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The Long-term Effects of Childhood Maltreatment Experiences on Subsequent Illicit Drug Use and Drug-related Problems in Young Adulthood

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Abstract

OBJECTIVES—The objective of this study was to examine the associations between (a) childhood maltreatment (i.e., physical abuse, sexual abuse, and neglect) and subsequent illicit drug use and (b) childhood maltreatment and drug-related problems in young adulthood.

METHODS—Wave 1 and Wave 3 public-use data from the National Longitudinal Study of Adolescent Health were used. Logistic regressions, controlling for adolescent drug use and other important family and peer contextual processes, were estimated to determine the associations between (a) childhood maltreatment experiences and subsequent illicit drug use and (b) childhood maltreatment and drug-related problems in young adulthood.

RESULTS—Among the participants, 31.9% reported some form of childhood maltreatment. Childhood physical abuse was associated with a 37% (OR=1.37; 95% CI=1.04, 1.80) increase in illicit drug use during the 30 days prior to the Wave 3 survey, a 48% (OR=1.48; 95% CI=1.16, 1.89) increase in illicit drug use during the year prior to the Wave 3 survey, and a 96% (OR=1.96; 95% CI=1.40, 2.76) increase in drug-related problems in young adulthood. The latter two associations persisted even after controlling for illicit drug use in adolescence. Neglect among females was associated with a higher likelihood of past year illicit drug use in young adulthood

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Contributors Dr. Shi Huang conceived the study, completed the analyses and led the writing.

Drs. Guillermo Prado, Lora Fleming, Lee Crandall, Michael French, Edward Trapido conceived and supervised the study. Dr. Kristopher Arheart assisted with the data analyses. Shandey Malcolm contributed to manuscript revision. All authors contributed to and have approved the final manuscript.

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(OR=1.31; 95% CI=1.002, 1.71). However, this association was not significant once the effect of illicit drug use in adolescence was statistically controlled for.

CONCLUSIONS—The present findings suggest that childhood maltreatment is related to subsequent illicit drug use and drug-related problems in young adulthood and that some of these associations differ by gender. Implications for preventive intervention are discussed.

Keywords

illicit drug use; drug-related problems; young adulthood; childhood maltreatment; Add Health Study

1. Introduction

Young adulthood (i.e., ages 18–25) is considered a period during which people are prone to engage in various risky behaviors, including the use of illicit drugs (Arnett, 2000). According to the 2008 National Survey on Drug Use and Health (Substance Abuse and Mental Health Services Administration---SAMHSA, 2009), the 18–20 and 21–25 age groups have the highest prevalence rate of current illicit drug use (21.5% and 18.4%, respectively). Childhood maltreatment (i.e., sexual abuse, physical abuse, and neglect that occurs under the age of 18) has been reported to be a significant risk factor for subsequent illicit drug use and drug-related problems in adulthood. The association between childhood maltreatment experiences and adult illicit drug use has been found in a wide range of settings and in different race/ethnic and socio-economic populations, including women recruited from STD clinics (NIMH Multisite HIV Prevention Trial Group, 2001), African-American and Hispanic males at risk for HIV infection (Dilorio et al., 2002), college women (Johnsen & Harlow, 1996) and women recruited from outpatient family practice clinics (Springs & Friedrich, 1992). A review by Polusny & Follette (1995) also noted that in clinical samples, 21% to 57% of sexual abused females had drug-related problems compared to only 2% to 27% of their non-abused counterparts. Several population-based retrospective studies have been conducted to examine the association of childhood maltreatment to subsequent adult illicit drug use and drug-related problems. For example, a study by Thompson and colleagues analyzing data from the National Violence against Women Survey, found that physical abuse in childhood was significantly related to current illicit drug use in adulthood (Thompson et al., 2004). Similarly, studies have found that childhood sexual abuse was an important risk factor contributing to illicit drug use and drug abuse/dependency in adulthood (Wilsnack et al., 1997; Burnam et al., 1988). A dose-response relationship of adverse childhood experiences on illicit drug use and having drug problem in adulthood has also been found in previous studies (Dube et al., 2003; Felitti et al., 1998).

In addition to cross-sectional and retrospective studies, there have been at least two prospective studies that have examined the association of childhood maltreatment experiences to subsequent illicit drug use and substance-use-related problems. In a prospective cohort study of a representative community sample of young adults, Silverman and colleagues found that among men who reported physical abuse before age 18, 40% developed drug abuse/dependence at age 21 compared to only 8% of their non-abused counterparts (Silverman et al., 1996). In contrast, a study by Widom and colleagues found that childhood physical abuse, sexual abuse and neglect did not increase the likelihood of drug abuse/dependence in adulthood (mean age=29 years) for both males and females (Widom et al., 1999). However, by following up this cohort to middle adulthood (mean age =40 years), they found that child abuse/neglect was related to past year illicit drug use and the mean number of substance-use-related problems for females, but not for males (Widom et al., 2006).

