

A Prospective Examination of the Path from Child Abuse and Neglect to Illicit Drug Use in Middle Adulthood: The Potential Mediating Role of Four Risk Factors

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Abstract This study examines prostitution, homelessness, delinquency and crime, and school problems as potential mediators of the relationship between childhood abuse and neglect (CAN) and illicit drug use in middle adulthood. Children with documented cases of physical and sexual abuse and neglect (ages 0–11) during 1967–1971 were matched with non-maltreated children and followed into middle adulthood (approximate age 39). Mediators were assessed in young adulthood (approximate age 29) through in-person interviews between 1989 and 1995 and official arrest records through 1994 ($N = 1,196$). Drug use was assessed via self-reports of past year use of marijuana, psychedelics, cocaine, and/or heroin during 2000–2002 ($N = 896$). Latent variable structural equation modeling (SEM) was used to test: (1) a four-factor model with separate pathways from CAN to illicit drug use through each of the mediating risk factors and (2) a second-order model with a single mediating risk factor comprised of prostitution, homelessness, delinquency and crime, and poor school performance. Analyses were performed separately for women and men, controlling for race/ethnicity and early drug use. In the four-factor model for both men and women, CAN was significantly related to each of the mediators, but no paths from the mediators to drug use

were significant. For women, the second-order risk factor mediated the relationship between CAN and illicit drug use in middle adulthood. For men, neither child abuse and neglect nor the second-order risk factor predicted drug use in middle adulthood. These results suggest that for women, the path from CAN to middle adulthood drug use is part of a general “problem behavior syndrome” evident earlier in life.

Keywords Childhood sexual abuse · Childhood physical abuse · Childhood neglect · Drug use

A widespread belief is that child abuse and neglect increases risk for drug use later in life, but the nature of this relationship and the factors that lead from childhood maltreatment to drug use are not well understood. Numerous studies have reported associations between childhood maltreatment and drug use in adolescence or adulthood (Simpson and Miller 2002). This relationship is more consistently supported and is often stronger for women than for men (Simpson and Miller 2002). Findings from a prospective cohort design study have suggested that women, but not men, with documented cases of child abuse and neglect are at increased risk for substance use problems in middle adulthood (Widom et al. 2006). Other findings from this prospective study suggest that the link from childhood maltreatment to illicit drug use in middle adulthood among women is mediated by symptoms of post-traumatic stress disorder (PTSD), antisocial behavior, and stressful life events (White and Widom 2008). This paper expands upon previous work to examine an alternative set of risk factors as mediators of the link from child abuse and neglect to illicit drug use in middle adulthood and assesses models separately for women and men.

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Ecodevelopmental Theory

Recognizing that multiple, interacting risk factors are likely to lead from an abusive or neglectful childhood environment to substance use later in life, we use ecodevelopmental theory (Szapocznik and Coatsworth 1999) as a framework for this investigation. Ecodevelopmental theory places drug use within the context of interacting processes including biology, family, peers, school, neighborhood, and the broader sociocultural environment (Szapocznik and Coatsworth 1999). Within this theoretical framework, a child's family is viewed as the most proximal and powerful influence on development (Perrino et al. 2000). Not only does the family have a direct role in shaping development, but the family environment also affects other contexts of development. Thus, childhood abuse and neglect (CAN) may result in a cascade of negative effects across multiple domains of the developing child's psychological and social functioning, and these conditions may provide contexts that increase the likelihood of drug use.

Ecodevelopmental theory suggests that evaluation of a single risk factor in isolation of related factors may overestimate its effects (Perrino et al. 2000). Thus, we evaluate a model including multiple pathways to drug use in middle adulthood. In existing literature, emotional problems, such as PTSD or depression, have received considerable attention as potential mediators of the relationship between child abuse and neglect and substance use (Simpson and Miller 2002), whereas less attention has been paid to other risk factors that develop subsequent to child abuse and neglect that may also mediate this relationship. Addressing this gap in the literature, we test a hypothetical model suggesting that four risk factors evident by young adulthood mediate the relationship between childhood maltreatment and illicit drug use in middle adulthood: (1) prostitution; (2) homelessness; (3) delinquency and crime; and (4) school problems. School problems are assessed through information obtained in young adulthood but clearly refer to an earlier time period. Nonetheless, school problems earlier in life have significant implications for adult opportunities and economic stability. The other risk factors reflect young adult behaviors that correspond to problem behaviors generally examined in adolescence (Jessor 1998).

Although, there are certainly other potential mediators that may help explain relationships between child abuse and later drug use, this paper focuses on a particular set of mediators that have been linked individually to both childhood maltreatment and to drug use but have not previously been examined together in a complex model. An extensive body of research supports bivariate associations between these four risk factors and both drug use and CAN, but few attempts have been made to combine these

literatures to build integrative developmental models describing mechanisms through which abused and neglected children may engage in patterns of illicit drug use that extend into middle adulthood. The following literature review describes empirical findings linking each of the four risk factors to drug use or CAN.

Potential Risk Factors in the Pathway from Child Abuse and Neglect to Illicit Drug Use

Prostitution

Research suggests that prostitution is associated both with a history of childhood maltreatment and with drug use. A number of cross-sectional studies have linked child abuse and neglect to prostitution (e.g., McClanahan et al. 1999; Nixon et al. 2002; Potter et al. 1999; Van Brunschot and Brannigan 2002). In addition, findings from a prospective study revealed that victims of CAN were more likely than controls to be involved in prostitution by young adulthood (Wilson and Widom 2008). Prostitution is also associated with drug use among adolescents (Chen et al. 2004) and adults (Potterat et al. 1998). However, the direction of this association is not clear. Some research suggests that drug use precedes prostitution (Potterat et al. 1998), whereas other findings suggest that prostitution leads to initiation or exacerbation of drug use (Chen et al. 2004; Cusick 2002). Based on this literature, the current study includes prostitution as a mediator of the pathway from child abuse and neglect to illicit drug use in middle adulthood.

Homelessness

Homelessness has also been linked to both childhood maltreatment and drug use. Studies have reported a connection between childhood maltreatment and homelessness (Herman et al. 1997; Stein et al. 2002). Homeless youths often report running away from an abusive or neglectful home environment (Paradise and Cauce 2002; Yoder et al. 2001). Moreover, children removed from home because of maltreatment face great disadvantages in terms of access to and ability to sustain independent living, which puts them at increased risk for homelessness when they age out of state care (Mendes and Moslehuddin 2006). There is also a link between homelessness and substance abuse (Fountain et al. 2003; Munoz et al. 2005). As with prostitution, however, the causal direction of this relationship is somewhat unclear (Mallett et al. 2005). While substance abuse may be one reason that individuals become homeless, homelessness also appears to exacerbate substance use problems (Fountain et al. 2003; Gray and Fraser 2005). In one study, interviews with homeless youths revealed multiple

pathways characterizing relationships between family conflict (sometimes including physical or sexual abuse), drug and alcohol use, and homelessness (Mallett et al. 2005). For at least some of the youths interviewed, family conflict led them to leave home, and substance abuse began or became problematic as a result of homelessness and a street culture encouraging drug use. Another study linking abusive family relationships, homelessness, and drug use reported that approximately 60% of young adults with histories of both homelessness and injection drug use reported leaving home as teenagers because of physical abuse (Hyde 2005). In the current study, homelessness is included as a mediator of the pathway from child abuse and neglect to drug use in middle adulthood.

