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Pathways from Childhood Abuse and Neglect to HIV-Risk Sexual Behavior in Middle Adulthood

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Abstract

Objective—This study examines the relationship between childhood abuse and neglect and sexual risk behavior in middle adulthood and whether psychosocial factors (risky romantic relationships, affective symptoms, drug and alcohol use, and delinquent and criminal behavior) mediate this relationship.

Methods—Children with documented cases of physical abuse, sexual abuse, and neglect (ages 0–11) processed during 1967–1971 were matched with non-maltreated children and followed into middle adulthood (approximate age 41). Mediators were assessed in young adulthood (approximate age 29) through in-person interviews between 1989 and 1995 and official arrest records through 1994 ($N = 1,196$). Past year HIV-risk sexual behavior was assessed via self-reports during 2003–2004 ($N = 800$). Logistic regression was used to examine differences in sexual risk behavior between the abuse and neglect and control groups, and latent variable structural equation modeling (SEM) was used to test mediator models.

Results—Child abuse and neglect was associated with increased likelihood of risky sexual behavior in middle adulthood ($OR = 2.84$, 95% $CI = 1.74 - 4.64$, $p \leq .001$), and this relationship was mediated by criminal behavior and risky romantic relationships in young adulthood. When both factors were included in SEM, only risky relationships remained a significant mediator (indirect $\beta = .07$, $p < .05$).

Conclusions—Results of this study draw attention to the potential long-term consequences of child abuse and neglect for physical health, particularly sexual risk, and point to romantic relationships as an important focus of intervention and prevention efforts.

Keywords

Child abuse and neglect; HIV risk; sexual behavior

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Introduction

Numerous studies have linked childhood maltreatment to risky sexual behavior later in life (e.g., Bensley, Van Eenwyk, & Simmons, 2000; Berenson, Wiemann, & McCombs, 2001; Cunningham, Stiffman, Dore, & Earls, 1994; Dube, Felitti, Dong, Giles, & Anda, 2003; Koenig & Clark, 2004; Mullings, Marquart, & Brewer, 2000; National Institute of Mental Health Multisite HIV Prevention Trial Group, 2001; Noll, Trickett, & Putnam, 2003; Paolucci, Genuis, & Violato, 2001; Purcell, Malow, Dolezal, & Carballo-Diéguez, 2004; Rodgers, Lang, Laffate, Satz, Dresselhaus, & Stein, 2004; Stiffman, Dore, Cunningham, & Earls, 1995). However, the majority of studies have focused only on sexual abuse (Senn, Carey, & Vanable, 2008), and most have relied on retrospective reports of childhood maltreatment. As an exception, findings from a prospective cohort design study revealed that individuals with documented cases of childhood physical abuse, sexual abuse, and neglect, compared to matched controls, were at increased risk for prostitution (Widom & Kuhns, 1996; Wilson & Widom, 2008a) and early sexual initiation (Wilson & Widom, 2008a) assessed in young adulthood. This study also found that victims of child abuse and neglect were more likely than non-maltreated controls to be HIV-positive and to report having had other sexually transmitted diseases in middle adulthood (Wilson & Widom, 2008a, 2009b). The current study expands upon this work to examine links from childhood abuse and neglect to risky sexual behavior in the same sample followed up in middle adulthood, at approximate age 41.

Recent research implicates childhood maltreatment as a risk factor for long-term physical health problems and health risk behaviors (Dube, et al., 2003; Rodgers, et al., 2004; Walker, Gelfand, Katon, Koss, Von Korff, Bernstein, & Russo, 1999). Childhood abuse and neglect can result in a cascade of negative effects across multiple domains of physiological, social, psychological, and behavioral development, which may explain increased propensity for risky sexual behavior in adulthood. The self-trauma model (Briere, 1996) suggests that childhood maltreatment can lead to problematic outcomes in adulthood through multiple developmental pathways involving attachment problems, symptoms of posttraumatic stress disorder (PTSD), maladaptive coping, and negatively distorted appraisals of oneself, others, and the future. According to this model, disruption of basic developmental processes can result in chaotic and conflictual relationships, use of poor coping strategies such as substance use and aggression, affective dysregulation, and psychological distress. For example, disruption of the early attachment relationship appears to undermine the development of intimate relationships and emotional regulation. Childhood maltreatment also appears to affect the development of neurological and physiological processes related to stress response, affect regulation, social and emotional development, and cognition (De Bellis, 2001; Glaser, 2000). In an integrative model, Repetti, Taylor, and Seeman (2002) suggest that maladaptive family environments, characterized by anger and aggression, low warmth and support, and neglect, increase risk for health compromising behaviors through deficits in children's emotional control and expression, social competence, and physiological regulation. Thus, deficits in multiple domains of psychosocial functioning may mediate the relationship between childhood maltreatment and risky sexual behavior. However, very little research has directly examined social, emotional, and behavioral mechanisms that may explain the relationship between childhood maltreatment and risky sexual behavior (Senn, et al., 2008).