Although previous studies have provided evidence suggesting that a history of childhood maltreatment is associated with illicit drug use in adulthood, a number of limitations in these previous studies exist. One of these limitations is the lack of comprehensive measurements of other childhood adverse exposures such as family background, family dysfunction and peer context. Researchers suggest that these are important constructs because childhood maltreatment might be only one of many adverse childhood experiences that contributes to illicit drug use in adulthood (Felitti et al., 1998; Fergusson et al., 1996; Fromuth, 1986; Green, 1993; Langeland & Hartgers, 1998; Mullen et al., 1996; Nash et al., 1993; Stern et al., 1995; O'leary et al., 1995). In addition to childhood maltreatment, exposure to household substance use, mental illness in the household, and the violent treatment of the mother have been shown to be independently related to lifetime illicit drug use (Dube et al., 2003; Felitti et al., 1998). Studies examining the relationship between childhood maltreatment and subsequent drug use should account for the potential confounding effect of other adverse exposures. Another limitation of previous studies is that they have focused almost exclusively on female samples. To date, only a few studies have involved males or have examined potential gender differences in the association of childhood maltreatment to subsequent illicit drug use and drug-related problems. The current study addresses both of these gaps in the literature.

The overall objective of the present study is to examine the long-term effects of childhood maltreatment experiences on subsequent illicit drug use and drug-related problems in young adulthood. The present study addresses several of the limitations of previous research on this topic by using a nationally representative sample of both males and females, controlling for prospectively-measured family and peer contexts to ensure the validity of the present study. Additionally, since associations were found between (a) childhood maltreatment and adolescent illicit drug use (Hussey et al., 2006) as well as between (b) adolescent illicit drug use and adulthood illicit drug use and drug-related problems in past research, we hypothesized that adolescent illicit drug use may mediate the effects of childhood maltreatment on adulthood illicit drug use and drug-related problems.

2. Methods

2.1. The Add Health Study design overview

The National Longitudinal Study of Adolescent Health (Add Health) is a school-based prospective cohort study which has followed a nationally representative probability-based sample of U.S. students in grades 7 through 12 from early adolescence to adulthood (Udry, 2003). The primary purpose of the Add Health study is to examine the causes of health-related behaviors of adolescents and their effects in adulthood. To date, there have been four waves of follow-up surveys. The present study used the Wave 1 and 3 data. Wave 1 (Baseline) was conducted in April to December 1995 when the participants were in grades 7 through 12, while Wave 3 was conducted from August 2001 to April 2002 when the Add Health respondents were 18 to 26 years old. The response rates for the Wave 1 and Wave 3 survey were 78.9% and 77.4%, respectively. The Add Health study design has been described in detail elsewhere (Harris et al., 2003; Resnick et al., 1997). More Add Health procedure details can also be found at <http://www.cpc.unc.edu/projects/addhealth/design>.

2.2. Participants

The present study used the public-use dataset of the Add Health study (Harris, et al., 1994–2002), which consisted of a randomly selected one-half of the core sample and one-half of the oversample of African-American adolescents from well-educated families. The total number of respondents in this dataset was 6,504 at the Wave 1 survey. Of these 6,504 participants, 75.1% (n = 4,882) were re-interviewed in the Wave 3 survey.

Among the participants who completed the Wave 3 survey, 50.7% were male whereas 49.3% were females. The participant's mean age was 21.8 years (S.E. = 0.12 years). The sample consisted predominantly of non-Hispanic Whites (68.3%), African Americans (15.8%), and Hispanics (11.2%).

2.3. Measures

Dependent variables: Illicit drug use in young adulthood (in the Wave 3 survey) was defined as using any illicit drugs (including marijuana, cocaine, crystal methamphetamines, and others, such as LSD, PCP, ecstasy, mushrooms, inhalants, “ice”, heroin, and any illegal injection drug) during the year and the 30 days prior to Wave 3 survey (yes/no).

Drug-related problems in young adulthood (in the Wave 3 survey) was defined as experiencing at least one of six problems related to drug use in the past year, including having problems at school or work, having problems with friends, having problems with someone the participant was dating, getting into a sexual situation that was later regretted, getting into a physical fight, or getting high on drugs at school or work.

Potential mediator: Illicit drug use in adolescence (in the Wave 1 survey) was measured by items that asked how many times adolescents had used marijuana, cocaine, inhalants and any other type of illegal drug (such as LSD, PCP, ecstasy, mushrooms, “speed”, “ice”, heroin, or pills without a doctor's prescription) in their lifetime. Three categories were created: nonusers, experimental users (used 1–10 times), and regular users (used >10 times) (Van den Bree & Pickworth, 2005).

Independent variables: Childhood Maltreatment was measured retrospectively during the Wave 3 survey. Physical abuse was measured by one item: “How often had your parents or other adult care-givers slapped, hit, or kicked you by the time you started 6th grade?”, which was rated on a six-point Likert scale ranging from 0 (never happened) to 5 (more than ten times). A response of 3 times or more was defined as physical abuse, which is consistent with the definition of physical abuse measured by the Conflict Tactics Scale (CTS) (Dube et al., 2003).

Sexual abuse was measured by one item: “How often had one of your parents or other adult care-givers touched you in a sexual way, forced you to touch him or her in a sexual way, or forced you to have sexual relations by the time you started 6th grade?”, which was rated on a six-point Likert scale ranging from 0 (never happened) to 5 (more than ten times). A response of 1 time or more was defined as sexual abuse.