Crime

Crime also appears to be associated with both childhood maltreatment and substance use. Several large prospective studies have documented a relationship between childhood maltreatment and criminal behavior in adolescence and/or adulthood (Maxfield and Widom 1996; Smith and Thornberry 1995; Stouthamer-Loeber et al. 2001; Zingraff et al. 1993). Likewise, involvement in crime appears to be one pathway to drug use problems (Joshi et al. 2001; van den Bree and Pickworth 2005). Substance use and abuse may develop in conjunction with participation in delinquent and criminal subcultures since these problematic behaviors often occur together as part of a generalized “problem behavior syndrome” (Donovan and Jessor 1985). In addition, similar traits (e.g., impulsivity, lack of control, emotional instability, and negative affect) put individuals at risk for both delinquency and substance abuse (White and Labouvie 1994). Previous findings with the same prospective cohort used in the present study, moreover, revealed that involvement in crime mediated the relationship between childhood maltreatment and women’s illicit drug use in middle adulthood (White and Widom 2008). Extending this previous work, the current study includes involvement in crime and delinquency as a mediator of the path from child abuse and neglect to illicit drug use.

School Problems

School problems are another risk factor potentially linking child abuse and neglect to drug use later in life. Abused and neglected children are at risk for a variety of emotional, behavioral, and cognitive difficulties that interfere with their success at school (Veltman and Browne 2001). Several prospective studies have established that poor school performance (e.g., poor grades, poor scores on standardized achievement tests, grade retention, placement in special education) is often an outcome of CAN (e.g., Jonson-Reid

et al. 2004; Leiter 2007). Some research also supports an association between childhood maltreatment and other school problems, such as truancy and dropping out of school (Garnefski and Arends 1998; McBroom 1994). School problems may, in turn, precipitate the onset of regular drug use (Joshi et al. 2001; van den Bree and Pickworth 2005). One study, for example, found that high school drop-outs reported more severe substance use than their peers and that this relationship was mediated by behavior problems (e.g., truancy, suspensions, discipline problems) while in school (Drapela 2006). However, another study with 11–15 year-olds referred for maltreatment investigations did not find a significant relationship between academic achievement or school engagement and substance use (Wall and Kohl 2007). The current study examines school problems as a potential mediator of the relationship between child abuse and neglect and illicit drug use.

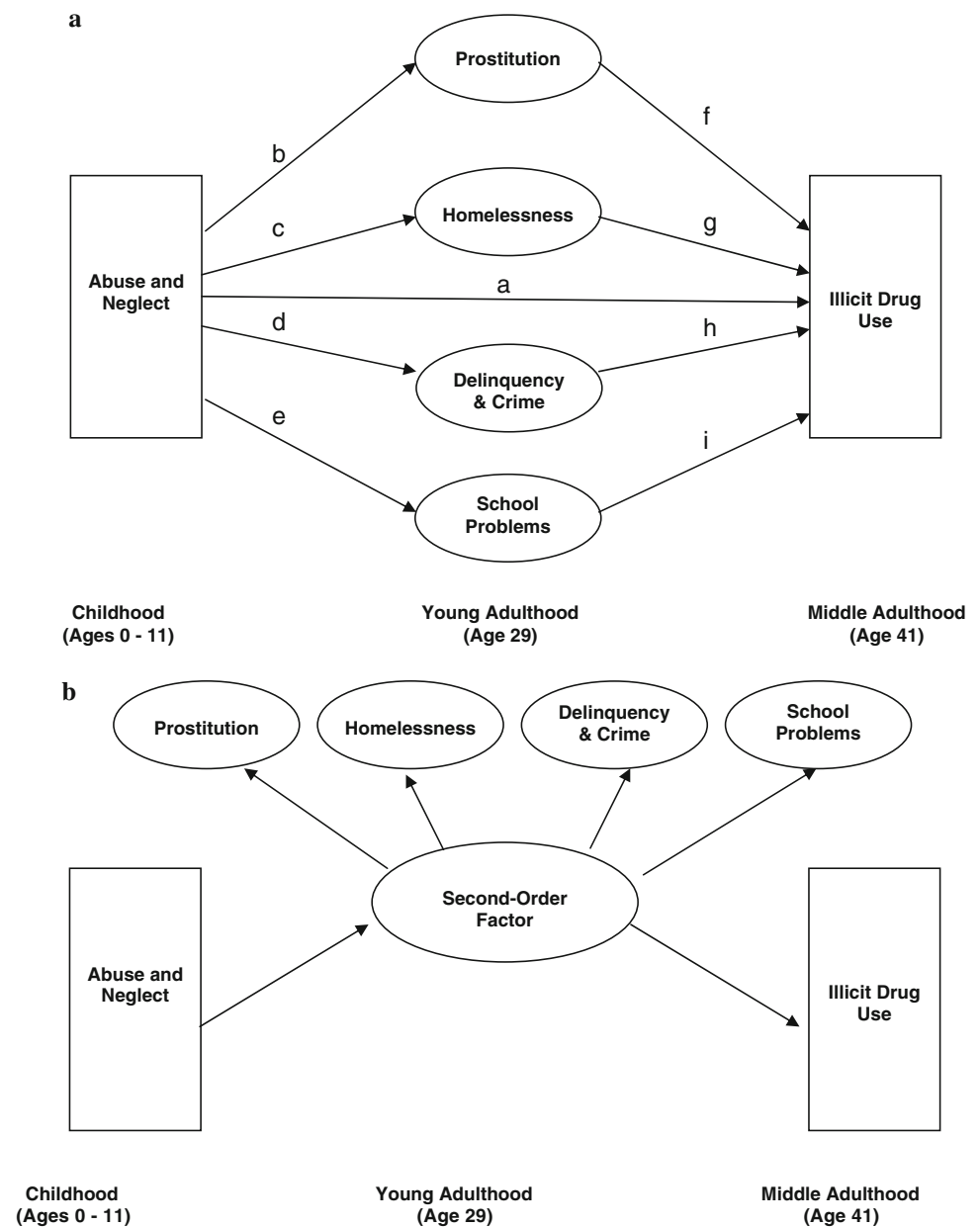
Problem Behavior Theory

The four risk factors described above may represent separate pathways to drug use (see Fig. 1a), but they may also reflect a pattern of related and overlapping risk behaviors that lead from child abuse and neglect to drug use in middle adulthood (see Fig. 1b). Problem behaviors, such as delinquency, sexual risk-taking, substance abuse, running away, and school problems tend to co-occur and may represent a “syndrome” that has been described among adolescents and young adults (Donovan and Jessor 1985). This problem behavior syndrome has been extended to encompass a broad range of risky behaviors and lifestyle characteristics (Jessor 1998). Consistent with this conceptualization, the risk factors assessed here may represent a cluster of risky behaviors that mediate the link from child abuse and neglect to illicit drug use in middle adulthood, rather than distinct and independent pathways.