The present study extends and expands on earlier work (Widom & Kuhns, 1996; Wilson & Widom, 2008a, 2009b, 2010b) by examining data collected during middle adulthood with a sample of individuals with documented histories of child abuse and neglect and matched controls. This study has two primary hypotheses. First, we predict that victims of childhood abuse and neglect will be more likely than controls to report HIV-risk sexual behavior in

middle adulthood. We expect this relationship to apply for three forms of child maltreatment -- sexual abuse, physical abuse, and neglect. Second, we predict that a set of psychosocial mediators (risky relationships, affective symptoms, drug and alcohol use, and delinquent and criminal behavior) will explain the relationship between childhood maltreatment and risky sexual behavior. We compare these potential mediating pathways to determine which specific risk factors are most likely to explain increased sexual risk in victims of childhood abuse and neglect.

Methods

Design and Participants

Data were collected as part of a large prospective cohort design study in which abused and/or neglected children were matched with non-abused, non-neglected children and followed into adulthood. Because of the matching procedure, the subjects are assumed to differ only in the risk factor; that is, having experienced childhood sexual or physical abuse or neglect. Since it is not possible to assign subjects randomly to groups, the assumption of equivalency for the groups is an approximation. The control group may also differ from the abused and neglected individuals on other variables nested with abuse or neglect. For complete details of the study design and subject selection criteria, see Widom (1989a).

The original sample of abused and neglected children ($N = 908$) was made up of substantiated cases of childhood physical and sexual abuse and neglect processed from 1967 to 1971 in the county juvenile (family) or adult criminal courts of a Midwestern metropolitan area. Cases of abuse and neglect were restricted to children 11 years of age or less at the time of the incident and, therefore, represent childhood maltreatment. A control group of children without documented histories of childhood abuse and/or neglect ($N = 667$) was matched with the abuse/neglect group on age, sex, race/ethnicity, and approximate family social class during the time that the abuse and neglect records were processed. The abuse and neglect and control groups were identified approximately 20 years after cases of abuse and neglect occurred.

The control group represents a critical component of the design of the study. Children who were under school age at the time of the abuse and/or neglect were matched with children of the same sex, race, date of birth (± 1 week), and hospital of birth through the use of county birth record information. For children of school age, records of more than 100 elementary schools for the same time period were used to find matches with children of the same sex, race, date of birth (± 6 months), class in elementary school during the years 1967 to 1971, and home address, preferably within a five-block radius of the abused/neglected child. Overall, matches were found for 74% of the abused and neglected children. Non-matches occurred for a number of reasons. For birth records, non-matches occurred in situations when the abused and neglected child was born outside the county or state or when date of birth information was missing. For school records, non-matches occurred because of lack of adequate identifying information for the abused and neglected children or because the elementary school had closed over the last 20 years and class registers were unavailable. Re-analyses of findings on criminal behavior were conducted using only matched pairs (that is, excluding abused and neglected subjects without matches), and the results did not change with the smaller sample size (Widom, 1989b). Court records were also searched for individuals identified for the control group, and those found to have cases of abuse or neglect were dropped ($N=11$).

The initial phase of the larger longitudinal study compared the abused and/or neglected children to the matched comparison group (total $N = 1,575$) on juvenile and adult criminal arrest records (Widom, 1989a). A second phase involved tracking, locating, and

interviewing the abused and/or neglected and comparison groups during 1989-1995, approximately 20 years after the incidents of abuse and neglect ($N = 1,196$). This interview consisted of a series of structured and semi-structured questionnaires and rating scales, including the National Institute of Mental Health Diagnostic Interview Schedule – Revised (DIS-III-R), a standardized psychiatric assessment that yields Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R) diagnoses (Robins, Helzer, Cottler, & Goldring, 1989). Subsequent follow-up interviews were conducted in 2000-2002 and in 2003-2004. The research presented in this paper uses self-reports and criminal records gathered in the 1989-1995 interviews and information on risky sexual behavior gathered as part of a medical status examination in 2003-2004.

Although there was attrition associated with death, refusals, and our inability to locate individuals over the various waves of the study, the composition of the sample at the four time points has remained about the same. The abuse and neglect group represented 56-58% at each time period; White, non-Hispanics were 62-66%; and males were 48-51% of the samples. There were no significant differences across the samples on these variables or in mean age across the four phases of the study.

