Childhood Trauma and Illicit Drug Use in Adolescence: A Population-Based National Comorbidity Survey Replication–Adolescent Supplement Study

Hannah Carliner, ScD, MPH, Katherine M. Keyes, PhD, Katie A. McLaughlin, PhD, Jacquelyn L. Meyers, PhD, Erin C. Dunn, ScD, MPH, Silvia S. Martins, MD, PhD

Objective: Although potentially traumatic events (PTEs) are established risk factors for substance use disorders among adults, little is known about associations with drug use during adolescence, an important developmental stage for drug use prevention. We examined whether childhood PTEs were associated with illicit drug use among a representative sample of US adolescents.

Method: Data were drawn from the National Comorbidity Survey Replication–Adolescent Supplement (NCS-A), which included adolescents aged 13 to 18 years (N = 9,956). Weighted logistic regression models estimated risk ratios for lifetime use of marijuana, cocaine, nonmedical prescription drugs, other drugs, and multiple drugs.

Results: Exposure to any PTE before age 11 years was reported by 36% of the sample and was associated with higher risk for use of marijuana (risk ratio [RR] = 1.50), cocaine (RR = 2.78), prescription drugs (RR = 1.80), other drugs (RR = 1.90), and multiple drugs (RR = 1.74). A positive monotonic relationship was observed between number of PTEs and marijuana, other drug, and multiple drug use. Interpersonal violence was associated with all drug use outcomes. Accidents and unspecified events were associated with higher risk for marijuana, cocaine, and prescription drug use.

Conclusion: Potentially traumatic events in childhood are associated with risk for illicit drug use among US adolescents. These findings add to the literature by illustrating a potentially modifiable health behavior that may be a target for intervention. The results also highlight that adolescents with a trauma history are a high-risk group for illicit drug use and may benefit from trauma-focused prevention efforts that specifically address traumatic memories and coping strategies for dealing with stressful life events.

Key words: substance use, illicit drugs, adolescents, childhood trauma, maltreatment

J Am Acad Child Adolesc Psychiatry 2016;55(8):701–708.

The average age of first use of illicit drugs is during late adolescence to early adulthood,[1] making adolescence an important developmental stage for education and interventions to prevent substance use and disorders.[1,2] In particular, earlier age at initiation and patterns of substance use in adolescence may have a lasting influence on substance use and disorders across the life course.[3,4] To develop and provide effective drug prevention programming to youth, it is necessary to identify adolescents at particularly high risk for illicit drug use[5,6] and to investigate the factors that create this higher risk.

Although potentially traumatic events (PTEs) in childhood are established risk factors for substance use disorders in adults,[7-12] scant research has examined the associations of childhood PTEs with initiation of substance use in adolescence. To our knowledge, only 4 previous studies have explicitly examined the role of family adversity and maltreatment on substance use in adolescence. Taken together, these studies reported that aspects of family adversity were associated with earlier age of drug and alcohol use initiation,[3,7,8,13] heavier alcohol use among boys reporting sexual assault,[13] and drinking as a coping behavior.[3] However, prior studies have been limited in several ways. First, prior studies have focused exclusively on childhood maltreatment and family dysfunction without examining other forms of trauma exposure,[3,7,8,13] even though potentially traumatic events experienced outside the home are strong predictors of mental health and substance use outcomes in adult populations.[14-19] Second, these studies have relied largely on the retrospective reports of adults about maltreatment and substance use in childhood and adolescence,[3,7,8] which decrease in accuracy with increasing age.[20-22] Third, most studies have assessed clinical or convenience samples,[7,8,13] limiting the potential to provide population estimates for the efficacy of any interventions or policy changes, and precluding conclusions as to whether these associations would persist among more diverse samples. Fourth, to our knowledge, no prior studies have examined effects across specific types of illicit drugs that could help in understanding the etiology of drug use problems and in targeting interventions to prevent adolescent