Hypotheses

The current study was designed to test the overarching hypothesis that CAN increases the likelihood of four risk factors (prostitution, homelessness, crime, and school problems) which, in turn, serve as potential pathways to illicit drug use in middle adulthood. We test two alternate path models with linkages from CAN to illicit drug use in middle adulthood via: (1) four separate mediators assessed in young adulthood (See Fig. 1a) and (2) a single risk factor comprised of the four potential mediators (See Fig. 1b). Because prior research has found differences between women and men in the relationship between child

Fig. 1 Hypothesized models linking child abuse and neglect to illicit drug use through risk factors earlier in life. **(a)** A four-factor model representing separate pathways leading to illicit drug use. **(b)** A second-order model representing a single “problem behavior syndrome” leading to drug use



abuse and neglect and later substance problems (Simpson and Miller 2002; Widom et al. 2006), we test the same models separately for women and men.

This study has a number of strengths. First, a prospective cohort design permits determination of the correct temporal sequence of these relationships. Moreover, we follow individuals into middle adulthood, beyond adolescence and young adulthood. Second, we have a large sample that includes women and men and is varied in terms of race/ethnicity. Third, we include three different types of childhood maltreatment (physical abuse, sexual abuse, and neglect), which are unambiguously defined and assessed through documented cases of childhood maltreatment. This strategy minimizes potential problems with reliance on

retrospective self-reports. Fourth, the mediators included in this study are assessed with latent variables comprised of self-reports and arrest records. Finally, we examine a complex model that includes multiple mediating pathways.

Methods

Overview

Data were collected as part of a large prospective cohort design study in which abused and neglected children were matched with non-abused, non-neglected children and followed into adulthood. Because of the matching procedure,

the participants are assumed to differ only in the risk factor; that is, having experienced childhood physical or sexual 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 associated with abuse or neglect. For complete details of the study design and subject selection criteria, see Widom (1989a).

The initial phase of the study compared the abused and/or neglected children to the matched comparison group ($N = 1,575$) on juvenile and adult criminal arrest records (Maxfield and Widom 1996; Widom 1989b). The second phase involved tracking, locating, and interviewing the abused and/or neglected and comparison groups during 1989–1995, approximately 20 years after 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 (DIS-III-R), a standardized psychiatric assessment that yields Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R) diagnoses (Robins et al. 1989). Subsequent follow-up interviews were conducted in 2000–2002 and in 2003–2004. The research presented in this paper uses information collected during 1989–1995 (mediators) and 2000–2002 (drug use).

Participants and Design

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. A control group of children without documented histories of child abuse 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 control group represents a critical component of the study design. 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 1967–1971, 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 and class registers were not available.

Of the original sample, 1,307 subjects (83%) were located and 1,196 (76%) participated in the 1989–1995 interview. Of those participants, 896 (75%) completed the 2000–2002 interview. Table 1 provides information on reasons for attrition and demographic characteristics of the sample at the original archival review and both interviews. The composition of the sample at the various waves of interviews has remained about the same. The abuse and neglect group represented 56–58% at each time period; White, non-Hispanics were 61–66%; and women were 49–51% of the samples. There were no significant differences across the samples on these variables or in mean age across the waves of the study.

Procedures

Participants completed the interviews in their homes or, if preferred by the participant, another place appropriate for the interview. 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

Childhood Abuse and Neglect

Childhood physical and sexual abuse and neglect were assessed through review of official records processed during the years 1967–1971. *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* charges varied 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

Table 1 Rates of attrition and demographic characteristics of sample at each stage of data collection

	Original sample <i>N</i> = 1,575	1989–1995 <i>N</i> = 1,196	2000–2002 <i>N</i> = 896
Base used to calculate attrition	NA	1,575 ^a	1,196
<i>Reason for attrition</i>	% (<i>n</i>)	% (<i>n</i>)	% (<i>n</i>)
Unable to locate	NA	17.0 (268)	6.7 (79)
Deceased	NA	2.7 (43)	3.1 (37)
Incapable of being interviewed (e.g., mental or physical impairment)	NA	0.5 (8)	0.3 (4)
Refused to participate	NA	3.8 (60)	15.1 (180)
<i>Demographic composition</i>			
Age, mean (range)	26.1 (16.7–35.9)	29.2 (19.0–40.7)	39.5 (30.0–47.0)
Female	49.0 (772)	48.7 (582)	51.0 (457)
White, non-Hispanic	66.1 (1041) ^b	61.5 (735)	60.8 (545)
Black, non-Hispanic	32.5 (512)	32.5 (389)	32.6 (292)
Hispanic and other	1.5 (22)	6.0 (72)	6.6 (59)
High school graduate	Unavailable	56.3 (674)	59.8 (531)
Menial/unskilled/semi-skilled work	Unavailable	53.6 (641)	53.8 (471)
Professional/semi-professional work	Unavailable	12.7 (153)	14.2 (124)
Abuse and/or neglect cases	57.6 (908)	56.5 (676)	55.8 (500)

Note: NA = not applicable

^a Original sample

^b Race/ethnic background of the original sample is based on documentation in court records, and the “other” category includes “unknown” and “missing”

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.

Illicit Drug Use

During the 2000–2002 interview, participants were asked whether and how often they used illicit drugs (marijuana, psychedelics, cocaine, and heroin) in the past year. Because the prevalence of past year illicit drug use was relatively low in the sample (29%) and there was little variance in frequency of use among users (see Widom et al. 2006), a count variable was used instead of a frequency measure. Illicit drug use was coded as “0” for no illicit drug use (71%), “1” for use of one type of illicit drug (21%), and “2” for use of more than one type of illicit drug (8%).

Prostitution

Prostitution was assessed through self-reports during the 1989–1995 interview and arrest records were gathered through 1994. Consistent with previous assessments of prostitution in this sample (Wilson and Widom 2008), involvement in prostitution was indicated by a single dichotomous variable (0 = no; 1 = yes) reflecting: (1) a record of arrest for prostitution and/or (2) self-report of “ever having been paid for sex” on the DIS-III-R Antisocial Personality Disorder (APD) module. Rates of arrests for prostitution were very low but were not necessarily captured

by self-reports. Thus, we used a variable reflecting either self-report or arrest to minimize the weaknesses of each measurement approach by itself (Maxfield et al. 2000).

Homelessness

Homelessness was assessed with two items during the 1989–1995 interview: (1) self-report of having experienced a period of homelessness in the past 12 months and (2) self-report on the DIS-III-R APD module of having ever experienced “a period when you had no regular place to live, for at least a month or so.” A dichotomous score (1 or 0) was created for each item.

