted in the fall, while the remaining assessments were conducted annually in the spring through the age of 16. Initial assessments were completed in children's classrooms via group-administered questionnaires. At age 13 years, assessments were changed to individual interviews lasting approximately 1 hour. Participants' parents also completed annual assessments when the youth were between the ages of 10 and 16. Additionally, youth were assessed in the spring of 1993 (age 18), 1996 (age 21), 1999 (age 24), and 2002 (age 27). A complete description of the project may be found elsewhere (e.g., Hawkins et al., 2003). Sample retention rates have remained consistently above 92% since 1989, when the participating youth were 14 years old. The SSDP retention rates exceed the estimates calculated by Hansen, Tobler, and Graham (1990) of 87% for studies of at least 3 years duration in order to minimize threats to validity.

A portion of the sample was exposed to a multicomponent preventive intervention in the elementary grades, consisting of teacher training, parenting classes, and social competence training for children (Hawkins, Catalano, Kosterman, Abbott, & Hill, 1999; Hawkins, Kosterman, Catalano, Hill, & Abbott, 2005; Hawkins, Kosterman, Catalano, Hill & Abbott, 2008). Consistent with prior analyses that have shown few differences in the covariance structures of the intervention and control groups (Catalano, Kosterman, Hawkins, Newcomb, & Abbott, 1996; Herrenkohl, Kosterman, Hawkins, & Mason, 2009; Huang, Kosterman, Catalano, Hawkins, & Abbott, 2001; Kosterman, Hawkins, & Abbott, 2005; McCarty et al., 2009), analyses shown here were based on the full sample after examining possible differences in the covariances corresponding to the models examined for this report, comparing the control group and intervention conditions combined. We conducted three separate multigroup measured variable model tests – one for each measure of youth adjustment – comparing models where covariances were constrained to be equal across the control and intervention groups to a model in which these parameters were freely estimated. These tests showed no significant reduction in the overall fit for the constrained models, including youth antisocial behavior, [$\Delta\chi^2(78) = 83.63, p = .31$], youth social problems [$\Delta\chi^2(78) = 84.65, p = .28$], or youth alcohol use [$\Delta\chi^2(78) = 74.54, p = .59$]. Results suggested no substantial group differences in the relationships of interest in this report, supporting single-group analyses.

Measures

The SSDP data include indicators for multiple risk factors associated with adolescent adjustment and adult mental health and health. Risk factors were examined across three developmental periods: childhood, early adolescence, and adolescence. Obtained indicators were developed based on reviews of the relevant research investigating predictors of problem behavior and young adult outcomes (Catalano & Hawkins, 1996).

Risk Factors

Adolescent mother status—Participants reported their mothers' age, which was used to identify children born to adolescent mothers. Consistent with prior research (Jaffee et al., 2001) participants whose mothers were younger than 20 years of age at the time of the participant's birth were coded as adolescent mothers. This was included as a time-invariant risk factor.

Low family income—Parents reported the "*family total yearly income*" when child participants were in 5th, 7th, and 10th grades. Total yearly income was reported using a categorical variable of seven income levels, which varied across time points. Income categories were combined and reverse coded for consistency across time points such that higher scores on the recoded income categories reflect lower income: (1) \$40,000 or greater, (2) \$30,000 – 39,999, (3) \$20,000 – 29,999, (4) \$10,000 – 19,000, (5) \$9,999.

Unmarried parent status—Parents of participants reported their marital status at each time point. Unmarried status was defined as those parents who reported being separated, divorced, widowed, or never married. Coding for this variable was 0 = married, 1 = not married. When children were age 10, 27% of their mothers were unmarried. This percentage steadily increased, as 31% of parents at age 13 and 37% at age 16 were unmarried.

Neighborhood safety—Children's perception of neighborhood safety was assessed through self-report measures at ages 10, 13, and 16. The scale was constructed of two items "*I feel safe in my own neighborhood*" and "*Kids in my neighborhood get into trouble*," rated by participants on a 4-point scale ranging from 0 to 3 (Hawkins, Arthur, & Catalano, 1997). Higher scores indicated perceptions of living in an unsafe neighborhood. The internal consistency of the two-item scales at each time point was as follows: age 10 $\alpha = .58$, age 13 $\alpha = .55$, age 16 $\alpha = .65$. Some reliability coefficients for some scales were low to moderate due to availability of few items across the ages of interest.