Neglect was measured by two items: 1) “How often had your parents or other adult care-givers not taken care of your basic needs, such as keeping you clean or providing food or clothing by the time you started 6th grade?” (physical neglect) and 2) “How often had your parents or other adult care-givers left you home alone when an adult should have been with you by the time you started 6th grade” (supervisory neglect). Both items were rated on a six-point Likert scale ranging from 0 (never happened) to 5 (more than ten times). Because childhood neglect involves inadequate caretaking and inadequate supervision by a parent(s) or caregiver(s), a positive response to either item (3 times or more) was defined as neglect, which is consistent with the definition of neglect measured by the Childhood Trauma Questionnaire (CTQ) (Dube et al., 2003).

Drug accessibility in the household was measured by one item. Subjects were asked whether illegal drugs were easily available in their home (yes/no).

Family suicide attempts (i.e., did any family member try to kill him/herself during the past 12 months) was used as a proxy indicator for mental illness in the household (Dube et al., 2003).

Peer drug use was measured by one item. Participants were asked whether they believed any of their three best friends used marijuana at least once a month (Any/None).

Other demographic characteristics were also included in the present study. These included family structure at the time of the Wave 1 survey, which was coded as adolescent living in a 2-parent home (biological or non-biological) vs. any other structure; family socioeconomic status at the time of the Wave 1 survey, which was coded as low if participant's family ever received public assistance or welfare payments, whereas those whose family didn't receive public assistance or welfare payments was coded as middle/high family socioeconomic status; participant's marital status at the time of the Wave 3 survey (married/not married); participant's employment status at the time of the Wave 3 survey (employed/not employed); and religious importance at the time of the Wave 3 survey (not important/important/very important).

2.4. Statistical analysis

The prevalence of each childhood maltreatment (i.e., sexual abuse, physical abuse, and neglect), illicit drug use and drug-related problems in young adulthood were calculated and compared between males and females.

The test of the association of childhood maltreatment to illicit drug use and drug-related problems in young adulthood proceeded in four steps. First, chi-square tests were conducted to compare the percentages of illicit drug use and drug-related problems in young adulthood between childhood maltreatment victims and non-victims. The crude odds ratio (cOR) was calculated to evaluate the bivariate relationship between childhood maltreatment and illicit drug use as well as between childhood maltreatment and drug-related problems in young adulthood.

Second, multivariate logistic regression was performed to examine the independent effects of the childhood maltreatment experiences on illicit drug use and drug-related problems. To examine the independent effect of the three different types of maltreatment, all three maltreatment variables (physical abuse, sexual abuse, neglect) were entered simultaneously along with other covariates. We had planned to examine the impact of having experienced the multiple types of maltreatment (i.e., cumulative effect) on later illicit drug use behaviors, however, the small number of cases reporting multiple forms of maltreatment prevented the inclusion of various combinations of maltreatment as separate groups in analyses. Only 1.1% (n = 46) of the subjects reported the 3 types of maltreatment, 0.3% (n = 18) reported sexual abuse and physical abuse only and 0.7% (n = 28) reported neglect and sexual abuse only (Table 2).

Consistent with prior research that has addressed the influence of important family and peer contexts on adolescent and adult risk-taking behaviors (Dube et al., 2003; Resnick et al., 1997), the effects of key confounding family context variables (i.e., drug accessibility in the household, family member suicide, family structure, family socioeconomic status), peer drug use, age, gender, race/ethnicity, current employment status, current marital status and religiosity were included in multivariate logistic regressions to control for their potential effects. These confounders were forced into the regression equation, and retained without regard to their statistical significance (Rothman & Greenland, 1998; McNamee, 2005).

Significance for the multivariate models was defined by a $p < 0.05$. Collinearity diagnostics (i.e., bivariate correlations, Variance Inflation Factor (VIF), condition indices, and variance proportions) suggested the absence of collinearity in the multivariate regression analysis.

Third, to test the mediation effect of illicit drug use in adolescence, we followed the steps described in Baron and Kenny (1986). We first examined if maltreatment variables were related to the potential mediator (i.e., illicit drug use in adolescence). Then we examined if the potential mediator (i.e., illicit drug use in adolescence) was related to the outcome variables (i.e., illicit drug use and drug related problems in young adulthood). Third, a logistic regression controlling for illicit drug use in adolescence was then estimated and mediation was assumed if the relationships between maltreatment variables and the outcome variable were reduced to nonsignificance. Additionally, we conducted a more conservative test of mediation by performing a single test of the product of two paths as proposed by Sobel (1982). Specifically, we used MacKinnon's (2008) asymmetric distribution of products test in a structural equation modeling framework using Mplus (version 5.21), which creates asymmetric confidence intervals for the mediated effect. If the confidence interval for this product does not include zero, then mediation is assumed.

Finally, we performed analyses to determine whether the effects of maltreatment differed by gender. We first tested statistical significance of three interaction terms between the predictor (i.e., physical abuse, neglect and sexual abuse) and the hypothesized moderator (i.e., gender) in the logistic regression model with the main effects of childhood maltreatment, gender and other covariates. Second, separate analyses by gender were then performed if a significant interaction was found.

All the analyses were performed using STATA (version 9) and Mplus (version 5.21) with adjustment for complex survey design effects.