Crime

Crime was measured by three observed variables assessed at the 1989–1995 interview 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 = no; 1 = yes); and (3) number of delinquent and criminal behaviors (e.g., property damage, theft, disruption of neighborhood peace, sexual and physical assault, carrying and/or using weapons) reported on a measure adapted from Wolfgang and Weiner (1989).

School Problems

School problems were indicated by four observed variables assessed at the 1989–1995 interview: (1) self-report of poor

grades in school; (2) any officially documented arrest for truancy and/or self-report on DIS-III-R APD module of frequent truancy (5 days or more in at least two school years) prior to the end of high school (combined because arrests for truancy were very low in frequency, 1.7%, but were not necessarily captured by self-reports); (3) self-report on the DIS-III-R APD module of having been expelled or suspended from school; and (4) completion of less than 12 grades of school. Each item was represented by a dichotomous (1 or 0) variable.

Control Variables

Race/ethnicity and early illicit drug use were included in analyses as control variables. Early illicit drug use reflected a self-report of using marijuana, psychedelics, cocaine, and/or heroin more than 5 times, beginning before age 18. Race/ethnicity was included as a control variable due to previous findings with this sample of a relationship between race/ethnicity and illicit drug use (White and Widom 2008).

Analyses

We conducted all analyses separately for women and men since previous findings with this sample have indicated gender differences in the relationship between child abuse and neglect and illicit drug use (Widom et al. 2006). We

calculated descriptive statistics (i.e., frequencies, means, standard deviations) with SPSS 15.0 and conducted latent variable structural equation modeling (SEM) with Mplus 4 (Muthen and Muthen 2006).

Two separate models were tested with latent variable SEM. A four-factor model reflected separate pathways for each of the four mediating risk factors, and a second-order model reflected a single risk construct as the mediator. For each model, SEM proceeded in two stages. First, we conducted confirmatory factor analysis (CFA) to assess the measurement model describing relationships between the observed indicators and latent constructs. In the four-factor measurement model, CAN, illicit drug use, and prostitution were treated as single observed variables, whereas homelessness, crime, and school problems were latent variables comprised of multiple indicators (see Table 2). All latent variables and the single-item variables (abuse/neglect, prostitution, and drug use) were allowed to correlate. In the second-order factor model, a higher-order latent variable was comprised of the three latent variables for homelessness, crime, and school problems and the single indicator for prostitution. In addition to assessing the fit of the measurement models, CFA provided information about the bivariate relationships between model constructs and a test of the requirements 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 et al. 1998).

Table 2 Variable descriptive statistics and factor loadings in confirmatory factor analysis

	Range	Women (<i>N</i> = 582)			Men (<i>N</i> = 614)				
		<i>N</i>	%	<i>M</i> (SD)	Factor loading	<i>N</i>	%	<i>M</i> (SD)	Factor loading
Childhood abuse and neglect	0–1	582	58.1		NA	614	55.0		NA
Prostitution	0–1	581	9.0		NA	609	11.5		NA
Homelessness									
Homeless in the past year	0–1	578	7.1		.73***	609	8.0		.59***
Ever homeless	0–1	582	17.5		.87***	610	22.0		.93***
Delinquency and crime									
Self-report of any arrest	0–1	578	31.8		.77***	611	59.1		.89***
Number of documented arrests	0–16	582		.99 (2.19)	.44***	614		4.07 (5.84)	.55***
Self-report of delinquency	0–11	582		1.52 (2.02)	.47***	612		3.77 (3.36)	.57***
School problems									
Poor grades	0–1	581	12.7		.27**	612	21.4		.53***
No high school graduation	0–1	578	40.1		.45**	608	46.1		.58***
Frequent truancy	0–1	571	28.9		.53**	598	43.6		.65***
Expulsions and/or suspensions	0–1	581	35.5		.57**	611	54.5		.71***
Illicit drug use ^a	0–2	456		.30 (.57)	NA	434		.45 (.68)	NA

Note: Frequencies (%) are reported for dichotomous variables and means and standard deviations for continuous variables. Factor loadings are standardized linear regression coefficients for continuous variables and standardized probit regression coefficients for dichotomous outcomes

^a The sample size for illicit drug use is 896 (457 women and 439 men)

** $p < .01$, *** $p < .001$

Second, we conducted latent variable path analysis to assess the structural models describing relationships between the predictor, mediators, and outcome. Before testing the full structural models, separate path models were tested for each mediator to assess the individual risk factors as mediators without other risk factors included (i.e., controlled). Paths were included to control for race/ethnicity and for early drug use. Separate path models provided a test of the two additional criteria for mediation: (1) the relationship between the mediator and the outcome remains when the predictor is included and (2) the relationship between the predictor and the outcome is no longer significant when the mediator is included.

The full four-factor model included paths from child abuse and neglect to each of the four mediators and to illicit drug use and from each mediator to illicit drug use (See Fig. 1a). The mediators were allowed to correlate with each other. The full second-order model included paths from child abuse and neglect to the second-order risk factor and to illicit drug use and from the second-order risk factor to illicit drug use (See Fig. 1b). In both models, race/ethnicity and early drug use were also controlled by including paths from both variables to each mediator (or the second-order risk factor) and to drug use. Chi-square difference testing determined whether removal of the direct path from child abuse and neglect to drug use significantly reduced model fit; if not, then full mediation would be supported. Tests of indirect effects assessed the magnitude and significance of mediated relationships. Gender differences in the path models were examined using multiple group analysis, which tested differences in path strengths for men and women with chi-square difference tests assessing change in model fit when paths were constrained to be equal for both groups. A non-significant chi-square indicated that the path was equivalent for both groups, whereas a significant chi-square indicated an interaction. The full path models were also tested for each of the three types of child abuse and neglect.

For measurement and structural models, we reported 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; nonsignificant χ^2 ($p > .05$) indicates a good fit. The Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) of .90 or higher indicate good fit. The Root Mean Square Error of Approximation (RMSEA) of less than .05 is considered a close fit, and less than .08 is adequate. Current recommendations support consideration of both the χ^2 test and other indices of model fit (Barrett 2007); χ^2 can be overly sensitive to discrepancies between observed and expected relationships with a large sample, but fit indices do not provide tests of significance.

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 illicit drug use, and standardized probit regression coefficients for dichotomous dependent variables (prostitution) or factor indicators. The probit coefficient represents 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 dichotomous 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 outcome. To handle missing data, we used full information maximum likelihood estimation, which uses all information available for each case and thus avoids biases and loss of power associated with traditional approaches to missing data (Allison 2003). Mplus 4 calculated 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.

Results

Descriptive Statistics

The prevalence of positive cases of dichotomous variables and the means and standard deviations of continuous variables are listed separately for women and men in Table 2. Approximately one-third (29.1%) of the sample reported use of one or more types of illicit drugs in the past year. Men were more likely than women to report illicit drug use ($\chi^2 = 13.54$, $p < .01$). Among women, 23.9% reported use of at least one drug in the past year (18.0% reported one type, and 5.9% reported more than one type). Among men, 34.5% reported use of at least one drug in the past year (23.7% reported one type, and 10.8% reported use of more than one type). Non-Whites were also more likely than Whites to report illicit drug use (33.6% vs. 26.2%; $\chi^2 = 5.66$, $p < .05$). Early illicit drug use predicted illicit drug use in middle adulthood ($\beta = .29$, $p < .001$).