Youth Adjustment from Childhood to Adolescence

Antisocial behavior—Parents reported on their children's antisocial behaviors in the 5th, 7th, and 10th grades using a subset of nine items from the Child Behavior Checklist (CBCL, Achenbach & Edelbrock, 1983). Items included parental reports such as "fights," "steals at home," and "destroys others' things." All responses were gathered on a 3-point Likert scale where 0 = "Not true," 1 = "Somewhat or sometimes true," and 2 = "Very true or often true." Internal reliability was acceptable at each time point (age 10 $\alpha = .77$, age 13 $\alpha = .77$, age 16 $\alpha = .80$).

Social problems—Parental reports of youth social problems were reported at each childhood time point (ages 10, 13, and 16). A three-item scale was constructed based on items from the CBCL (Achenbach & Edelbrock, 1983) which examined the degree to which parents perceived their child to experience social difficulties: "*was not liked by others*," "*doesn't get along with other kids*," and "*gets teased a lot*." The internal consistencies of the three-item scales at each time point were as follows: age 10 $\alpha = .66$, age 13 $\alpha = .55$, age 16

$\alpha = .54$. Again, some reliability coefficients for some scales were low to moderate due to availability of few items across the ages of interest.

Youth drinking behavior—A dichotomous measure of self-reported lifetime alcohol use was created for age 10. For ages 13 and 16, frequency of use in the past month was used in the analyses. When children were 10 years old, 24% reported having had a drink in their lifetime. By age 13, 21% reported at least one drink in the past month, up to a maximum of 12 drinks reported by two participants. At age 16, 32% said that they had had a drink in the past month, up to a maximum of 30 drinks ($n = 2$).

Young Adult Outcomes

Major depressive episode—A modified version of the Diagnostic Interview Schedule (DIS) (Robins, Helzer, Croughan, Williams, & Spitzer, 1981) was administered to participants at the ages of 21, 24, and 27 to assess past-year depressive episodes (McGee et al., 1990). Responses were incorporated into an algorithm that conformed to the diagnostic criteria specified in DSM-IV (American Psychiatric Association, 1994). Studies of psychiatric disorders have frequently used the DIS, demonstrating its reliability and validity in community samples (Jaffee et al., 2002; Leaf, Myers, & McEvoy, 1991; Newman et al., 1996; Reinherz, Giaconia, Carmola Hauf, Wasserman, & Paradis, 2000). A measure of major depressive episodes at ages 21, 24, and 27 was created by summing the number of times each participant met diagnostic criteria across the three time points. An aggregate indicator was used as interest was in determining whether exposure to risk and adolescent adjustment predicted problems in adulthood.

Alcohol abuse or dependence—Similarly, alcohol abuse and dependence was assessed with the DIS, indicating those who met DSM-IV criteria for an alcohol abuse or dependence diagnosis. As with the indicator of major depression, a summary index was created indicating the number of times a participant met diagnostic criteria at ages 21, 24, and 27.

HIV risk—A dichotomous measure of HIV risk assessed those who met any one or more of the following criteria in the past year: (a) had six or more sexual partners in the past year, (b) male with a male sex partner in the past year, (c) not married or cohabitating and did not always use latex protection in the past year, (d) usually used alcohol or drugs when having sex in the past year, (e) gave or received money or drugs for sex in the past year, (f) diagnosed with a sexually transmitted disease in the past year, or (g) have taken illicit drugs by injection in the past year. Similar to the mental health outcomes, a summary index was created by adding the number of times a participant met criteria at ages 21, 24, and 27.

Data Analysis

All analyses were conducted using Mplus 4.1 (Muthén & Muthén, 1998–2007), using full-information maximum likelihood estimates (FIMLE) for incomplete data. Missing data were mainly due to nonparticipation in a given survey year, and were relatively minimal for a study of this duration. Preliminary analyses examined zero-order correlations among covariates, risk factors, youth adjustment, and adult outcomes. Next, models including autoregressive and cross-lagged paths allowed us to simultaneously estimate the stability of repeated measures of risk factors over time, the cross-lagged effects of risk factors on youth adjustment, and the direct and indirect effects of predictors across development on adult outcomes. Separate models were examined for each measure of youth adjustment (i.e., antisocial behavior, social problems, and alcohol use). All risk factors, covariates, and outcomes were included in each model. Because gender differences are often observed in adolescent adjustment problems and adult health outcomes (see Hankin et al., 1998; Kessler

et al., 2005), gender was included as a covariate. Estimates from the path models are presented in both unstandardized and standardized values.