1989-1995 Interview—Of the original sample, 1,307 subjects (83%) were located and 1,196 (76%) participated in the first interview. Of those not interviewed, 43 were deceased, 8 were unable to be interviewed, 268 were not found, and 60 refused to participate. At this wave of the study, the sample was an average of 29.2 years old (range = 19.0 – 40.7; $S.D. = 3.8$) and included 582 females (49%). Based on self reports of race/ethnicity, 61% of participants were White, non-Hispanic, 33% Black, 4% Hispanic, 1.5% American Indian, and less than 1% Pacific Islander or other. The median occupational level (Hollingshead, 1975) for the group was semi-skilled workers, and only 13% held professional jobs. On average, participants completed 11.5 years of education ($S.D. = 2.14$). Thus, the sample was skewed toward the lower end of the socioeconomic spectrum. Of the 1,196 participants, 520 were in the control group and 676 in the abuse and/or neglect group (543 cases of neglect, 110 cases of physical abuse, and 96 cases of sexual abuse). These numbers add up to more than 676 since some individuals experienced more than one type of abuse or neglect.

2003-2004 Interview—A total of 808 individuals completed the third interview, and 800 participants provided information about risky sexual behavior. This sample included 454 cases of abuse and neglect (367 neglect, 78 physical abuse, and 60 sexual abuse) and 346 matched controls. They were an average of 41.2 years old (range 32.0-49.0) and were 52.9% female. Based on self reports of race/ethnic background, 59.0% were White, non-Hispanic, 34.4% were Black, non-Hispanic, 4.0% were Hispanic, and 2.6% were of other racial/ethnic backgrounds. Women from minority backgrounds comprised 22% of the sample.

Procedures

Participants completed the interview and comprehensive medical examination in their homes or another place appropriate for the interview if preferred by the participant. The interviewers were blind to the purpose of the study and to the inclusion of an abused and/or neglected group. Participants were also blind to the purpose of the study and were told that they had been selected to participate as part of a large group of individuals who grew up in the late 1960s and early 1970s. Institutional Review Board approval was obtained for the procedures involved in this study, and subjects who participated gave written, informed consent. For individuals with limited reading ability, the consent form was presented and explained verbally.

Measures

Child abuse and neglect—Childhood physical and sexual abuse and neglect were assessed through review of official records processed during the years 1967 to 1971. *Physical abuse* cases included injuries such as bruises, welts, burns, abrasions, lacerations, wounds, cuts, bone and skull fractures, and other evidence of physical injury. *Sexual abuse* cases had charges ranging from relatively nonspecific charges of “assault and battery with intent to gratify sexual desires” to more specific charges of “fondling or touching in an obscene manner,” sodomy, incest, rape, etc. *Neglect* cases reflected a judgment that the parents’ deficiencies in child care were beyond those found acceptable by community and professional standards at the time and represented extreme failure to provide adequate food, clothing, shelter, and medical attention to children.

HIV-Risk Sexual Behavior—As part of a medical history interview in 2003–2004, participants reported whether they had in the past year: 1) been treated for a sexually transmitted disease; 2) given or received money or drugs in exchange for sex; 3) had anal sex without a condom; or 4) used intravenous drugs. Participants who endorsed any of the four items were then asked, if comfortable, to identify which situations applied to them. Participants also reported how many sexual partners they had in the past year and whether they used a condom at the last sexual intercourse. A composite score was created to reflect any risky sexual behavior in the past year, and separate items indicated: 1) sexually transmitted disease (STD); 2) trading sex; 3) unprotected anal sex; and 4) multiple partners and inconsistent condom use. This paper focused only on HIV-risk sexual behavior since relationships between childhood maltreatment and drug use in this sample are not straightforward (Widom, Marmostein, & White, 2006).

Risky relationships—Participants were asked a series of questions about intimate relationship functioning in young adulthood as part of the Antisocial Personality Disorder (APD) module of the DIS-III-R. These items asked about lifetime and current involvement in intimate relationships, whether the participant had ever walked out on a partner for several weeks or longer, been sexually faithful for at least a year, or had sexual relations outside of marriage with at least three people (Colman & Widom, 2004). Additional interview questions asked about intimate relationship history, including marriage and cohabitation. Separate dichotomous variables (1=yes; 0=no) were created to reflect: (1) walking out on a partner; (2) never sexually faithful; (3) sexual relations outside of marriage; (4) temporary separation from a partner; and (5) multiple marriages.

Affective symptoms—Lifetime symptoms of depression, dysthymia, and PTSD were assessed in young adulthood with the DIS-III-R and, therefore, correspond to DSM-III criteria for these disorders. Continuous variables reflecting the number of symptoms reported are used in analyses.