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drug use.[23,24] Fifth, no studies have examined whether associations between PTEs and adolescent drug use are equivalent for individuals with or without comorbid psychiatric disorders, even though there is robust evidence of multifinality following exposure to PTEs,[25-27] particularly for posttraumatic stress disorder (PTSD) and substance use.[28-30] Finally, prior studies have not controlled for the potential confounding or moderating effects of parental substance misuse in estimates of substance use outcomes[9,13] or have treated parental substance misuse as a direct form of adversity.[3,7,10] Parental substance misuse could confound the association between childhood PTEs and adolescent drug use because of its association with exposure to a dysfunctional home environment, family violence, and other forms of trauma,[31,32] as well as its influence on adolescent drug use through biological predisposition, access to drugs in the home, modeling behavior, low parental involvement, and social acceptability.[3,6,33-38] Furthermore, parental substance misuse could also moderate the association between PTEs and drug use because adolescents with a parent who misuses substances could be at higher risk for drug use due to predisposition, access, and modeling.

In summary, this is the first study, to our knowledge, to examine associations between a broad range of traumatic events in childhood with specific types of drug use in a nationally representative sample of adolescents, adjusting for parental substance misuse. We examine PTEs experienced during childhood and their associations with drug use in adolescence, independent of any proximal traumatic stressors occurring simultaneously with drug use. We focus on trauma exposure prior to age 11 years, as this is the age when most US adolescents transition from elementary to middle school, with the related exposure to older students, more independence, and potentially greater opportunities for using illicit drugs.[5,6,39-41] In secondary analyses, we also assessed whether any associations persisted among adolescents reporting parental substance misuse or diagnosed with distress or behavior disorders. Data were drawn from the National Comorbidity Survey Replication–Adolescent Supplement (NCS-A). The primary aim of this study was to examine the association between multiple types of PTEs in childhood with use of various illicit drugs in adolescence. In addition, we also determined the role of parental substance misuse in these associations.

METHOD

Study Design and Sample

The National Comorbidity Survey–Adolescent Supplement (NCS-A) was conducted between 2001 and 2004. Adolescents were selected from households participating in the National Comorbidity Survey Replication (NCS-R) at a response rate of 86.8% (879 adolescents). An additional sample was derived from schools at a response rate of 82.6% (9,244 adolescents). The total NCS-A sample was 10,123 English-speaking adolescents who were 13 to 18 years of age. Data were weighted for variability in probability of selection and differential nonresponse based on population sociodemographic distributions. Merged weighted household and school samples were adjusted for design effects, and closely approximate the sociodemographic distribution of the 2000 US Census population.[42-44] Additional details about the survey design and sampling procedures are provided elsewhere.[43-45] For the current study, we excluded any participant who was missing a response for any of the PTEs or survey stratification variables, creating a final analytic sample of 9,956 adolescents (98.4%). Written informed consent from parents and assent from adolescents were obtained from all participants. Study procedures were approved by Human Subjects Committees at Harvard Medical School and the University of Michigan. The current study was approved by the Human Subjects Committee at Columbia University.

Measures

Exposure: Potentially Traumatic Events. Potentially traumatic events assessed in this study included items from the Criterion A1 assessment for PTSD included in the Composite International Diagnostic Interview (CIDI) portion of the NCS-A.[46] The CIDI for *DSM-IV* is a fully structured diagnostic instrument administered by trained lay interviewers.[47] Following prior work in this sample and others showing differential consequences of certain traumatic event types,[10,44,48,49] Criterion A1 PTEs were grouped into the following categories: interpersonal violence (physical abuse by caregiver, physical assault by someone else, mugged, raped, sexually assaulted, stalked, kidnapped, or exposed to domestic violence), traumatic accidents (car accident, other serious accident, natural or manmade disaster, physical illness, toxic chemical exposure, or having accidentally injured someone), network or witnessing events (unexpected death of a loved one, traumatic experience of a loved one, or witnessing injury or death), and other events. This final category included a question from the PTSD instrument asking, "Did you ever experience any other extremely upsetting or life-threatening event that I haven't asked about yet?" and a question about events that the participant did not feel comfortable disclosing to the interviewer. Although we lack details of the event type for this measure, prior studies have shown this "other" category to be particularly highly associated with psychiatric disorders.[44] We created a variable to assess exposure to any PTE, and a count variable assessing exposure to no PTEs, to only 1 PTE type, 2 PTE types, and 3 or more PTE types (due to low frequencies above this number), based on the original 19 items from the PTSD checklist.