Results

Preliminary Analyses

Descriptive results for risk factors and young adult outcomes are presented in Table 1 and show that the sample was gender balanced and that the percentage of students born to adolescent mothers was above the national average, 5.6% (Ventura, Mathews, & Hamilton, 2001) in 1975, when most students in the present study were born.

Table 2 shows correlations among all contextual risk factors and youth adjustment measures. Each risk factor and adjustment indicator showed significant stability over time, with cross-time risk-factor correlations ranging from .18 to .74 for family income, .14 to .70 for single-parent status, and .16 to .28 for youth perception of neighborhood. Table 3 shows that all of the risk factors during childhood and adolescence were related to at least one adult mental health or health problem indicator, suggesting they were plausible predictors of adult outcomes.

Model-fitting Analyses

First, we examined the impact of contextual risk (adolescent mother status, low family income, child of single parent, and unsafe neighborhood) across adolescence on young adult depression, alcohol abuse or dependence, and HIV risk. Next, youth adjustment measures at ages 10, 13, and 16 were included as possible mediators of the effects of contextual risk, considering each of the three youth adjustment indicators in separate models.

Tests of mediation were conducted according to MacKinnon, Fairchild, and Fritz (2007). Mediation is supported if each of the mediated pathways from the independent variable to the dependent variable are significant (MacKinnon et al., 2007). This test of mediation was appropriate for the current analyses examining multiple intervening variables in comprehensive developmental models. For testing the effect of one intervening variable we also calculated the product of coefficients according to guidelines by MacKinnon et al. (2002) and found the same results.

Youth Antisocial Behavior as a Mediator of the Effects of Contextual Risk

Figure 1 shows results for the model examining parent report of youth antisocial behavior as a potential mediator of the effects of contextual risk factors on young adult outcomes. Significant standardized path coefficients are shown. Among the contextual risk factors, only perception of unsafe neighborhood was related to young adult outcomes. Direct effects of perception of unsafe neighborhood at each age were specific to different outcomes. Unsafe neighborhood at age 10 was related to more adult depression; at age 13 it was related to greater HIV risk; and at age 16 it was related to more alcohol use disorders. Parent report of youth antisocial behavior at age 16 had a significant effect on all three adult outcomes. Primary mediated pathways were from unsafe neighborhood at ages 10 and 13 through youth antisocial behavior at the subsequent time point, as well as through the significant autoregressive paths for unsafe neighborhood and antisocial behavior. In addition, Table 4 shows that male gender was significantly related to less depression and more alcohol use disorder. Having been born to an adolescent mother was significantly related to more depression and more HIV risk. The overall fit of this model, $\chi^2(46) = 139.68$ ($p < .0001$), was acceptable as evaluated using the following fit indices: CFI = .96, RMSEA = .05, and 90% confidence interval = .04 – .06.

Youth Social Problems as a Mediator for the Effects of Contextual Risk

Figure 2 shows the significant paths for the model including parent-reported youth social problems as a possible mediator of the effects of contextual risk on early adult depression, alcohol abuse or dependence, and HIV risk. Similar to the previous model, only unsafe neighborhood had direct and age-specific impacts on young adult outcomes. Perception of unsafe neighborhood at age 13 was related to HIV risk, and at age 16 it was related to greater alcohol use disorders. Parent reports of youth social problems at ages 13 and 16 were significantly related to HIV risk, but not other young adult outcomes. Early perception of unsafe neighborhood was mediated through both social problems at age 13 and via significant autoregressive relationships for unsafe neighborhood and youth social problems. It is notable that youth social problems at age 13 were negatively related to adult HIV risk, but at age 16 were positively related to adult HIV risk. The direction of these associations is consistent with the zero-order correlations reported in Table 2. These findings are discussed further in the Discussion section. Unexpectedly, given the consistency of correlations between risk factors and young adult depression in Table 3, there were no significant direct effects in this path model of any of the contextual risk factors on depression or of parent-reported youth social problems on depression. Similar to the pattern in the previous model, Table 5 shows that male gender was significantly related to fewer depressive episodes and more alcohol use disorders, while having been born to an adolescent mother was significantly related to depression and HIV risk. The overall fit of this model, $\chi^2(46) = 126.43$ ($p < .0001$), was adequate as evaluated using the following fit indices: CFI = .97, RMSEA = .05, and 90% confidence interval = .04 – .06.