Women

Confirmatory Factor Analysis (CFA)

CFA supported the four-factor measurement model for women. Overall fit indices indicated a good fit to the data ($\chi^2 = 58.85$, $df = 33$, $p < .01$; CFI = .96; TLI = .96; RMSEA = .04), with the exception of a significant χ^2 , but χ^2 is sensitive to sample size and is often high with large

Table 3 Correlations among child abuse and neglect, illicit drug use, and potential mediators for women and men

Latent or manifest variable	CAN	PR	HO	DC	SP	DU
Child abuse and neglect (CAN)	–	.26***	.34***	.22***	.35***	.10*
Prostitution (PR)	.21*	–	.39***	.53***	.45***	.22***
Homelessness (HO)	.32**	.40***	–	.48***	.52***	.17***
Delinquency and Crime (DC)	.25***	.56***	.50***	–	.85***	.28***
School Problems (SP)	.38***	.45***	.46***	.85***	–	.28***
Illicit Drug Use (DU)	.04	.13 [†]	.04	.20**	.18**	–

Note: Numbers refer to standardized correlation coefficients (R). Correlations are above the line for women ($N = 582$) and below the line for men ($N = 614$). The sample size for correlations with illicit drug use is 457 for women and 439 for men

[†] $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

samples. Table 2 shows that the factor loadings of the observed variables were all strong and significant. Significant correlations among child abuse and neglect, drug use, and the mediators (See Table 3 above the line) supported the requirements for mediation. In addition, the mediators were significantly correlated with each other (See Table 3 above the line).

CFA also supported the second-order measurement model for women ($\chi^2 = 61.58$, $df = 39$, $p < .05$; CFI = .97; TLI = .97; RMSEA = .03). All factor loadings on the second-order factor were strong and significant: prostitution .69 ($p < .001$), homelessness .66 ($p < .001$), crime .93 ($p < .001$), school .88 ($p < .01$). The second-order factor was significantly correlated with child abuse and neglect ($\beta = .46$, $p < .001$) and with illicit drug use ($\beta = .43$, $p < .001$), and child abuse and neglect was significantly correlated with illicit drug use ($\beta = .19$, $p < .01$).

Single Mediator Models

Separate path models supported prostitution, homelessness, crime, and school problems each as mediators of the relationship between CAN and women's use of illicit drugs, controlling for race/ethnicity and early drug use. First, a model that did not include any of the mediators indicated a significant direct relationship between CAN and illicit drug use among women ($\beta = .15$, $p < .001$) and explained 13% of the variance in illicit drug use. Second, single-factor models supported significant paths from child abuse and neglect to each mediator, and third, from each mediator to drug use (with the direct path from abuse and neglect included and thus controlled). Fourth, the direct relationship between abuse and neglect in childhood and illicit drug use in middle adulthood was no longer significant when each mediator was included in separate models.

The following description of findings for each of the single mediator models refers to paths labeled *a-i* in Fig. 1a. The prostitution model (paths *a*, *b*, and *f*), explained 16% of the variance in illicit drug use and

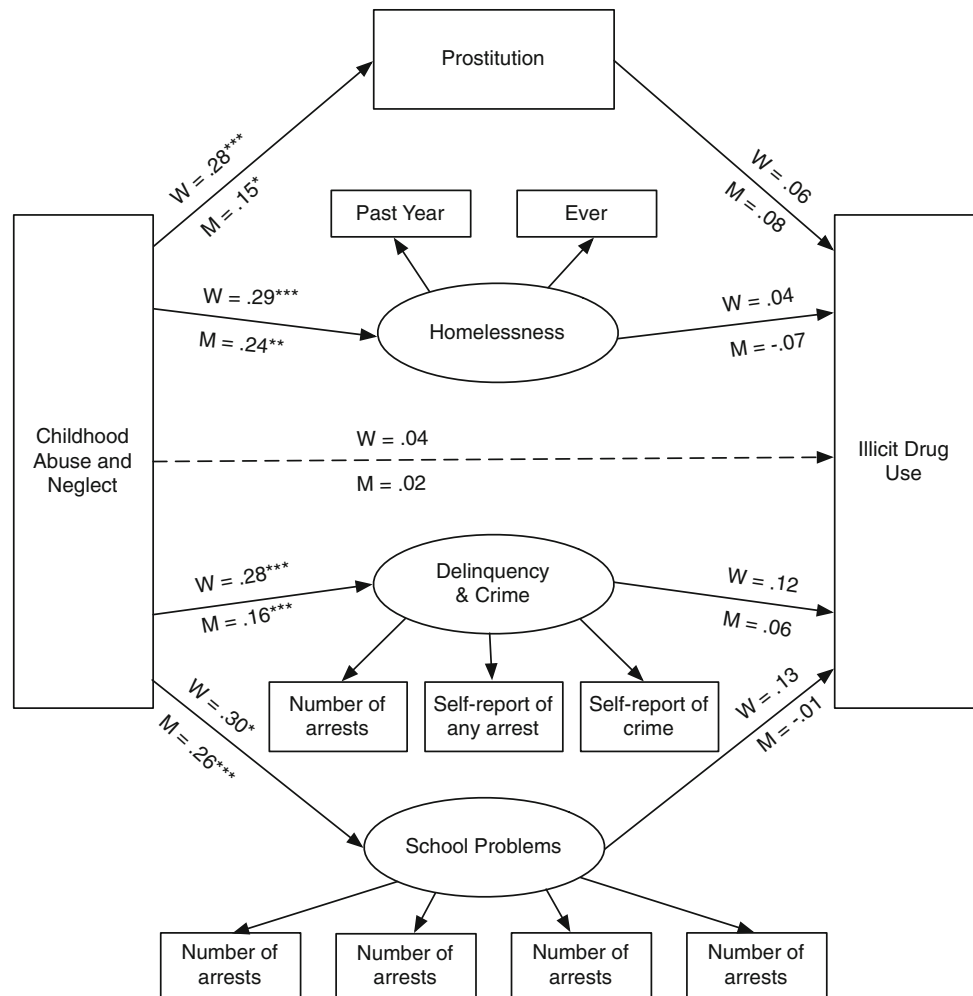
included significant paths *b* ($\beta = .28$, $p < .001$) and *f* ($\beta = .18$, $p < .001$) and a marginally significant path *a* ($\beta = .10$, $p < .10$). The homelessness model (paths *a*, *c*, and *g*) explained 16% of the variance in illicit drug use and included significant paths *c* ($\beta = .30$, $p < .001$) and *g* ($\beta = .18$, $p < .05$) and a marginally significant path *a* ($\beta = .09$, $p < .10$). The delinquency and crime model (paths *a*, *d*, and *h*) explained 18% of the variance in illicit drug use and included significant paths *d* ($\beta = .28$, $p < .001$) and *h* ($\beta = .28$, $p < .001$) and a non-significant path *a* ($\beta = .07$, $p > .10$). The school problems model (paths *a*, *e*, and *i*) explained 18% of the variance in illicit drug use and included significant paths *e* ($\beta = .30$, $p \leq .01$) and *i* ($\beta = .26$, $p < .05$) and a non-significant path *a* ($\beta = .07$, $p > .10$).