Drug and alcohol use—Drug and alcohol use were assessed through self-reports on the DIS-III-R substance use module completed in young adulthood. Three variables were created to reflect: (1) number of problems associated with alcohol use; (2) number of problems associated with drug use; and (3) number of illicit drugs used more than five times.

Delinquent and criminal behavior—Delinquency and crime were measured with two variables self-reported in young adulthood and collection of arrest records through 1994: (1) number of officially documented arrests for crimes other than prostitution; (2) self-report on the DIS-III-R APD module of having been arrested (0 = never; 1 = yes); and (3) number of delinquent and criminal behaviors (e.g., property damage, theft, sexual and physical assault,

carrying and/or using weapons) reported on a measure adapted from Wolfgang and Weiner (1989).

Control variables—Age in middle adulthood, gender, and race/ethnicity were examined as potential control variables, given differences in rates of HIV risk behavior reported in the literature (Centers for Disease Control and Prevention, 2005; Leigh, Temple, & Trocki, 1993). Gender was coded 1 for males and 0 for females. Race/ethnicity was coded as non-Hispanic Black (1), non-Hispanic White (2), or Hispanic (3). Other race/ethnic groups were not included in this variable since their proportion of the sample was too small for meaningful comparison (2.3%).

Analyses

Logistic regression was used to assess differences between the abuse/neglect and control groups in overall HIV risk and each indicator of HIV risk. Odds ratios (OR) were generated by exponentiation of the regression coefficients. Each regression included all participants with complete data on the variables included in that regression model (i.e., pairwise deletion). Therefore, the sample size differed somewhat depending on the outcome (see Table 1) due to a small number of missing responses (e.g., participant refused to answer a particular question).

Latent variable structural equation modeling (SEM) with Mplus 5.1 was used to examine mediator models. SEM proceeded in three stages. First, we conducted confirmatory factor analysis (CFA) to assess the measurement model describing relationships between the observed indicators and latent constructs. Table 1 lists the observed variables that loaded onto each latent factor. Residual correlations among the observed indicators for each latent factor were included in the model. HIV risk behavior was indicated by the single binary composite score, due to the low prevalence of any individual risk behavior, and childhood abuse and neglect was also indicated by a single binary variable. All bivariate correlations between the latent variables, HIV risk behavior, and childhood abuse and neglect were included in the model. Thus, in addition to assessing the fit of the measurement model and significance of factor loadings, CFA provided a test of the criteria for mediation that: (1) the predictor is related to the outcome; (2) the predictor is related to the mediator; (3) the mediator is related to the outcome (Kenny, Kashy, & Bolger, 1998). Second, we examined separate path models with each mediator, which evaluated the two additional criteria for mediation by each latent factor: (4) the relationship between the mediator and the outcome remains significant when controlling for the predictor; and (5) the direct relationship between the predictor and the outcome is significantly reduced when the mediator is included. Third, we examined a multiple-mediator model that included all mediators supported by analysis of the separate path models considering traditional criteria (Kenny et al., 1998) and current recommendations of MacKinnon (2008), as well as the moderated mediation approach recommended by Kraemer, Kiernan, Essex, and Kupfer (2008). Although the Kenny et al. (1998) approach to mediation has been criticized as overly conservative, and newer approaches suggest that criteria 1 and 5 are not essential (MacKinnon, 2008), we considered all criteria in evaluating the potential mediators.

For measurement and structural models, we evaluated multiple indices of overall model fit. A chi-square statistic (χ^2) reflects the difference between the observed model relationships and estimated relationships based on the specified model. A low χ^2 and non-significance ($p < .05$) is desirable, and a χ^2 to degrees of freedom (df) ratio of less than 5 is considered adequate (Bollen, 1989). A Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) of .90 or higher indicate good fit. Root Mean Square Error of Approximation (RMSEA) of less than .05 is considered a close fit, and Weighted Root-Mean-Square Residual (WRMR) of

less than 1 indicates a good fit. Current recommendations support consideration of both the χ^2 test and other indices of model fit (Barrett, 2007); χ^2 and WRMR can be overly sensitive to discrepancies between observed and expected relationships with a large sample.

Individual factor loadings (measurement models) and path estimates (structural models) were standardized linear regression coefficients for continuous factor indicators or dependent variables, including latent constructs, and standardized probit regression coefficients for binary (0-1) factor indicators or dependent variables, including HIV risk behavior. Probit coefficients represent change in the cumulative normal probability of the dependent variable associated with a one-unit increase in the predictor. Thus, the magnitudes of coefficients corresponding to continuous and binary outcomes (or factor indicators) are not directly comparable. Statistical significance was assessed with z-scores, and R^2 provided a measure of effect size, indicating the amount of variance explained in the HIV risk behavior by each model. Strength of mediational relationships was evaluated with tests of indirect effects (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002) and bias-corrected bootstrapped confidence intervals (MacKinnon, Lockwood, & Williams, 2004).