Youth Alcohol Use as a Mediator for the Effects of Contextual Risk

Figure 3 shows significant results for the model examining youth-reported alcohol use as a potential mediator in the relations between contextual risk and young adult health outcomes. Similar to previously described models, only perception of unsafe neighborhood was significantly related to young adult health. Perception of unsafe neighborhood at age 10 predicted young adult depression, and at age 13 perception of unsafe neighborhood predicted HIV risk. Further, youth self-reported alcohol use at ages 13 and 16 predicted young adult alcohol abuse or dependence and HIV risk. Alcohol use at age 16 mediated the relations between perception of unsafe neighborhood and young adult alcohol abuse or dependence and HIV risk. In addition, age 16 self-reported alcohol use mediated the relations between age 13 self-reported alcohol use and adult alcohol abuse or dependence and HIV risk. Table 6 shows that, similar to previous models, being male was significantly related to less depressive episodes and more alcohol use disorders. In contrast to previous models, being born to an adolescent mother was related to greater alcohol abuse or dependence only. The overall fit of this model, $\chi^2(46) = 126.28$ ($p < .0001$), was adequate as evaluated using the following fit indices: CFI = .97, RMSEA = .05, and 90% confidence interval = .04 – .06.

Discussion

This study examined the relative contribution of family income, single-parent status, perceptions of neighborhood safety, and adolescent mother status in predicting concurrent youth adjustment problems and prospective adult mental health and health risk outcomes. The timing of these factors was also examined in order to understand the relative contribution of contextual risk factors across development. In addition, we examined whether the effects of adversity during childhood and adolescence were in part mediated through youth adjustment. Results suggest youth perceptions of negative neighborhood characteristics were an important predictor of adjustment problems during adolescence, which in turn predicted problem outcomes in adulthood. Gender and being born to an

adolescent mother were also important predictors of adult mental health outcomes. Neighborhood risk and the different indicators of adolescent adjustment were all relatively stable during adolescence, suggesting that various times throughout adolescence may be appropriate for preventive intervention designed to buffer effects of unsafe neighborhoods or to reduce adjustment problems.

Low income and single-parent status during childhood and adolescence did not predict adjustment problems after accounting for effects of unsafe neighborhood. Although the zero-order correlations indicated that these factors were related to adjustment, it appears that these associations were accounted for by neighborhood risk. Further, the relation between low income and adult outcomes appeared to be accounted for by the persistence of adjustment problems through adolescence. The lack of direct effects of income and single-parent status on adolescent adjustment and young adult outcomes is in contrast to other studies examining the relation of low income and adjustment at earlier developmental stages (Brooks-Gunn & Duncan, 1997; Gilman et al., 2002; Macmillan et al., 2004). The correlations in this study show that low family income and single-parent status at age 10, compared with later assessments, were more strongly associated with adjustment problems, implying these risk factors may exert a greater impact on children during earlier developmental periods. These findings appear to parallel those from other studies that suggest a temporary equalization of the impact of SES on cognitive and social development during adolescence (see Lengua, Bush, Long, Kovacs, & Trancik, 2008; Lupien et al., 2001). That is, the effect of low income may exert a greater influence on younger children than adolescents. One possible explanation for this discrepancy is that as youth spend less time with family and more time with peers, low family income later in development may have less impact on adjustment than have neighborhood characteristics (e.g., Brooks-Gunn & Duncan, 1997; Lupien et al., 2001; Schneiders et al., 2003). To this point, previous research has demonstrated the negative effect of neighborhood disadvantage on adjustment above the common variance associated with low income and poverty (Leventhal & Brooks Gunn, 2000). Such results are consistent with the timing of developmental transitions in which children are increasingly exposed to extra-familial contexts as they enter adolescence (Schneiders et al., 2003).

By adolescence, however, our models suggest that youths' perception of negative neighborhood characteristics and danger when interacting with their community may be the primary mode by which contextual risk affects adjustment. Moreover, perception of an unsafe neighborhood and adolescent mother status were the only significant contextual predictors of adult outcomes above the effects of youth adjustment. Related risk factors, such as family income and single-parent status, were not significantly associated with adult depression, alcohol abuse or dependence, or HIV risk after accounting for the effects of disadvantaged neighborhood, gender, being born to an adolescent parent, and the persistence of adolescent adjustment problems.