Four-Factor Structural Model

For women, the full four-factor structural model provided an adequate fit to the data ($\chi^2 = 108.02$, $df = 39$, $p < .001$; CFI = .91; TLI = .87; RMSEA = .05) and explained 19% of the variance in illicit drug use. The total indirect effects via the set of mediators were significant ($\beta = .10$, $p < .01$), while the direct effect of child abuse and neglect on illicit drug use was non-significant ($\beta = .04$, $p > .10$). Figure 2 shows the estimated path coefficients (above the lines for women) in the full model. Paths from child abuse and neglect to each of the mediators were significant for women. However, none of the mediators were significantly related to illicit drug use in the full model, controlling for the other mediators.

Separate models for child neglect and sexual abuse were consistent with overall findings for women, but the model for child physical abuse did not include significant paths from physical abuse to homelessness or school problems. It is important to note that the sample sizes for the models comparing physical abuse to the control group ($N = 289$) and sexual abuse to the control group ($N = 318$) were in the minimal range necessary for testing this model, and therefore

Fig. 2 Four-factor structural equation model linking child abuse and neglect to illicit drug use in middle adulthood through risk factors earlier in life. Rectangles represent observed variables; ovals represent latent variables; lines represent estimated paths. Path estimates are standardized linear regression coefficients for continuous outcomes (latent variables, illicit drug use) and a standardized probit regression coefficient for the dichotomous outcome (prostitution). Paths not depicted in the model are included to control for race/ethnicity and early drug use. W = women; M = men. * $p < .05$, ** $p < .01$, *** $p < .001$



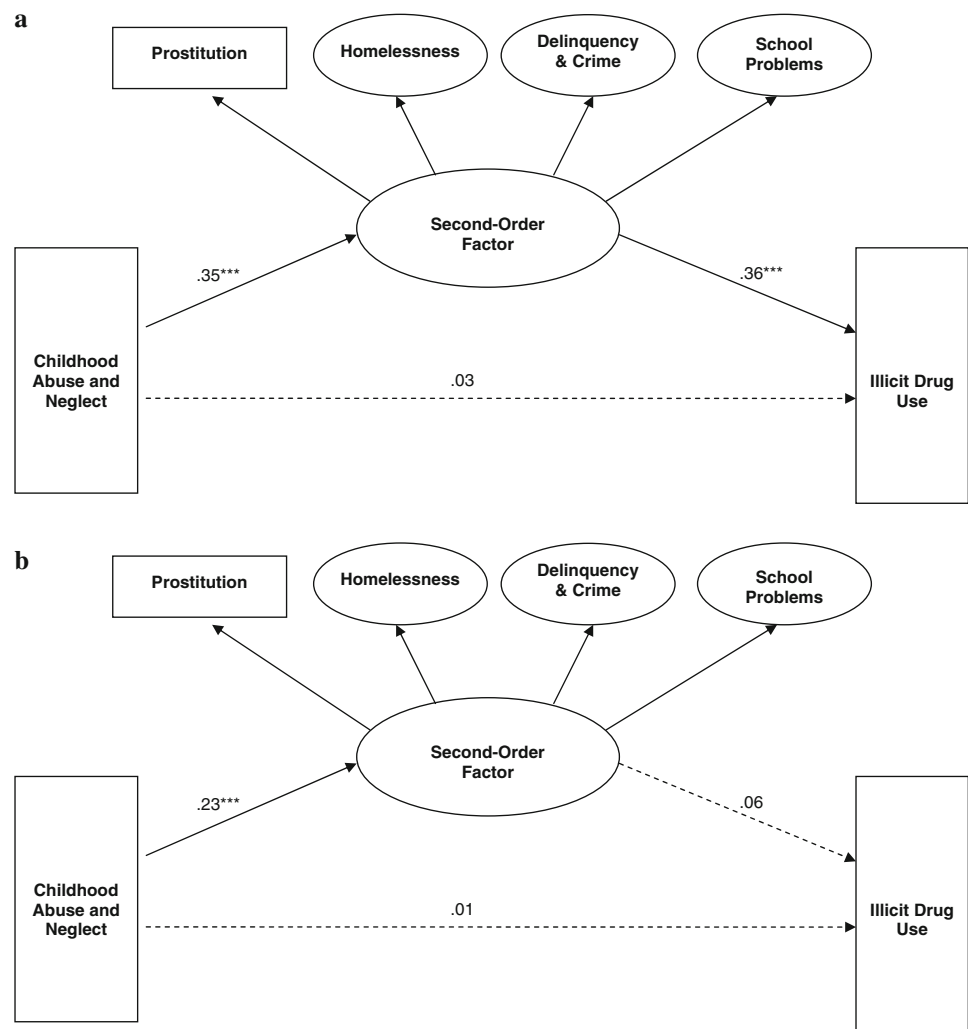
findings with these types of abuse and neglect may not be reliable. The following description of findings for each type of abuse and neglect refers to paths labeled a–i in Fig. 1a. The model for child neglect ($\chi^2 = 97.85, df = 42, p < .001$; CFI = .90; TLI = .86; RMSEA = .05) included significant paths b ($\beta = .28, p \leq .001$), c ($\beta = .30, p \leq .001$), d ($\beta = .31, p \leq .001$), and e ($\beta = .31, p \leq .05$), and non-significant paths a ($\beta = .07, p > .10$), f ($\beta = .04, p > .10$), g ($\beta = .12, p > .10$), h ($\beta = .16, p > .10$), and i ($\beta = .02, p > .10$). The model for child sexual abuse ($\chi^2 = 96.71, df = 38, p < .001$; CFI = .85; TLI = .80; RMSEA = .07) included significant paths b ($\beta = .28, p \leq .001$), c ($\beta = .35, p \leq .001$), d ($\beta = .24, p \leq .001$), and e ($\beta = .27, p \leq .01$), and non-significant paths a ($\beta = .07, p > .10$), f ($\beta = -.21, p > .10$), g ($\beta = -.14, p > .10$), h ($\beta = .41, p > .10$), and i ($\beta = .19, p > .10$). The model for child physical abuse did not yield a good fit ($\chi^2 = 89.81, df = 37, p < .001$; CFI = .80; TLI = .75; RMSEA = .07), and only paths b ($\beta = .28, p \leq .01$) and d ($\beta = .30, p \leq .001$) were significant. Paths c ($\beta = .24, p > .10$), e ($\beta = .15, p > .10$), a ($\beta = .01, p > .10$), f ($\beta = -.64, p > .05$), g ($\beta = .15, p > .10$), h

($\beta = .39, p > .10$), and i ($\beta = .48, p > .10$) were not significant.