Full information maximum likelihood (FIML) estimation was used to handle missing data. This method uses all data available for each case and thus avoids biases and loss of power associated with traditional approaches to missing data (Allison, 2003; Schlomer, Bauman, & Card, 2010). FIML calculates weighted least square parameter estimates using a diagonal weight matrix with standard errors and mean- and variance adjusted χ^2 test statistics that use a full weight matrix, and this estimator is robust to deviations from normality. Analysis of missing data using MPlus revealed 33 specific patterns. The most common pattern reflected participants with complete data on the young adulthood variables but who were lost to attrition at middle adulthood or did not respond to questions about sexual risk (17%); an additional 217 (18%) were missing sexual risk data as well as at least one young adulthood variable. The next most common pattern (11%) reflected individuals who were missing data on the variables of “temporary separation from a partner” and “never sexually faithful” because they had never had a marital, live-in, or exclusive partner (these individuals were coded “0” for “walking out on a partner,” “multiple marriages,” and “sexual relations outside of marriage”). Other patterns were associated with less than 10% of the sample. SEM analyses including only cases with available data on sexual risk in middle adulthood ($N = 778$) yielded findings consistent with those reported below.

Results

Prevalence of Risky Sexual Behavior in the Sample

Overall, 12.7% of the sample reported at least one type of risky sexual behavior in middle adulthood. Specifically, 2.1% reported treatment for an STD, 1.6% reported trading sex, 5.5% reported unprotected anal sex, and 7.2% reported multiple partners with no condom use at last sexual intercourse. Rates of risky sexual behavior were not associated with age ($OR = .98$, 95% $CI = .92 - 1.04$, $p > .10$) and did not differ significantly for women and men ($OR = 1.09$, 95% $CI = .71 - 1.66$, $p > .10$) or for different race/ethnic groups ($F(2,754) = .65$, $p > .10$). Therefore, these variables were not controlled in subsequent analyses.

Relationships between Childhood Abuse and Neglect and Risky Sexual Behavior

As shown in Table 1, child abuse and neglect overall was significantly associated with increased likelihood of any risky sexual behavior ($OR = 2.84$, 95% $CI = 1.74 - 4.64$, $p \leq .001$) in the past year and specifically for treatment for an STD ($OR = 3.65$, 95% $CI = 1.04 - 12.79$, $p \leq .05$), unprotected anal sex ($OR = 2.73$, 95% $CI = 1.33 - 5.60$, $p \leq .01$), and multiple partners with inconsistent condom use ($OR = 2.68$, 95% $CI = 1.42 - 5.07$, $p \leq .01$).

The association with any risky sexual behavior was evident for all three types of maltreatment but was strongest for childhood neglect (OR = 2.88, 95% CI = 1.74 - 4.77, $p \leq .001$) and weakest for sexual abuse (OR = 2.46, 95% CI = 1.08 - 5.62, $p \leq .05$). In addition, relationships with specific types of sexual risk-taking varied for different types of childhood abuse or neglect. Sexual abuse was associated with unprotected anal sex (OR = 3.11, 95% CI = 1.02 - 9.45, $p \leq .05$). Physical abuse was associated with treatment for an STD (OR = 7.83, 95% CI = 1.83 - 33.50, $p \leq .01$) and multiple partners with inconsistent condom use (OR = 3.35, 95% CI = 1.38 - 8.15, $p \leq .01$). Neglect was associated with unprotected anal sex (OR = 2.88, 95% CI = 1.38 - 6.01, $p \leq .01$) and multiple partners with inconsistent condom use (OR = 2.70, 95% CI = 1.40 - 5.20, $p \leq .01$). It should also be noted that the ORs reflecting the magnitude of relationships between childhood abuse and neglect and trading sex were substantial (3.83 - 6.04), although they only reached marginal statistical significance, possibly because of reduced power to detect a significant effect due to the small number of individuals who reported this behavior.

Structural Equation Modeling

The measurement model provided an acceptable fit ($\chi^2 = 191.12$; $df = 49$; $p < .05$; CFI = .90, TLI = .93, RMSEA = .05, WRMR = 1.14). Factor loadings on the latent constructs were all statistically significant and ranged from .32 to .84 (see Table 1). Bivariate correlations indicated significant direct relationships between childhood abuse and neglect, HIV risk behavior, and each of the four proposed mediators (see Table 3), thereby supporting the initial criteria for mediation. However, the correlation between child abuse and neglect and drug and alcohol use was very small.