Although neighborhood emerged as the only time-varying predictor of adolescent adjustment and adult mental health, adolescent mother status and gender were predictive of adult outcomes. Participants born to adolescent mothers reported more depressive episodes and HIV risk behaviors as adults. Previous research suggests that adolescent mothers tend to use more negative parenting (Rhule et al., 2004), have more mental health problems themselves, and have fewer social and economic resources (Jaffee et al., 2001), and studies have shown that having an adolescent parent is consistently associated with an increase in the risk of adjustment and mental health problems for children (e.g., Jaffee et al., 2001). In addition, children of adolescent mothers are likely to experience earlier initiation of sexual activity, higher rates of adolescent childbearing, and exposure to higher rates of paternal absence and maternal re-partnering (Ellis et al., 2003), all of which are associated with

higher rates of risky sexual behavior, consistent with the findings in this study. With regard to gender, females reported more depressive episodes, whereas males reported more alcohol abuse or dependence, consistent with prevalence rates in epidemiological studies (Kessler et al., 2005; Mason et al., 2004).

All of the adolescent adjustment indicators emerged as significant predictors of HIV risk behaviors, whereas adult depression was predicted only by youth antisocial behavior, and adult alcohol abuse or dependence was predicted by antisocial behavior and youth alcohol use. The fact that antisocial behavior, social problems, and drinking behavior during adolescence each predicted HIV risk is consistent with our hypotheses and previous research (Sikkema et al., 2004; Tolou-Shams et al., 2007). Further, the convergence of multiple risk factors predicting a single outcome is consistent with a model of equifinality, demonstrating that a range of early problem behaviors each was associated with risk for contracting HIV. Ramrakha and colleagues also demonstrated a longitudinal association of antisocial behavior and substance use during childhood with risky sexual behavior in young adulthood (Ramrakha et al., 2007). Interestingly, adult HIV risk was negatively related to youth social problems at age 13, but positively related to youth social problems at age 16. These findings may reflect changing norms about sexual activity as youth advance through adolescence, such that social problems at age 13 (when sexual activity is less normative) are more isolating and less likely to manifest as early adolescent sexual risk taking. In contrast, social problems at age 16 (when there are more opportunities for sexual activity) may be more likely to lead to sexual risk taking as a way to “fit in,” which may in turn set the stage for future HIV risk.

As exemplified by the findings for HIV risk, the use of longitudinal path models allowed for the consideration of timing with regard to the effects of contemporaneous and later adjustment problems. Interestingly, perception of dangerous neighborhood at ages 10 and 13 were the only contextual risk factors to predict adolescent adjustment. These findings suggest that exposure to negative community characteristics may increase the likelihood of problem behaviors during adolescence, perhaps by increasing exposure to violence, gangs, drugs, and opportunities to engage in risky and antisocial behavior. In addition, the results indicated both direct and indirect effects of neighborhood on adult mental health, with partially mediated effects through youth antisocial behavior problems, alcohol use, and social problems.

Strengths and Limitations

There are a number of strengths of this study, including the large sample, the availability of both self- and parent-reported data, longitudinal assessments across childhood, adolescence, and early adulthood with high sample retention, and utilization of a developmental framework. Nonetheless, some limitations of the study design constrain our conclusions. Because surveys in the earliest years of the study were briefer and more narrowly focused, some scales were limited in the number of items available across time points to assess constructs of interest. Due to limited items, the reliability of some measures was somewhat low, particularly for perceptions of neighborhood disadvantage and youth social problems; thus, correlations of these measures with adult outcomes are likely to be attenuated. However, both of these variables were related to adult outcomes, and neighborhood emerged as a robust predictor above the effects of other variables in the model. Also, although data were available from multiple reporters, each individual variable was measured from a single reporter. Lastly, neither depressive symptoms nor HIV risk were assessed across adolescence in this study. Thus, we were unable to examine early indicators of these problems as predictors of adult outcomes. In addition, the role of more proximal factors was not considered, potentially excluding important mediators that might account for the relation of disadvantaged neighborhood to youth adjustment and adult outcomes. Future research

should consider more proximal experiences, such as parenting behaviors and family conflict, which may account for the observed effects. It is also noteworthy that, with the median age of onset for major depressive disorder extending until age 32 (Kessler et al., 2005), many at-risk participants would be expected to experience their first depressive episode beyond the time frame of this study. Future research may benefit from considering these models further into adulthood.