Outcome: Lifetime Illicit Drug Use. Adolescents were asked whether they had ever (even once) used a list of illicit drugs.[45,50] Respondents were asked about the following: marijuana or hashish; cocaine in any form (including powder, crack, free base, coca leaves, or paste); tranquilizers, stimulants, painkillers, or other prescription drugs either without the recommendation of a health professional, or for any reason other than a health professional said they should be used; and heroin, opium, glue, LSD, peyote, or any other drug. We created a dichotomous variable for polydrug use by combining affirmative responses from the above list, and assigning a "yes" value if participants endorsed use of more than one drug type.

To establish temporality between our exposures and outcomes, to focus on trauma experienced during childhood as a distinct developmental stage, and to capture the initiation of drug use among the vast majority of our sample, we assessed only PTEs with the first occurrence before age 11 years (74% of events), and excluded drug use with first occurrence before age 11 years (<1% of the sample).

Moderation and Control Variables. Baseline demographic control variables included sex, age (continuous), race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, other), and parent income (low income, low-middle income, high-middle income, high income). Final regression models also controlled for possible confounding by parent substance misuse (combined binary measure of adolescents' reports of problem drinking or drug use for mothers or fathers). Interaction terms were constructed to assess moderation of

the association between PTEs and drug use by parent substance misuse, as well as by lifetime distress disorder (*DSM-IV* diagnosis of social anxiety disorder, PTSD, dysthymia, major depression, or generalized anxiety disorder) and lifetime behavior disorder (*DSM-IV* diagnosis of attention-deficit/hyperactivity disorder, oppositional defiant disorder, conduct disorder, anorexia nervosa, bulimia, or binge eating disorder), using classifications based on prior factor analyses in this sample.[51]

Statistical Analysis

After assessing univariate and bivariate statistics for the full sample, we estimated logistic regression models for the association between PTEs and lifetime prevalence of drug use among adolescents. First, we estimated the association between any PTE and the 5 drugs of interest, controlling for baseline demographic variables. We then controlled for parent substance misuse in these models. We repeated these steps using a categorical variable for number of PTEs reported (0, 1, 2, 3 or more) and for specific categories of PTEs. Finally, we assessed statistical interaction between PTEs and parental substance misuse, adolescent distress disorder, and adolescent behavior disorder. For any significant interaction, regression models were stratified by the moderator of interest. Sensitivity analyses assessed whether effect estimates changed when controlling for all PTE types in the same model simultaneously.

Due to the high prevalence of some outcomes, odds ratios obtained from logistic regression models were converted to model-adjusted risk ratios using predicted marginals.[52,53] Results are presented as adjusted risk ratios (RR) and 95% CIs. All analyses were conducted to account for the complex survey design of the NCS-A, and included sample weights to account for differential probability of selection and to be nationally representative based on sociodemographic characteristics. Analyses were conducted using SAS-callable SUDAAN version 11.0 (Research Triangle Institute, Research Triangle Park, NC; 2012).

RESULTS

Prevalences of sociodemographic variables in this sample have been reported previously, and are representative of the 2000 US Census population.[54] Before age 11 years, 36% of participants had experienced at least 1 PTE, 23% reported only 1 type of PTE, 8% reported 2, and 4% reported 3 or more (Table 1). Before the age of 11 years, 11% of participants had experienced interpersonal violence, 18% had had a traumatic accident, 15% had witnessed or heard about a traumatic event happening to a loved one, and 4% reported an unspecified event. For lifetime drug use, 22% had ever used marijuana, 2% cocaine, 5% prescription drugs not for medical reasons, 3% other drugs, and 6% multiple drugs.

Specific Event Types and Drug Use

Exposure to interpersonal violence before the age of 11 years was associated with higher risk for lifetime use of all drug types, controlling for demographic covariates (Table 2). These effects were attenuated after controlling for parent substance misuse, but associations remained statistically significant. Interpersonal violence was associated with use of marijuana (RR = 1.78, CI = 1.54–2.07), cocaine (RR = 2.64, CI = 1.75–3.98), nonmedical prescription drugs (RR = 2.20, CI = 1.49–3.27), other drugs (RR = 1.70, CI = 1.12–2.57), and multiple drugs (RR = 2.31, CI = 1.69–3.15).