The results from separate path models with each potential mediator are depicted in Figure 1. Only the risky relationships construct was clearly supported as a mediator. This model explained 13% of the variance in HIV risk behavior, and indirect effects were significant ($\beta = .07$, 95% CI = .01 - .13). The other mediators were not strongly supported, based on consideration of statistical significance or magnitude of indirect effects. The model with delinquent and criminal behavior explained 3% of the variance in risky sexual behavior, and indirect effects were small ($\beta = .02$, 95% CI = .001 - .03). In this model, the coefficient for the path from delinquent and criminal behavior was small, despite being statistically significant. In the path model with affective symptoms, childhood abuse and neglect predicted increased affective symptoms, but affective symptoms did not significantly predict HIV risk behavior. The indirect effects in this model were small ($\beta = .03$, 95% CI = -.003 - .06). In the model with drug and alcohol use, on the other hand, childhood abuse and neglect did not significantly predict drug and alcohol use, although drug and alcohol use did increase the likelihood of HIV risk behavior. In all four models, the direct path between childhood abuse and neglect and HIV risk behavior remained significant, suggesting that risky relationships only partially mediate this relationship.

As recommended by Kraemer et al. (2008), moderated mediation models were examined for affective symptoms and for delinquent and criminal behavior, which were associated with abuse and neglect but not HIV risk behavior in the multivariate models. Inclusion of the interaction between affective symptoms and child abuse/neglect in a model with random slopes using a robust maximum likelihood estimator (Klein and Moosbrugger, 2000) did not yield a significant moderation effect for affective symptoms ($z = .78$). Similarly, the interaction of child abuse and neglect with delinquent and criminal behavior was not significant ($z = 1.49$).

Although risky relationships alone emerged as a significant mediator, we subjected this mediator to a more strenuous test by examining two separate multiple-mediator models, one including delinquent and criminal relationships and the second including affective

symptoms. Results from the model with both risky relationships and delinquent and criminal behavior as mediators are depicted in Figure 2. The model provided a good fit ($\chi^2 = 53.05$; $df = 17$; $p < .05$; CFI = .96, TLI = .93, RMSEA = .04, WRMR = .99) and explained 14% of the variance in HIV risk behavior. Risky relationships remained a significant mediator, when delinquent and criminal behavior was included. The indirect effect through risky relationships was only marginally significant, although the magnitude remained the same as in the single-mediator model ($\beta = .07$, 95% CI = -.002 - .14). Delinquent and criminal behavior did not contribute substantially to variance in HIV risk behavior, although risky relationships and delinquent and criminal behavior were moderately correlated with each other.

Findings for the model including both risky relationships and affective symptoms as mediators (Figure 3) were similar. The model provided a strong fit ($\chi^2 = 12.20$; $df = 14$; $p > .05$; CFI = 1.00, TLI = 1.00, RMSEA = .00, WRMR = .46) and explained 12% of the variance in HIV risk behavior. In this model, the path from risky relationships to HIV risk behavior was only marginally significant, although the magnitude of the relationship was consistent, and the indirect effect decreased. However, the relationship between affective symptoms and HIV risk behavior, as well as associated indirect effects, was close to zero. In both multiple-mediator models, the direct relationship between child abuse and neglect and HIV risk behavior remained significant.

Conclusion

The first notable finding from this study is that individuals with documented cases of childhood abuse and neglect reported increased HIV risk behavior in middle adulthood, 30 years after these childhood experiences. Documentation of increased sexual risk-taking in these abused and neglected individuals followed up in middle adulthood extends findings with the same sample in young adulthood and adds validity to the larger body of research indicating correlations between sexual risk behavior and adult retrospective reports of childhood maltreatment. Victims of childhood abuse and neglect appear to be at risk for a long-term pattern of health compromising sexual behaviors that extends into middle adulthood, when risky sexual behavior decreases for most individuals. In our sample overall, 13% reported sexual risk taking in middle adulthood, but 17% of individuals with histories of childhood abuse or neglect reported sexual risk, and this rate was a nearly three-fold increase over the controls. Our findings add to increasing recognition that the long-term consequences of childhood abuse and neglect extend to physical health risk, and they underscore the importance of clinical interventions to reduce sexual risk-taking among victims of childhood abuse and neglect.