3. Results

3.1. Attrition

About 25% (1,622/6,504) of the Wave 1 participants were not re-interviewed during the Wave 3 survey in 2001–2002. A comparison of the loss-to-follow-up sample with the followed-up sample indicated that there were no significant differences in terms of age (16.2 vs. 15.9), percentage of lifetime (31.6% vs. 28.6%) or past 30-day (16.9% vs. 14.4%) illicit drug use in adolescence. However, compared to the followed-up sample, the lost-to-follow-up sample had a higher percentage of males (58.0% vs. 48.4%), was less likely to be White (62.6% vs. 68.8%), was more likely to be from a single parent family (40.3% vs. 29.3%), and was more likely to have a low SES (13.7% vs. 9.5%).

3.2. Prevalence of childhood maltreatment, illicit drug use and drug-related problems in young adulthood

As seen in Table 1, childhood physical abuse occurring in isolation or with other types of maltreatment was reported by 14.3% (95% CI=13.1%, 15.7%) of the respondents. Sexual abuse, in isolation or combination, was reported by 4.3% (95% CI=3.7%, 5.7%) of the respondents, and 20.7% (95% CI=19.3%, 22.2%) of participants reported that they were neglected either alone or in combination with the other two types of maltreatment by parents or other adult care-givers before the 6th grade. Overall, 31.9% (95% CI=30.2%, 33.7%) of the respondents reported being exposed to at least one type of childhood maltreatment. No significant differences in the prevalence of each type of maltreatment emerged between males and females. More details regarding the prevalence of childhood maltreatment are presented in Table 2.

Overall, 34.6% (95% CI=32.4%, 36.9%) and 24.0% (95% CI=22.2%, 26.0%) of the respondents reported past year and past 30-day illicit drug use, respectively. Eleven percent (95% CI=9.7%, 12.4%) of the respondents reported drug-related problems during the year prior to the Wave 3 survey. Males had significant higher illicit drug use rate and drug-related problems than females.

3.3. Association of maltreatment to adulthood illicit drug use and drug-related problems in bivariate analysis

The bivariate analysis (Table 3) indicated that participants who experienced physical abuse in childhood were significantly more likely than their non-abused counterparts to use illicit drugs six years later (OR=1.56, 95% CI=1.26, 1.93; OR=1.44, 95% CI=1.15, 1.80, for past year and past 30-day drug use, respectively). We also observed that a history of physical abuse during the childhood was significantly related to drug-related problems (OR=2.08; 95% CI=1.56, 2.77). Similarly, neglect was also significantly related to illicit drug use and drug-related problems (OR=1.21, 95% CI=1.02, 1.44; OR=1.26, 95% CI=1.06, 1.50; OR=1.57, 95% CI=1.20, 2.05, for past year, past 30-day drug use and drug-related problems, respectively). Sexual abuse was significantly associated with drug-related problems but not associated with illicit drug use in young adulthood (OR=1.78, 95% CI=1.09, 2.90; OR=1.01, 95% CI=0.67, 1.50; OR=1.24, 95% CI=0.81, 1.90, for drug-related problems, past year and past 30-day drug use, respectively).

3.4. Association of maltreatment to adulthood illicit drug use and drug-related problems in multivariate regression analyses

As seen in Table 4, after controlling for other family, peer contexts and demographic characteristics, respondents with a childhood physical abuse history were more likely to use illicit drugs during the past year (OR=1.48; 95% CI=1.16, 1.89) and during the past 30 days (OR=1.37; 95% CI=1.04, 1.80) at young adulthood than their non-abused counterparts. Childhood physical abuse history was also significantly related to drug-related problems in young adulthood (OR=1.96; 95% CI=1.40, 2.76). Neither childhood neglect nor sexual abuse was significantly associated with illicit drug use and drug-related problems in young adulthood.

3.5. Mediation effects of baseline adolescent illicit drug

We followed the steps described in Baron and Kenny (1986) to test for mediation. First, multinomial logistic regression results suggested that childhood physical abuse was significantly related to illicit drug use in adolescence. Compared to their non-abused counterparts, physical abuse victims had a higher risk of engaging in experimental illicit drug use (relative risk=1.65, $p<0.05$) and regular illicit drug use (relative risk=1.76, $p<0.05$) in adolescence. Second, a strong association was found between the outcomes (i.e., young adulthood illicit drug use during the past year, illicit drug use during the past 30 days, and drug-related problems) and both adolescent experimental illicit drug use (OR=2.37, 2.16, and 1.72, respectively; all $ps<0.001$) and adolescent regular illicit drug use (OR=3.70, 3.63 and 3.54, respectively; all $ps<0.001$). Given these findings, adolescent illicit drug use was then added into the previous regression models to assess its mediation effect in the present study. As seen in Table 4, after adjusting for adolescent illicit drug use, the odds ratio for physical abuse remained significant for illicit drug use in the past year (OR=1.40; 95% CI=1.10, 1.78) and drug-related problems (OR=1.87; 95% CI=1.33, 2.63), suggesting a direct effect of physical abuse on illicit drug use in the past year and drug-related problems in young adulthood. We also used MacKinnon's (2008) asymmetric distribution of products test in a structural equation modeling framework. Both the direct effect ($\beta=0.169$, 95% CI=0.029–0.310; $\beta=0.302$, 95% CI=0.123–0.482, for illicit drug use in the past year and drug-related problems, respectively) and the indirect effect ($\beta=0.069$, 95% CI=0.020–0.119;