Implications

In summary, this study suggests that correlates of low income, including being born to an adolescent mother, perceptions of neighborhood danger, and higher rates of adjustment problems during adolescence may start youth on a trajectory to adult problems through adolescent adjustment problems. Further, disadvantaged neighborhood may be a particularly important risk factor for adjustment problems in adolescence and for adult outcomes. Thus, a promising intervention strategy may be to divert youth at various points along these risky trajectories in order to ameliorate the long-term adverse effects of socioeconomic risk and associated risks and youth adjustment problems. The current findings suggest that an important target of intervention during adolescence may be helping youth cope with their experiences in high-risk neighborhoods, as adjustment in response to high-stress environments is partially mediated by coping (Wadsworth, Raviv, Compas, & Connor-Smith, 2005). Finally, these findings highlight the persisting effects of early adversity on adolescent and young adult adjustment along with the potential for multiple points of intervention.

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Figure 1.

Auto-regressive, cross-lagged model showing significant ($p < .05$) relationships between risk factors, youth antisocial behavior, and adult outcomes. The reported estimates are the standardized values.

Figure 2. Auto-regressive, cross-lagged model showing relationships ($p < .05$) between risk factors, youth social problems, and adult outcomes. The reported estimates are the standardized values.

Figure 3.

Auto-regressive, cross-lagged model showing significant ($p < .05$) relationships between risk factors, youth drinking, and adult outcomes. The reported estimates are the standardized values.

Table 1

Means and Standard Deviations of Covariate, Predictor, and Outcome Variables

Variable	Age		
	10	13	16
Time-invariant variables			
Male ^a	.51	--	--
Child of adolescent mother ^a	.15	--	--
Parent-reported risk factors			
	M(SD)	M(SD)	M(SD)
Low family income (1–5)	3.18 (1.39)	3.00 (1.44)	2.62 (1.40)
Single-parent status (0–1)	.39 (.49)	.41 (.49)	.41 (.49)
Youth antisocial behavior (0–2)	.14 (.21)	.14 (.21)	.15 (.24)
Youth social problems (0–2)	.32 (.40)	.29 (.37)	.18 (.30)
Child-reported risk factors			
Perception of neighborhood (0–3)	.93 (.85)	.87 (.84)	.85 (.74)
Ever drank alcohol (0–1)	.24 (.43)	--	--
Frequency of alcohol use (0–30)	--	.45 (1.37)	1.01 (2.71)
Young adult-reported health outcomes ^b			
	Age		
	21, 24, 27		
Major depressive episode (0–3)	.45 (.72)		
Alcohol abuse or dependence (0–3)	.67 (.93)		
HIV risk (0–3)	1.92 (1.12)		

Note. Data for age 10 were collected during the fall. Data for all other ages were collected during the spring.

^aDichotomous variables where 1.00 = 100%.

^bMeans and standard deviations for young adult-reported health outcomes are based on scores aggregated across ages 21, 24, and 27.