TABLE 1 Prevalence[a] of Potentially Traumatic Events (PTE) and Lifetime Illicit Drug Use Among Adolescents in the National Comorbidity Survey–Adolescent Supplement (N = 9,956)

	Item	% (SE)
Parent substance use problems		19.19 (0.89)
PTEs before age 11	Interpersonal violence	11.06 (0.63)
	Accident	18.16 (0.73)
	Witnessing/network event	14.61 (0.66)
	Other/nondisclosed event	3.85 (0.25)
	Any PTE	35.60 (0.88)
	One PTE	23.33 (0.57)
	Two PTEs	7.67 (0.54)
	Three or more PTEs	4.48 (0.31)
Lifetime drug use	Marijuana	22.44 (1.44)
	Cocaine	2.29 (0.33)
	Nonmedical prescription drugs	5.11 (0.44)
	Other drugs	3.07 (0.42)
	Multiple illicit drugs	6.31 (0.59)

Note: Interpersonal violence includes physical abuse by caregiver, or physical assault by someone else, having been mugged, raped, sexually assaulted, stalked, kidnapped, or exposed to domestic violence. Traumatic accidents include car accident, other serious accident, natural or manmade disaster, physical illness, toxic chemical exposure, or having accidentally injured someone. Network or witnessing events include unexpected death of a loved one, traumatic experience of a loved one, or witnessing injury or death. Other events include events not listed and undisclosed events.
[a]Weighted percentage (standard error).

In baseline models, exposure to traumatic accidents was associated with higher risk for lifetime marijuana, cocaine, and other drug use. After controlling for parent substance misuse, effect sizes were attenuated, and only cocaine use remained statistically significant. Witnessing a traumatic event or hearing about the PTEs of loved ones was associated with higher risk for marijuana and other drug use in baseline models. However, none of these associations remained significant after controlling for parent substance misuse. Unspecified PTEs were associated with higher risk for all types of drug use except cocaine in baseline models. After controlling for parent substance misuse, other PTEs were associated with higher risk for marijuana use (RR = 1.48, CI = 1.14–1.93) and cocaine use (RR = 1.84, CI = 1.21–2.80).

Sensitivity analyses assessed whether these associations persisted when simultaneously estimating all 4 PTE classes in the same regression models. We found that effect sizes were slightly attenuated in all models, but no tests of statistical significance of PTE exposure classes were changed in any instance (results not shown). Therefore, independent of exposure to other types of PTEs, all reported associations remained statistically significant for unique PTE exposures.

Number of Traumatic Events and Drug Use

Controlling for demographic covariates, exposure to any PTE before the age of 11 years was associated with higher

TABLE 2 Risk of Lifetime Illicit Drug Use by Exposure to Potentially Traumatic Events (PTE) Among Adolescents in the National Comorbidity Survey–Adolescent Supplement (N = 9,956)