$\beta=0.060$, 95% CI=0.017–0.104, for illicit drug use in the past year and drug-related problems, respectively) of physical abuse were significant. The results suggested that illicit drug use in adolescence partially mediated the effect of physical abuse on illicit drug use in the past year and drug-related problems. In contrast, for illicit drug use in the past 30 days, the odds ratio of physical abuse became non-significant. Only the indirect effect ($\beta=0.064$; 95% CI=0.019–0.109) of physical abuse was significant. The direct effect, however, was not significant ($\beta=0.115$; 95% CI=–0.046–0.276). This suggests that the effects of childhood physical abuse on subsequent adult illicit drug use in the past 30 days operated indirectly through its effect on adolescent illicit drug use.

3.6. Interaction effects and separate gender analyses

To determine whether the effects of maltreatment differed by gender, three interaction terms between the predictor variables (i.e., physical abuse, neglect and sexual abuse) and the hypothesized moderator (e.g., gender) were entered into logistic regression models in addition to the main effects of maltreatment, gender and the covariates. We found a significant interaction between neglect and gender ($t=2.21$, $p=0.029$) with illicit drug use during the past year as the outcome, which indicated that the effect of neglect on illicit drug use during the past year differed for males and females. Therefore, we estimated separate models by gender. As seen in Table 5, female respondents with a childhood neglect history were 31% more likely to use illicit drugs in the past year at young adulthood than their non-abused counterparts (OR=1.31; 95% CI=1.002, 1.71). In contrast, this relationship was not significant for males. After adjusting for adolescent illicit drug use, the odds ratio for neglect became non-significant for females. Only the indirect effect ($\beta=0.078$; 95% CI=0.021–0.134) of neglect was significant. The direct effect, however, was not significant ($\beta=0.090$; 95% CI=–0.061–0.214). This suggests that the effects of childhood neglect on past year illicit drug use operated indirectly through its effect on adolescent illicit drug use. Neither the interaction between physical abuse and gender ($t=-1.26$, $p=0.208$) nor the interaction between sexual abuse and gender ($t=0.81$, $p=0.420$) was significant. Similarly, there were no significant interactions between maltreatment (e.g., physical abuse, neglect and sexual abuse) and gender with illicit drug use during the past 30 days and drug-related problems as the outcome. Therefore, separated analyses by gender were not conducted for these outcomes.

4. Discussion

Using nationally representative data, our analyses illustrated that childhood maltreatment is not uncommon in the United States: 31.9% of respondents reported some instance of physical abuse, sexual abuse, or neglect. The most prevalent maltreatment and the least prevalent maltreatment were neglect and sexual abuse, respectively. The prevalence of physical abuse in the Add Health sample (14.3%) was similar to several previous estimates (Bensley et al., 2000; Diaz et al., 2002; Goodwin et al., 2003; Goodwin & Stein, 2004), in which the prevalence of physical abuse ranged from 10.6% to 15.8%. The Add Health estimate of sexual abuse (4.3%) was also comparable to the results of a study by Finkelhor and Dzubia-Leatherman (1994) which showed that 3.3% of a nationally representative sample (two thousand children aged 10 – 16 years) reported contact sexual abuse by a family member. There have been relatively few studies that have examined the prevalence of child neglect using a nationally representative sample. The Add Health estimate of childhood neglect (20.7%) was much higher than that of other studies (e.g., 2.89% in Goodwin & Stein, 2004). The discrepancy may have resulted from the fact that other studies such as Goodwin & Stein's study (2004) measured a relatively severe form of neglect (i.e., “seriously neglected”) while the Add Health neglect measure was more inclusive (e.g., supervisory neglect, physical neglect). In fact, among those experiencing neglect ($n=938$),

77% reported supervisory neglect only, 12% reported physical neglect only, and 11% reported both. Hence, our findings regarding neglect may actually reflect the fact that neglect was measured predominantly by supervisory neglect. Moreover, it is important to note that the measure of supervisory neglect is similar to the construct of parental monitoring used in other studies (DeVore & Ginsberg, 2005; Fisher et al., 2003).

Our results demonstrated that physical abuse was related to illicit drug use and drug-related problems in young adulthood. Compared to those not abused, participants with a physical abuse history in childhood were 37% more likely to use illicit drugs in the past 30 days. This finding is consistent with the results in a recent retrospective study by Thompson and colleagues using data from National Violence against Women Survey. They found that physical abuse in childhood was significantly related to past month illicit drug use in adulthood and reported no significant childhood physical abuse by gender interaction (Thompson et al., 2004). Although the results from a longitudinal community study by Silverman and colleagues suggested physical abuse was related to drug abuse/dependence at age 21 for men, but not for women (Silverman et al., 1996), it should be noted that in our study there was no significant physical abuse by gender interaction therefore results by gender were not reported.