In addition to documenting increased sexual risk behavior, findings from this study shed light on mechanisms that may explain the link from childhood abuse and neglect to sexual risk. Of the set of potential mediators assessed (risky relationships, affective symptoms, drug and alcohol use, and delinquent and criminal behavior), risky relationships emerged as the most powerful factor linking child abuse and neglect to risky sexual behavior. Thus, risky sexual behavior appears to take place in the context of generally chaotic, unstable relationships characterized by disruptions, sexual infidelity, and lack of monogamy. These problematic relationship patterns may develop as a result of disrupted early attachment (Main, 1996) as well as the neurobiological effects of abuse and neglect (De Bellis, 2001; Glaser, 2000). It is important to note that the data available in this study reflects participants' reports about their own behavior rather than their partners' behavior or level of risk. Other research suggests that involvement with risky partners may largely explain increased risk for STDs among women with histories of sexual abuse (Testa, VanZile-Tamsen, & Livingston, 2005). In addition, the indicators of relationship risk included in this study may not

necessarily reflect abnormal or maladaptive relationships (e.g., multiple marriages). Taken together, however, the construct reflects a pattern of romantic relationships lacking stability or commitment. Moreover, risky relationships were associated with delinquent and criminal behavior, suggesting that these relationship characteristics are associated with a general pattern of risky, deviant behavior.

The relationship between delinquent and criminal behavior in young adulthood and HIV risk behavior in middle adulthood was tenuous, and this pathway was no longer significant when risky relationships were included in the model. As noted above, however, risky relationships were associated with delinquent and criminal behavior. Thus, it may be that these relationship characteristics develop as part of a larger pattern of antisocial behavior among victims of child abuse and neglect. Other analyses with this sample, which did not include relationship risk, have emphasized the role of antisocial behavior as a mediator in the link to risky sexual behavior (Wilson & Widom, 2008b, 2010a). Indeed, several of the items used to assess relationship risk were drawn from a measure of antisocial personality disorder. Nonetheless, it appears that deviance in the context of romantic relationships may provide the direct link to risky sexual behavior and may even mediate the pathway from general antisocial behavior to sexual risk taking. Since both general delinquency and relationship risk were assessed at the same point in time in this study, we could not directly test the more complex mediational pathway, but evidence of a connection between the two constructs provides some support for this hypothesis.

In this study, neither affective symptoms nor drug and alcohol use were supported as mediators of the relationship between childhood maltreatment and risky sexual behavior. Lack of a strong connection between child abuse and neglect and substance use in young adulthood is consistent with other findings from this sample (Widom, Weiler, & Cottler, 1999). Interestingly, in this sample, relationships between child maltreatment and substance use do not emerge until middle adulthood and exist primarily for women (Widom, Marmorstein, & White, 2006). Nonetheless, drug and alcohol use did appear to increase HIV risk sexual behavior for the sample overall. Moreover, it is possible that greater drug use in middle adulthood among female victims of abuse and neglect (Wilson & Widom, 2009a) contributes to sexual risk taking at this time point.

An opposite pattern was revealed for affective symptoms, which were associated with childhood abuse and neglect but were not strongly linked to sexual risk. Although symptoms of depression and PTSD have been linked to sexual risk in other studies (Mazzaferro, Mruray, Ness, Bass, Tyus, & Cook, 2006; Swanholm, Vosvick, & Chng, 2009), these problems in young adulthood did not predict later sexual risk behavior in our sample. As with delinquent and criminal behavior, affective symptoms were associated with risky relationships and may contribute to risk for involvement in unstable, chaotic relationships. However, affective symptoms in young adulthood may not necessarily persist into middle adulthood or directly influence behavior in middle adulthood. Thus, correlations found between affective symptoms and sexual risk behavior at a single point in time may not generalize to the longitudinal relationship assessed in this study. Furthermore, findings from another recent study suggest that although there are correlations between these phenomena, depression may not be involved in the relationship between child abuse and sexual risk behavior (Morokoff, Redding, Harlow, Cho, Rossi, Meier, Mayer, Koblin, & Brown-Peterside, 2009).

This study has several advantages. First, the prospective longitudinal design allows for determination of the correct temporal sequence in the variables of interest. Second, this study traces development into middle adulthood, unlike most studies that end at adolescence or young adulthood. Third, the sample is large, includes men and women, and is ethnically

diverse. Fourth, documented cases of childhood maltreatment minimize potential problems with reliance on retrospective self-reports and provide a non-ambiguous definition of childhood abuse and neglect. Fifth, we examine mediating mechanisms to uncover specific processes that may explain this relationship.

Despite the strengths of this study, a number of important limitations must be noted. First, although the use of documented cases of child abuse and neglect is an advantage, this decision means that only cases that came to the attention of authorities and met the threshold for a legal definition of abuse and neglect are included. Less severe or unreported cases are not reflected. Second, our measure of risky relationships reflects the participants' own behavior, rather than characteristics of their partners. Third, we only examined a subset of the possible mediators that may explain this relationship. Fourth, the base rate of HIV risk behavior in middle adulthood was fairly low, which may have reduced power. Finally, cases of abuse and neglect occurred in the late 1960s and early 1970s in a Midwestern metropolitan area in the United States, and therefore our results may not generalize to all cases of child maltreatment.