Table 2

Correlations Among Covariates, Risk Factors, and Youth Adjustment

Predictors	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Male	--																		
2. Child of adolescent mother	.01	--																	
3. Low family income age 10	.10*	.01	--																
4. Low family income age 13	.01	-.06	.18*	--															
5. Low family income age 16	-.01	-.04	.18*	.74*	--														
6. Perception of neighborhood age 10	.02	-.09*	.14*	.65*	.71*	--													
7. Perception of neighborhood age 13	.07	.07	.08*	.17*	.16*	.16*	--												
8. Perception of neighborhood age 16	.12*	-.05	.09*	.23*	.26*	.20*	.28*	--											
9. Single-parent status age 10	.10*	-.07	.16*	.22*	.26*	.25*	.22*	.37*	--										
10. Single-parent status age 13	.11*	-.05	.12*	.48*	.38*	.36*	.09*	.10*	.14*	--									
11. Single-parent status age 16	.12*	-.01	.10*	.37*	.45*	.39*	.10*	.10*	.09*	.70*	--								
12. Youth antisocial behavior age 10	.14*	-.02	.16*	.34*	.38*	.49*	.13*	.08*	.13*	.60*	.73*	--							
13. Youth antisocial behavior age 13	.06	.04	.05	.19*	.12*	.19*	.05	.06	.01	.18*	.11*	.17*	--						
14. Youth antisocial behavior age 16	.11*	.09*	.13*	.16*	.15*	.17*	.16*	.09*	.17*	.12*	.12*	.17*	.40*	--					
15. Youth social problems age 10	.15*	.08*	.05*	.08	.09*	.16*	.14*	.12*	.17*	.04	.12*	.19*	.25*	.47*	--				
16. Youth social problems age 13	-.05	-.05	.00	.14*	.10*	.17*	.11*	.10*	.03	.10*	.10*	.11*	.52*	.21*	.21*	--			
17. Youth social problems age 16	-.09*	.05	-.04	.11*	.09*	.19*	.16*	.03	.06	.11*	.07	.11*	.31*	.43*	.27*	.45*	--		
18. Ever drank alcohol age 10	.04	-.03	.02	.08	.08*	.13*	.11*	.05	.16*	.07	.11*	.09*	.24*	.31*	.44*	.39*	.39*	--	
19. Frequency of alcohol use age 13	.12*	.07	.04	-.15*	-.11*	-.11*	.10*	-.00	.05	.02	-.02	-.01	-.03	.06	.02	.01	-.01	.02	--
20. Frequency of alcohol use age 16	.14*	-.01	.08*	.03	.03	.03	.02	.04	.08	.05	.04	.04	.21*	.18*	.07	.03	.07	.17*	

* $p < .05$

Table 3

Correlations Between Adult Outcomes and Covariates and Youth Risk Factors

Outcomes and risk factors	MDE	Alcohol Abuse/Dependence	HIV risk
Major depressive episode (MDE)	--		
Alcohol abuse or dependence	.14 *	--	
HIV risk	.16 *	.28 *	--
Male	-.09 *	.29 *	.00
Child of adolescent mother	.12 *	-.03	.09 *
Low family income age 10	.18 *	-.05	-.01
Low family income age 13	.14 *	-.04	.01
Low family income age 16	.12 *	-.05	.01
Perception of neighborhood age 10	.12 *	.04	.06
Perception of neighborhood age 13	.13 *	.02	.11 *
Perception of neighborhood age 16	.11 *	.05	.10 *
Single-parent status age 10	.10 *	.01	.07
Single-parent status age 13	.07	.02	.14 *
Single-parent status age 16	.11 *	.02	.14 *
Youth antisocial behavior age 10	.08	.08 *	.05
Youth antisocial behavior age 13	.06	.12 *	.10 *
Youth antisocial behavior age 16	.13 *	.14 *	.15 *
Youth social problems age 10	.11 *	-.04	-.07
Youth social problems age 13	.10 *	.03	-.10 *
Youth social problems age 16	.06	.04	.05
Ever drank alcohol age 10	.04	.09 *	.11 *
Frequency of alcohol use age 13	.05	.11 *	.15 *
Frequency of alcohol use age 16	.05	.14 *	.16 *

Note. MDE was measured as the number of times participants met criteria for major depression; Alcohol Abuse or Dependence was measured as the number of times participants met DSM-IV criteria; HIV Risk was measured as the number of times participants met criteria for high HIV risk. Outcomes were aggregated across three time points, ages 21, 24, and 27.