Although previous studies have found that childhood sexual abuse is associated with lifetime illicit drug use and drug abuse/dependence (Wilsnack et al., 1997; Burnam et al., 1988), we did not observe a relationship between childhood sexual abuse and illicit drug use and drug-related problems in young adulthood. This finding was consistent with some previous prospective and community-based studies. For example, the prospective findings of a study by Widom and colleagues (1999) suggested that sexual abuse was not related to current drug abuse/dependence. The results from a longitudinal community study by Silverman and colleagues (1996) also indicated that, among women, sexual abuse was not associated with drug abuse-dependence at age 21.

There have been relatively few studies that have examined the relationship of childhood neglect and illicit drug use in young adulthood. In our study, child neglect was indirectly related to adulthood illicit drug use for females, but not for males. This result is in agreement with the findings from two studies by Widom and colleagues (Widom & White, 1997; Widom et al., 2006), which showed that for females, but not for males, child abuse/neglect was related to substance abuse/dependence and illicit drug use. Similarly, the Adverse Childhood Experiences study also showed that neglect (emotional and physical neglect) was independently related to lifetime use of illicit drugs (Dube et al., 2003). However, a study by Kang and colleagues reported that neglect was not related to drug-related HIV risk behaviors, including heroin use and injection drug use (Kang et al., 2002). Comparisons of findings among these studies can be challenging due to different definitions used for neglect and illicit drug use outcomes.

The link between childhood maltreatment and subsequent illicit drug use in young adulthood and why the relationships differ by gender are still poorly understood. Risky behaviors, including substance use may serve as a coping mechanism or a self-medication strategy by which victims deal with the feelings of pain, anxiety, anger, depression and low self-esteem associated with childhood maltreatment and these risky behaviors can be used chronically if found beneficial (Felitti et al., 1998; Lebling 1986; Triffleman et al., 1995; Miller et al., 1987). There is evidence that females are more vulnerable to childhood maltreatment, and therefore exhibit a higher frequency of maladaptive coping strategies. Our finding about the effect of neglect is consistent in this regard where females who experience childhood neglect are more likely to engage in illicit drug use during the past year prior the Wave 3 survey. However, our study presents an even more complicated scenario whereby males and females

respond similarly to physical abuse. Previous research also show that female victims are more inclined to experience internalizing symptoms as a response to childhood maltreatment (e.g., depression, alcohol and drug abuse) whereas males victims are more inclined to experience externalizing symptoms (e.g., aggressive behaviors, violence, antisocial personality disorder) (Horwitz et al., 1996; Luntz & Widom, 1994; Chandy et al., 1999). Our finding regarding the effect of neglect is also in agreement with the hypothesis that females who experience childhood neglect are more likely to engage in illicit drug use during the past year prior the Wave 3 survey. A previous study hypothesized that gender differences in the prevalence of adverse childhood experiences, other than maltreatment, may cause the effects of maltreatment to differ by gender (MacMillan et al., 2001). In our study, however, important family and peer contextual variables were statistically controlled for both males and females in the analyses, thus our findings cannot be interpreted by differences in other adverse childhood experiences. Research also suggests that the difference in the severity of maltreatment between males and females may contribute to the differences of childhood maltreatment effects (Cutler & Nolen-Hoeksema, 1991). In our study, there were no significant differences by gender in the percentage of participants reporting physical abuse and neglect items that happened either 5 to 10 times or more than 10 times between male and female victims. Thus, it is unlikely that the observed differences in the effects of neglect on illicit drug use were due to difference in the severity of maltreatment between males and females. However, without a more detailed quantitatively-measured maltreatment severity history, this hypothesis could not be tested. In summary, these inconsistent findings underscore the need for further research to determine the ways in which males and females differ in the consequences of childhood maltreatment.

Our study attempted to address the mechanisms that might mediate the relationship between childhood maltreatment and subsequent illicit drug use in young adulthood. In our study, illicit drug use in adolescence partially mediated the effects of childhood physical abuse on past year illicit drug use and drug-related problems, and fully mediated the effect of childhood neglect on past year illicit drug use for females. Although our study did not examine specifically which contextual or individual factors mediated the relationship between childhood maltreatment and illicit drug use in young adulthood, our results reinforced the importance of early illicit drug use intervention in adolescence, which can interrupt a critical point in the developmental path of illicit drug use in young adulthood.

Our study is among only a few studies at the national level that have examined the relationship of childhood maltreatment to subsequent illicit drug use and drug-related problems in adulthood. The present study has several strengths and addresses some of the gaps in previous studies. First, we employed a large nationally representative sample of young adults. Second, the inclusion of a large sample of men and women allowed us to investigate whether the association between maltreatment in childhood and illicit drug use and drug related problems in adulthood varied by gender. Third, in addition to childhood maltreatment experiences, other (prospectively) measured family and peer contexts were statistically adjusted in our study to control for these potential sources of confounding.