Results of this study draw attention to the potential long-term consequences of child abuse and neglect for physical health, particularly sexual risk. Findings also point to romantic relationships as an important focus of intervention and prevention efforts for reducing HIV risk behavior among victims of childhood abuse and neglect. Helping victims of abuse and neglect to form healthy romantic relationships early in life may reduce risky sexual behavior that persists into middle adulthood.

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Figure 1. Separate mediator models predicting HIV risk behavior through childhood abuse and neglect

NOTE: Numbers in parentheses are bias-corrected bootstrapped 95% confidence intervals around the indirect effect.

Figure 3. Path model predicting HIV risk behavior from child abuse and neglect through risky relationships and affective symptoms

NOTE: Numbers in parentheses are bias-corrected bootstrapped 95% confidence intervals around the indirect effect.

Table 1
Variable Descriptive Statistics and Factor Loadings in Confirmatory Factor Analysis

	Range	N	%	M (SD)	Factor Loading
Child abuse and neglect	0-1	1196	56.5		NA
Any HIV risk behavior	0-1	778	12.7		NA
STD treatment	0-1	799	2.1		NA
Trading sex	0-1	799	1.6		NA
Unprotected anal sex	0-1	799	5.5		NA
Multiple partners and inconsistent condom use	0-1	780	7.2		NA
Risky relationships					
Walking out on a partner	0-1	1191	29.6		.57***
Never sexually faithful	0-1	954	8.1		.33***
Sexual relations outside of marriage	0-1	958	7.3		.84***
Temporary separation from partner	0-1	838	62.1		.44***
Multiple marriages	0-1	1113	15.6		.39***
Affective symptoms					
Depression	0-9	1196		3.38 (2.72)	.69***
Dysthymia	0-7	1195		2.44 (2.10)	.69***
Posttraumatic stress disorder	0-17	1191		5.20 (5.73)	.69***
Drug and alcohol use					
Alcohol problems	0-9	1193		2.54 (2.68)	.71***
Drug problems	0-9	1193		1.65 (2.47)	.73***
Number of illicit drugs used	0-4	1193		0.89 (1.00)	.70***
Delinquent and criminal behavior					
Number of arrests	0-20	1196		2.57 (4.71)	.32***
Self-report of being arrested	0-1	1189	45.8		.70***
Number of delinquent behaviors	0-11	1194		2.67 (3.00)	.74***

NOTE: % = percentage of the sample; M = mean; SD = standard deviation.

 p ≤ .001

Table 2
Past Year HIV Risk Behavior among Abused and Neglected Children and Matched Controls Followed Up at Approximate Age 41

	Control (N = 337)			Any Child Abuse or Neglect (N = 443)			Sexual Abuse (N = 59)			Physical Abuse (N = 76)			Neglect (N = 358)		
	%			%	95% CI	OR	%	95% CI	OR	%	95% CI	OR	%	95% CI	OR
Any HIV risk behavior	6.8	17.2	2.84***	15.3	1.74 - 4.64	2.46*	3.4	1.08 - 5.62	17.1	2.82**	1.36 - 5.86	17.4	2.88***	1.74 - 4.77	
STD treatment	.9	3.1	3.65*	3.4	1.04-12.79	4.01	6.4	0.66-24.54	6.4	7.83**	1.83-33.50	2.7	3.20†	0.87-11.74	
Trading sex	.6	2.4	4.28	3.4	0.94-19.44	6.04	2.6	0.83-43.71	2.6	4.53	0.63-32.64	2.2	3.83†	0.81-18.18	
Unprotected anal sex	2.9	7.5	2.73**	8.5	1.33 - 5.60	3.11*	5.1	1.02 - 9.45	5.1	1.82	0.55 - 5.95	7.9	2.88**	1.38 - 6.01	
Multiple partners and inconsistent condom use	3.9	9.7	2.68**	6.8	1.42 - 5.07	1.81	11.8	0.57 - 5.76	11.8	3.35***	1.38 - 8.15	9.8	2.70**	1.40 - 5.20	

NOTE: Sample sizes differ slightly for each outcome due to missing data on specific items.

*
p ≤ .05

**
p ≤ .01

p ≤ .001

Table 3
Bivariate Correlations among Variables in Confirmatory Factor Analysis

	1	2	3	4	5
1. Child abuse or neglect					
2. HIV risk behavior	.32***				
3. Risky relationships	.33**	.32**			
4. Affective symptoms	.24***	.18**	.54***		
5. Drug and alcohol use	.09*	.22***	.48***	.50***	
6. Delinquent and criminal behavior	.22***	.18*	.43***	.35***	.93***

* $p \leq .05$

** $p \leq .01$

*** $p \leq .001$