* $p < .05$

Table 4

Effects of Contextual Adversity and Youth Antisocial Behavior on Adult Outcomes

Variable	MDE b (SE) β	Alcohol b (SE) β	HIV Risk b (SE) β
Time-invariant variables			
Male	-.14* (.05) -.10	.53* .28	-.01 (.08) -.01
Child of adolescent mother	.17* .08 (.07)	-.12 (.09) -.05	.24* (.11) .08
Time-varying risk factors			
Low family income age 10	.03 (.04) .05	-.06 (.05) -.10	-.02 (.06) -.02
Low family income age 13	.05 (.04) .11	-.02 (.05) -.03	-.09 (.06) -.11
Low family income age 16	-.03 (.03) -.06	-.01 (.04) -.01	-.02 (.05) -.03
Perception of neighborhood age 10	.07* (.03) .09	.00 (.04) .00	.02 (.05) .01
Perception of neighborhood age 13	.04 (.04) .04	.00 (.05) .00	.13* (.06) .10
Perception of neighborhood age 16	.01 (.04) .01	.10* (.05) .08	.06 (.06) .04
Single-parent status age 10	.07 (.10) .05	.13 (.12) .07	.08 (.15) .03
Single-parent status age 13	-.12 (.11) -.08	.06 (.13) .03	.17 (.17) .07
Single-parent status age 16	.06 (.09) .04	-.03 (.12) -.01	.18 (.14) .08
Youth antisocial behavior age 10	.15 (.16) .00	.30 (.20) .07	.03 (.25) .01
Youth antisocial behavior age 13	-.23 (.17) -.07	.16 (.21) .04	.14 (.26) .03
Youth antisocial behavior age 16	.43* (.13) .14	.29* (.17) .08	.46* (.20) .10

*
 $p < .05$

Table 5

Effects of Contextual Adversity and Youth Social Problems on Adult Outcomes

Variable	MDE b (SE) β	Alcohol b (SE) β	HIV Risk b (SE) β
Time-invariant variables			
Male	-.13* (.05) -.09	.55* (.07) .30	.03 (.08) .01
Child of adolescent mother	.17* (.07) .09	-.11 (.09) -.04	.23* (.11) .07
Time-varying risk factors			
Low family income age 10	.03 (.04) .05	-.05 (.05) -.07	-.01 (.06) -.01
Low family income age 13	.05 (.04) .11	-.03 (.05) -.04	-.10 (.06) -.13
Low family income age 16	-.03 (.03) -.07	.00 (.04) .00	.01 (.05) .01
Perception of neighborhood age 10	.06 (.03) .07	.01 (.04) .01	.05 (.05) .04
Perception of neighborhood age 13	.04 (.04) .05	.01 (.05) .01	.14* (.06) .10
Perception of neighborhood age 16	.02 (.04) .02	.10* (.05) .08	.06 (.06) .04
Single-parent status age 10	.04 (.10) .03	.13 (.12) .07	.09 (.15) .04
Single-parent status age 13	-.12 (.11) -.08	.03 (.14) .01	.14 (.17) .06
Single-parent status age 16	.09 (.09) .06	.03 (.12) .02	.24 (.14) .10
Youth social problems age 10	.13 (.09) .07	-.10 (.11) -.04	-.15 (.14) -.05
Youth social problems age 13	.10 (.09) .05	.04 (.12) .02	-.34* (.14) -.11
Youth social problems age 16	.00 (.10) .00	.16 (.13) .05	.33* (.16) .09

*
 $p < .05$

Table 6

Effects of Contextual Adversity and Youth Alcohol Use on Adult Outcomes

	MDE b (SE) β	Alcohol b (SE) β	HIV Risk b (SE) β
Time-invariant variables			
Male	-.13* (.05) -.01	.54* (.06) .29	-.01 (.08) .00
Child of adolescent mother	.15* (.07) .07	-.17 (.09) -.07	.02 (.05) .05
Time-varying risk factors			
Low family income age 10	.04 (.04) .07	-.06 (.05) -.09	-.01 (.06) -.02
Low family income age 13	.04 (.04) .08	-.02 (.05) -.04	-.09 (.06) -.11
Low family income age 16	-.02 (.03) -.04	.01 (.04) .01	-.01 (.05) -.01
Perception of neighborhood age 10	.07* (.03) .08	.01 (.04) .01	.02 (.05) .01
Perception of neighborhood age 13	.04 (.04) .05	.00 (.05) .00	.13* (.06) .10
Perception of neighborhood age 16	.01 (.04) .02	.09 (.05) .07	.06 (.06) .04
Single-parent status age 10	.04 (.10) .03	.13 (.12) .07	.05 (.15) .02
Single-parent status age 13	-.11 (.11) -.07	.07 (.13) .04	.20 (.16) .09
Single-parent status age 16	.09 (.09) .06	-.02 (.12) -.01	.19 (.14) .08
Ever drank alcohol age 10	.07 (.07) .04	.08 (.08) .04	.18 (.10) .07
Frequency of alcohol use age 13	.02 (.02) .03	.06* (.03) .09	.08* (.03) .10
Frequency of alcohol use age 16	.00 (.01) .00	.04* (.01) .11	.04* (.02) .10

*
 $p < .05$