Limitations

This study has several limitations. First, although the Add Health survey prospectively collected data on family and peer contexts during childhood, the measures of childhood maltreatment relied on retrospective recall in the subsequent Wave 3 survey. However, several concerns accompany the prospective collection of childhood maltreatment. First, it may seem offensive to collect information of this sort from parents or care-givers and second, the discovery of child abuse during data collection typically signals a concerted effort to protect the child, which, in turn, will contaminate the effects of the maltreatment being studied (Fergusson et al., 1996). The Add Health study prospectively collected details

on family and peer contexts during the Wave 1 survey, and retrospectively collected childhood maltreatment history when the participants reached young adulthood. This method is consistent with the one used in Fergusson's study (Fergusson et al., 1996). Nevertheless, responses may have been subjected to recall bias. Recall bias may have been alleviated somewhat by use of an audio-CASI technique for collecting answers to sensitive questions concerning maltreatment experiences in the Add Health survey (Turner et al., 1998). Furthermore, studies have shown that childhood maltreatment experiences are generally underreported (Williams, 1995). This random misclassification would have probably biased our results toward the null. Thus our estimates of the association between childhood maltreatment experiences and adult illicit drug use were probably underestimated. Second, to our knowledge, there is no consensus on measures of childhood maltreatment, and the measures used in the Add Health study may not be comparable to the ones used in other studies. The childhood maltreatment measures used in the Add Health study also have some limitations. For example, the two items assessing neglect were based on respondent's personal opinion or perception and not on observation. The item on physical abuse bundled "slap, hit, and kick" into one question. This can be problematic as it encompasses a wide range of severity of behaviors from physical discipline to life-threatening assaults and, therefore, may mask significant differences between these subgroups. Also, childhood physical abuse and sexual abuse in Add Health study were measured by a single items and thus the reliability and validity of these constructs may be significantly limited. Another limitation of this study is that it only examined the long-term effects of childhood maltreatment that were committed by parents or primary caretakers. Maltreatment by nonfamily members was not collected as part of the Add Health study, and consequently was not evaluated in this study. Finally, the Add Health Wave 3 survey did not measure drug abuse/dependence based on the 4th edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV). Thus, we did not investigate the relationship between childhood maltreatment experiences and drug abuse/dependence in young adulthood.

Conclusions

We found direct effects of physical abuse on subsequent illicit drug use and drug-related problems in young adults even when a host of contextual factors and adolescent drug use were controlled for. Our study also found that neglect was indirectly associated with a higher likelihood of illicit drug use for females. Our findings indicate the importance of considering childhood maltreatment when developing drug abuse preventive interventions for adolescents.

Research highlights

- Childhood physical abuse was associated with a higher likelihood of past 30-day illicit drug use, past year illicit drug use and drug-related problems in young adulthood.
- Childhood neglect was associated with a higher likelihood of past year illicit drug use in young adulthood for females.
- Illicit drug use in adolescence mediated the effects of childhood physical abuse and neglect on illicit drug use and drug-related problems in young adulthood.

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Table 1

Characteristics of participants of the Wave 3 survey.

	Male (N=2253, 50.7% ^a)	Female (N=2629, 49.3% ^a)	Total (N=4882)
	N (%) ^a	N (%) ^a	N (%) ^a
Age ^b (Mean, SE)	21.9 (0.12)	21.7 (0.12)	21.8 (0.12)
Race/ethnicity			
White	1365 (67.9)	1579 (68.7)	2944 (68.3)
Black	504 (15.5)	649 (16.1)	1151 (15.8)
Hispanic	249 (11.6)	265 (10.8)	514 (11.2)
Other	131 (5.1)	130 (4.4)	261 (4.7)
Participant's marital status			
Not married	1972 (87.3)	2107 (79.0)	4079 (83.2)
Married	280(12.7)	522 (21.0)	802 (16.8)
Participant's employment status			
Unemployed	644 (28.2)	896 (33.0)	1540 (30.6)
Employed	1609 (71.8)	1733 (67.0)	3342 (69.4)
Physical abuse ^c	319 (15.2)	335 (13.4)	654 (14.3)
Sexual abuse ^c	89 (4.4)	111 (4.3)	200 (4.3)
Neglect ^c	439 (21.3)	499 (20.2)	938 (20.7)
Wave 3 past year any illicit drug use *	887 (40.1)	740 (29.1)	1627 (34.6)
Wave 3 past year marijuana use *	848 (38.5)	708 (27.8)	1556 (33.2)
Wave 3 past year cocaine use *	190 (9.0)	109 (4.4)	299 (6.7)
Wave 3 past year crystal methamphetamines use *	76 (3.6)	44 (1.7)	120 (2.7)
Wave 3 past year used other illicit drugs (LSD, PCP, ecstasy, mushrooms, inhalants, "ice", heroin) *	260 (12.4)	181 (7.0)	441 (9.7)
Wave 3 past year used any illegal injection drug	12 (0.4)	10 (0.5)	22 (0.5)
Wave 3 past 30-day any illicit drug use *	631 (29.0)	472 (18.9)	1103 (24.0)
Wave 3 past 30-day marijuana use *	608 (28.1)	454 (18.2)	1062 (23.2)
Wave 3 past 30-day cocaine use *	92 (4.3)	51 (2.0)	143 (3.2)
Wave 3 past 30-day crystal methamphetamines use *	43 (2.0)	23 (0.8)	66 (1.4)
Wave 3 past 30-day used other illicit drugs (LSD, PCP, ecstasy, mushrooms, inhalants, "ice", heroin) *	121 (5.6)	86 (3.5)	207 (4.5)
Wave 3 past 30-day used any illegal injection drug *	9 (0.4)	3 (0.1)	12 (0.2)
Wave 3 past year drug-related problems *	334 (15.5)	170 (6.3)	504 (11.0)
Perceived peer drug use	715 (32.8)	809 (31.5)	1524 (32.2)
Wave 1 adolescent illicit drug use *			
0 times	1590 (70.0)	1943 (73.2)	3533 (71.6)
1~10 times	368 (16.9)	4359 (16.8)	803 (16.9)
>10 times	271 (13.1)	241 (10.0)	512 (11.5)

^aReflects the representative proportion in the target US population. Percentages may not total 100% because of rounding.