	Lifetime Substance Use (Predicted Marginal Risk Ratio, 95% CI)				
Potentially Traumatic Events[a]	**Marijuana (n = 2,241)**	**Cocaine (n = 234)**	**Nonmedical Prescription Drugs (n = 483)**	**Other Drugs (n = 302)**	**Multiple Drugs (n = 590)**
Interpersonal					
Model 1	1.98 (1.74–2.26)*	3.88 (2.81–5.37)*	2.66 (1.84–3.83)*	2.29 (1.57–3.34)*	2.81 (2.12–3.71)*
Model 2	1.78 (1.54–2.07)*	2.64 (1.75–3.98)*	2.20 (1.49–3.27)*	1.70 (1.12–2.57)*	2.31 (1.69–3.15)*
Accidental					
Model 1	1.22 (1.03–1.44)*	2.34 (1.49–3.67)*	1.40 (0.86–2.28)	1.59 (1.08–2.34)*	1.35 (0.98–1.86)
Model 2	1.12 (0.94–1.33)	2.13 (1.34–3.38)*	1.22 (0.75–2.01)	1.40 (0.96–2.03)	1.20 (0.88–1.65)
Witnessing					
Model 1	1.29 (1.07–1.55)*	1.20 (0.83–1.72)	1.18 (0.85–1.64)	1.58 (1.07–2.33)*	1.25 (0.95–1.65)
Model 2	1.17 (0.99–1.38)	0.92 (0.58–1.46)	1.09 (0.78–1.52)	1.45 (0.97–2.17)	1.11 (0.83–1.47)
Other					
Model 1	1.65 (1.31–2.09)*	1.45 (0.71–2.96)	2.19 (1.49–3.22)*	1.88 (1.15–3.05)*	1.79 (1.19–2.69)*
Model 2	1.48 (1.14–1.93)*	1.14 (0.56–2.31)	1.84 (1.21–2.80)*	1.58 (0.95–2.65)	1.46 (0.93–2.28)
Any PTE					
Model 1	1.50 (1.33–1.69)*	2.78 (1.95–3.97)*	1.80 (1.29–2.51)*	1.90 (1.37–2.63)*	1.74 (1.37–2.20)*
Model 2	1.34 (1.20–1.50)*	2.17 (1.48–3.17)*	1.50 (1.07–2.10)*	1.58 (1.12–2.23)*	1.45 (1.14–1.84)*
One PTE					
Model 1	1.32 (1.19–1.48)*	2.13 (1.26–3.58)*	1.50 (1.02–2.20)*	1.56 (1.03–2.36)*	1.38 (1.02–1.87)*
Model 2	1.22 (1.11–1.35)*	1.98 (1.21–3.25)*	1.34 (0.91–1.98)	1.42 (0.95–2.14)	1.25 (0.94–1.68)
Two PTEs					
Model 1	1.65 (1.37–1.99)*	4.23 (2.73–6.55)*	1.90 (1.20–3.01)*	2.11 (1.32–3.39)*	2.25 (1.57–3.21)*
Model 2	1.41 (1.15–1.72)*	2.61 (1.44–4.73)*	1.38 (0.81–2.33)	1.49 (0.82–2.73)	1.62 (1.04–2.52)*
Three or more PTEs					
Model 1	2.17 (1.72–2.74)*	3.58 (1.88–6.81)*	3.14 (1.95–5.06)*	3.26 (2.05–5.19)*	2.69 (1.82–3.97)*
Model 2	1.89 (1.47–2.43)*	2.24 (1.18–4.22)*	2.50 (1.53–4.09)*	2.51 (1.54–4.10)*	2.14 (1.41–3.23)*

Note: Model 1 logistic regression results adjusted for age, sex, race/ethnicity, and parent income; Model 2 logistic regression results adjusted for age, sex, race/ethnicity, parent income, and parent substance misuse.

[a]For specific event types and "Any PTE" models, the reference group is participants who reported no PTEs of that type. For number of PTEs, the reference group is participants who reported no PTEs, and the number of PTEs are included as a single categorical variable in each model.