Second-Order Structural Model

For women, the structural model with the second-order factor as a mediator of the relationship between child abuse and neglect and illicit drug use, with paths included to control for race/ethnicity and early drug use, provided a good fit ($\chi^2 = 117.16, df = 53, p < .001$; CFI = .91; TLI = .90; RMSEA = .05) and explained 20% of the variance in drug use. Paths from child abuse and neglect to the second-order factor ($\beta = .35, p < .001$) and from the second-order factor to illicit drug use ($\beta = .36, p < .001$) were significant and substantial in magnitude for women. The direct relationship between child abuse and neglect and illicit drug use was non-significant ($\beta = .03, p > .10$), and its removal did not significantly reduce model fit ($\Delta\chi^2 = .23, \Delta df = 1, p > .10$), indicating full mediation. The final second-order model for women is shown in Fig. 3a with the non-significant, removed path in a dotted line. This model provided a good fit

Fig. 3 (a and b) Second-order structural equation models linking child abuse and neglect to illicit drug use in middle adulthood through risk factors earlier in life, for women (a) and men (b). Rectangles represent observed variables; ovals represent latent variables; lines represent estimated paths; dotted lines reflect non-significant, removed paths. Path estimates are standardized linear regression coefficients. Paths not depicted in the model are included to control for race/ethnicity and early drug use. * $p < .05$, *** $p < .001$



($\chi^2 = 117.45$, $df = 54$, $p < .001$; CFI = .91; TLI = .90; RMSEA = .05), and total indirect effects were significant ($\beta = .13$, $p < .001$).

The second-order models for child neglect and child sexual abuse were consistent with overall findings for women. In the neglect model ($\chi^2 = 106.91$, $df = 52$, $p < .001$; CFI = .90; TLI = .89; RMSEA = .05), pathways from child neglect to the second-order factor ($\beta = .36$, $p < .001$) and from the second-order factor to illicit drug use ($\beta = .32$, $p < .01$) were strong and significant, and the direct path from child neglect to illicit drug use was non-significant ($\beta = .05$, $p > .10$). Similarly, in the sexual abuse model ($\chi^2 = 98.60$, $df = 45$, $p < .001$; CFI = .86; TLI = .85; RMSEA = .06), pathways were strong and significant from sexual abuse to the second-order factor ($\beta = .32$, $p < .001$) and from the second-order factor to illicit drug use ($\beta = .34$, $p < .01$), but the direct path from sexual abuse to illicit drug use ($\beta = .01$, $p > .10$) was non-significant. In the child physical abuse model ($\chi^2 = 97.03$, $df = 44$, $p < .001$; CFI = .86; TLI = .79; RMSEA = .07), the path from physical abuse to the second-order factor was significant

($\beta = .29$, $p < .01$), but the path from the second-order factor to illicit drug use was only marginally significant ($\beta = .31$, $p = .06$). The direct path from physical abuse to illicit drug use was non-significant ($\beta = -.03$, $p > .10$).

Men

Confirmatory Factor Analysis (CFA)

The four-factor measurement model provided an adequate fit to the data for men ($\chi^2 = 116.82$, $df = 34$, $p < .001$; CFI = .90; TLI = .90; RMSEA = .06), and all factor loadings were strong and significant (See Table 2). Child abuse and neglect was correlated with each of the mediators (See Table 3 below the line). However, child abuse and neglect was not correlated with illicit drug use among men. Illicit drug use was associated with crime and school problems, but its correlation with prostitution was only marginally significant, and it was not significantly associated with homelessness. Thus, requirements for mediation were not supported for men. Consistent with findings for

women, however, the mediators were all significantly correlated with each other (See Table 3 below the line). The full structural models were examined to compare with findings for women, despite failure to support the requirements for mediation for men.

The second-order measurement model also provided an adequate fit for men ($\chi^2 = 120.59$, $df = 39$, $p < .001$; CFI = .90; TLI = .91; RMSEA = .06). The factor loadings were strong and significant: prostitution .58 ($p < .001$); homelessness .55 ($p < .001$); crime .93 ($p < .001$); school .90 ($p < .001$). The second-order factor was significantly correlated with child abuse and neglect ($\beta = .36$, $p < .001$) and with illicit drug use among men ($\beta = .20$, $p < .01$), but child abuse and neglect was not associated with illicit drug use ($\beta = .04$, $p > .10$).

Four-Factor Structural Model

Since there was no direct relationship between child abuse and neglect and illicit drug use for men, even when race/ethnicity and early drug use were controlled ($\beta = .02$, $p > .10$), results of separate mediated path models for men are not reported (data are available from the first author upon request). The four-factor path model did not provide an adequate fit for men ($\chi^2 = 198.20$, $df = 45$, $p < .001$; CFI = .84; TLI = .79; RMSEA = .08) and only explained 7% of variance in men's illicit drug use in middle adulthood. Path estimates for men are shown below the lines in Fig. 2. Similar to the model for women, all paths from child abuse and neglect to the mediators were significant, but the paths from the mediators to illicit drug use were not. Multiple group analysis indicated that only the coefficient for the path from child abuse and neglect to school problems differed significantly for men and women ($\chi^2 = 4.01$, $df = 1$, $p < .05$).

The overall pattern of results was consistent for the four-factor child neglect model for men. However, childhood physical abuse was only associated with homelessness and school problems, and childhood sexual abuse was only associated with delinquency and crime and school problems. Specific results for the separate types of child abuse and neglect with the sample of men are available upon request from the first author.

Second-Order Structural Model

The second-order path model for men yielded low CFI and TLI and therefore did not provide an adequate fit ($\chi^2 = 204.25$, $df = 54$, $p < .001$; CFI = .84; TLI = .83; RMSEA = .07). The model only explained 7% of variance in men's illicit drug use (compared to 20% for women). The path coefficients in the full model are shown in Fig. 3b. Similar to the model for women, the path from

child abuse and neglect to the risk factor was statistically significant. However, the risk factor was not associated with illicit drug use for men. Neither direct ($\beta = .01$, $p > .10$) nor indirect ($\beta = .02$, $p > .10$) effects were significant for men. Removal of the direct path from child abuse and neglect to illicit drug use did not impact model fit ($\Delta\chi^2 = 1.08$, $\Delta df = 2$, $p > .10$). The final model for men explained 6% of the variance in illicit drug use, primarily accounted for by race/ethnicity and early drug use. In the final model, early drug use was the only significant predictor of men's illicit drug use in middle adulthood ($\beta = .21$, $p < .01$), an association that was less robust for women ($\beta = .12$, $p < .05$). Additional analyses indicate that men are also more likely to initiate early drug use ($\chi^2 = 36.69$, $p < .001$). Child abuse and neglect, however, is not associated with early drug use for either men ($\beta = .05$, $p > .10$) or women ($\beta = .002$, $p > .10$) in this sample. The coefficients for the primary (hypothesized) pathways in the model (Fig. 3a, b) were all smaller for men than for women; however, these differences were not statistically significant based on the results of multiple group analysis.