^b Mean and standard error (SE) were presented because age is continuous.

^c Occurred in isolation or with other types of maltreatment.

* Significant differences in the prevalence of illicit drug use between boys and girls.

Table 2

Maltreatment prevalence by gender.

Maltreatment variables	Male		Female		Total	
	No. of victims	Weighted % ^a	No. of victims	Weighted % ^a	No. of victims	Weighted % ^a
Neglect only	277	13.0%	318	13.2%	595	13.1%
Physical abuse only	166	8.5%	159	6.9%	325	7.7%
Sexual abuse only	51	2.7%	45	1.6%	96	2.1%
Neglect+physical abuse only	108	5.4%	109	4.3%	217	4.8%
Neglect+sexual abuse only	13	0.8%	15	0.5%	28	0.7%
Sexual +physical abuse only	2	0.09%	16	0.6%	18	0.3%
3 types of maltreatment together	16	0.8%	30	1.5%	46	1.1%
At least one maltreatment ^b	55	2.5%	49	1.7%	104	2.1%

^aReflects the representative proportion in the target US population. Percentages may not total 100% because of rounding.^bParticipants in this group reported one or two types of maltreatment, but had missing values on other types of maltreatment.

Table 3

Bivariate analysis of association between maltreatment and adulthood illicit drug use and drug-related problems.

Predictors	Illicit Drug use in the past year		Illicit Drug use in the past 30 days		Drug-related problems in the past year	
	(%)	cOR	(%)	cOR	(%)	cOR
Physical abuse						
No	33.6 %		23.2%		9.8%	
Yes	44.0 %	1.56 (1.26–1.93) **	30.3%	1.44 (1.15–1.80) **	18.5%	2.08 (1.56–2.77) **
Sexual abuse						
No	35.0 %		23.9%		10.8%	
Yes	35.1 %	1.01(0.67–1.50)	28.0%	1.24(0.81–1.90)	17.8%	1.78 (1.09–2.90)*
Neglect						
No	34.4 %		23.3%		10.3%	
Yes	38.9 %	1.21(1.02–1.44)*	27.7%	1.26 (1.06–1.50) *	15.2%	1.57 (1.20–2.05) **

Values are expressed as crude odds ratio (cOR) and 95% confidence interval (95%CI).

* p < 0.05

** p < 0.01.

Table 4
Multivariate analysis of association between maltreatment and adulthood illicit drug use and drug-related problems.

Risk factor	Model 1			Model 2 (Adjusted for baseline illicit drug use)		
	Illicit Drug use in the past year	Illicit Drug use in the past 30 days	Drug-related problems in the past year	Illicit Drug use in the past year	Illicit Drug use in the past 30 days	Drug-related problems in the past year
Physical abuse	1.48 (1.16–1.89)**	1.37 (1.04–1.80)*	1.96 (1.40–2.76)*	1.40 (1.10–1.78)**	1.29 (0.98–1.71)	1.87 (1.33–2.63)**
Sexual abuse	0.82 (0.50–1.34)	1.04 (0.63–1.70)	1.32 (0.74–2.36)	0.80 (0.47–1.36)	1.01 (0.59–1.72)	1.26 (0.68–2.31)
Neglect	0.99 (0.82–1.20)	0.95 (0.76–1.18)	1.19 (0.88–1.62)	0.97 (0.80–1.18)	0.94 (0.75–1.16)	1.19 (0.87–1.61)

Values are expressed as odds ratio (OR) and 95% confidence interval (95%CI).

Model 1 adjusted for family context (i.e., family member suicide, drug easily available at home, family structure, family SES), peer drug use, age, gender, race/ethnicity, employment status, marital status, religious importance. Model 2 adjusted for baseline illicit drug use in addition to the covariates in model 1.

* p < 0.05

** p < 0.01.

Table 5

Multivariate analysis of association between neglect and adulthood past year illicit drug use by gender.

Risk factor	Model 1 Illicit Drug use in the past year		Model 2 (Adjusted for baseline illicit drug use) Illicit Drug use in the past year	
	Male	Female	Male	Female
Physical abuse	--	--	--	--
Sexual abuse	--	--	--	--
Neglect	0.80 (0.61–1.05)	1.31 (1.002–31.71) *	--	1.24 (0.94–1.62)

Values are expressed as odds ratio (OR) and 95% confidence interval (95%CI).

Model 1 adjusted for family context (i.e., family member suicide, drug easily available at home, family structure, family SES), peer drug use, age, race/ethnicity, employment status, marital status, religious importance. Model 2 adjusted for baseline illicit drug use in addition to the covariates in model 1.

*
p < 0.05

**
p < 0.01