For men, the second-order models for child neglect and physical abuse were consistent with the overall model. For the child neglect model ($\chi^2 = 187.61$, $df = 53$, $p < .001$; CFI = .85; TLI = .84; RMSEA = .07), the only significant path was from neglect to the second-order factor ($\beta = .23$, $p < .001$). Paths to illicit drug use from the second-order factor ($\beta = .06$, $p > .10$) and from child neglect ($\beta = .01$, $p > .10$) were not significant for men. Similarly, in the child physical abuse model ($\chi^2 = 117.98$, $df = 47$, $p < .001$; CFI = .85; TLI = .83; RMSEA = .07), the path from physical abuse to the second-order factor ($\beta = .18$, $p < .05$) was significant, but paths from physical abuse ($\beta = .03$, $p > .10$) and from the second-order factor ($\beta = -.01$, $p > .10$) were non-significant. However, in the child sexual abuse model ($\chi^2 = 103.27$, $df = 44$, $p < .001$; CFI = .84; TLI = .82; RMSEA = .07), the paths from sexual abuse to the second-order factor ($\beta = .15$, $p > .10$), from the second-order factor to illicit drug use ($\beta = .02$, $p > .10$), and from sexual abuse to illicit drug use ($\beta = -.02$, $p > .10$) were all non-significant for men.

Discussion

Results of this study provide further understanding of the link between CAN and substance use later in life and suggest important gender differences in this relationship. Findings for women are particularly clear—a risk factor comprised of prostitution, homelessness, delinquency and criminal behavior, and school problems mediated the pathway from CAN to illicit drug use in middle adulthood.

These findings suggest that, for women, drug use occurs as part of a more generalized problem behavior syndrome that is an outcome of CAN and is evident by young adulthood. For men, however, child abuse and neglect did not predict illicit drug use. The problem behavior syndrome was also unrelated to drug use among men, though involvement in delinquency and crime and a history of school problems were associated with increased risk for illicit drug use when race/ethnicity and early drug use were not controlled. When other factors were controlled, early drug use was the only significant predictor of men's illicit drug use in middle adulthood. Thus, it appears that men start using drugs at earlier ages, continue later in life, and engage in higher rates, regardless of their child abuse or neglect history.

The finding that child abuse and neglect was related to illicit drug use in women but not men is consistent with other research with this sample (Widom et al. 2006), but results of this study also suggest that the pathway from young adulthood risk behavior to illicit drug use in middle adulthood exists only for women. Child abuse and neglect increased risk for the problem behaviors among both men and women, but the second part of the model leading from young adult risk to middle adult drug use only held up for women. Our findings do not provide an explanation for why these risk factors are more likely to lead to illicit drug use in women, but a "saturation effect" or "ceiling effect" appears to be occurring. Since men are generally at higher risk than women for illicit drug use, the added risk associated with these factors may be minimal (Widom et al. 2006). Although women have lower rates of drug use overall, child abuse and neglect appears to confer an increase in risk for women, a phenomenon that some have described as a "gender paradox." Helzer et al. (1990) suggested that risk factors for alcoholism play a greater role when social sanctions against alcohol are strong. This logic could be extended to our findings with illicit drug use since social sanctions against drug use may also be stronger for women than for men. While social norms may in general protect women from becoming involved in drug use, risk associated with child abuse and neglect and the young adult risk factors we assessed may override typical social sanctions. These findings suggest that women and men may benefit from different kinds of interventions to prevent or reduce substance use.

Of note, child abuse and neglect was not associated with drug problems, for either men or women, in this sample when they were assessed at age 29. High rates of substance use in the sample overall may have obscured differences between the abuse and neglect and control groups in young adulthood. However, women in particular with histories of child abuse and neglect appear to be less likely than their peers to mature out of substance use as they enter middle adulthood (Widom et al. 2006). For most of these women,

it appears that drug use began earlier in life and has persisted into middle adulthood, but for a small subset, it appears that drug use began after young adulthood. Further research might investigate the conditions under which these women initiate drug use in adulthood, which may differ from the factors leading to drug use earlier in life.

Findings from this study support the hypothesis that a single risk factor, or problem behavior syndrome, leads from CAN to illicit drug use among women. This study revealed significant overlap of the four risk factors examined—prostitution, homelessness, delinquency and crime, and school problems. Indeed, their effects cancelled each other out when they were considered as individual, competing pathways in the model. In contrast, when these risk factors were considered as part of a broader risk construct, they provided a clear linkage from child abuse and neglect to women's illicit drug use in middle adulthood. Our findings suggest that a "problem behavior syndrome" (Jessor and Jessor 1977), which has been used to describe the co-occurrence of risk-taking behaviors, such as delinquency, risky sex, and substance use, in adolescence and young adulthood (Donovan and Jessor 1985), may extend into middle adulthood. Further research is needed, however, to determine whether problem behaviors in young adulthood predict problem behaviors other than drug use in middle adulthood.

Our findings support multidimensional interventions that acknowledge and address the co-occurrence of risk factors that may lead from child abuse and neglect to substance abuse among women. Interventions that focus on an isolated problem or risk may fail to account for other co-existing problems contributing to an individual's substance use. Based on our findings, interventions to reduce substance use among women who are victims of child abuse and neglect should target multiple contexts by, for example, helping individuals to obtain high school degrees, acquire job skills and jobs, and secure housing. This approach would simultaneously address multiple factors that may lead to drug use as a way of coping with, or maintaining, a risky lifestyle characterized by experiences of homelessness, compromised education, and involvement in activities such as crime and prostitution. In addition, early interventions that target problem behaviors broadly are needed to prevent these problems from developing among abused and neglected girls.

Despite the strengths of this study, several important limitations should be noted. First, although use of documented cases of CAN is an advantage, these cases most likely represent the most extreme and do not capture cases of abuse and neglect that did not come to the attention of authorities. Second, cases of abuse and neglect occurred in the late 1960s and early 1970s in the Midwest part of the United States, and therefore our results may not generalize

to all cases of abuse and neglect. Third, our sample is skewed toward the lower end of the socioeconomic spectrum, and therefore findings cannot be generalized to middle class samples. Fourth, although participants were matched to controls on several demographic characteristics, we did not control for all factors that may have influenced the effects of childhood victimization on later substance use.

Results from this study increase understanding of how child abuse and neglect lead to a pattern of deviant behavior that persists over the life course. Our findings suggest that one important developmental pathway to substance use in adulthood among victims of child abuse and neglect, girls in particular, is through a “problem behavior syndrome” evident earlier in life. This pattern of problem behavior appears to continue into middle adulthood as evidenced by illicit drug use at a life stage when the majority of people mature out of engaging in such behaviors. Although perhaps not surprising, these new findings reveal that a trajectory of problem behaviors evident by young adulthood among women with histories of child abuse and neglect continues to predict at least one form of deviant behavior—illicit drug use—later in life.

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