**p < .05.*

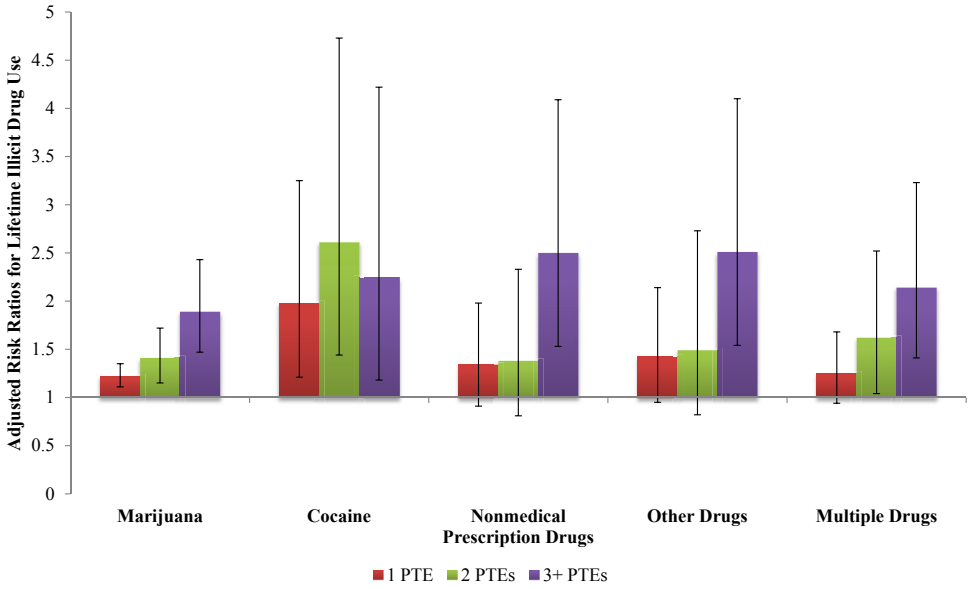
risk for lifetime use of marijuana (RR = 1.50, CI = 1.33–1.69), cocaine (RR = 2.78, CI = 1.95–3.97), nonmedical prescription drugs (RR = 1.80, CI = 1.29–2.51), other drugs (RR = 1.90, CI = 1.37–2.63), and multiple drugs (RR = 1.74, CI = 1.37–2.20) (Table 2). Controlling for parent substance misuse attenuated these effect estimates; however, all remained statistically significant. There was evidence of a positive monotonic relationship for number of PTEs experienced and risk of marijuana, other drug, and polydrug use (Figure 1). Controlling for demographic covariates and parent substance misuse, any 1, 2, and 3 or more childhood PTEs reported were all statistically associated with higher risk for marijuana and cocaine use.

Moderation by Parent Substance Misuse and Adolescent Psychiatric Disorders

Our results indicated that parental substance misuse largely failed to moderate the association between PTEs and adolescent drug use. Significant interactions were observed only for 2 drug use types. Adolescents reporting parent substance misuse were at higher risk for lifetime marijuana use associated with other PTEs (RR = 1.63, CI = 1.28–2.07), compared to adolescents reporting no parent substance misuse (RR = 1.38, CI = 1.00–1.90; $p_{interaction}$ = .046). Adolescents reporting parent substance misuse were also at higher risk for use of other drugs associated with interpersonal PTEs ($p_{interaction}$ = .02), any PTE ($p_{interaction}$ = .02), and number of PTEs ($p_{interaction}$ = .001), compared to adolescents not reporting parent substance misuse.

Similarly, adolescent distress disorders and behavioral disorders mostly did not moderate the associations between PTEs and drug use. The single exception was for interpersonal violence PTEs and nonmedical prescription drug use, where adolescents without a history of behavior disorder were at higher risk for prescription drug use (RR = 3.00, CI = 1.92–4.70) compared to adolescents with a history of behavior disorder (RR = 1.45, CI = 0.95–2.22; $p_{interaction}$ = .0008).

FIGURE 1 Adjusted risk ratios and 95% CIs for lifetime illicit drug use associated with number of potentially traumatic experiences before age 11 among adolescents in the National Comorbidity Survey–Adolescent Supplement (N = 9,956). Note: For each model, the reference group is adolescents exposed to no potentially traumatic events (PTEs) prior to age 11. All models adjusted for age, sex, race/ethnicity, parent income, and parent substance misuse.



DISCUSSION

In this population-representative sample of US adolescents, exposure to any PTE in childhood was associated with higher risk for lifetime use of all illicit drugs assessed. We found evidence for a dose–response relationship between number of PTEs experienced and marijuana, other drug, and polydrug use. Interpersonal violence experienced in childhood was consistently associated with lifetime use of all illicit drugs assessed, even after controlling for the confounding effect of parent substance misuse, which attenuated the effect sizes of many of the associations assessed. To our knowledge, this is the first population-based study to report that traumatic events other than childhood maltreatment are associated with higher risk for marijuana, cocaine, and nonmedical prescription drug use among adolescents.

Consistent with prior research using both the NCS-A and the adult sample of the National Comorbidity Survey (NCS-R), childhood maltreatment and interpersonal violence are strongly associated with multiple psychiatric and behavioral outcomes.[10,11,44,46] Combined with results from previous studies on diverse health outcomes, our findings here confirm that these forms of physical and sexual violence exhibit multifinality in that they are associated with elevated risk for multiple adverse outcomes, including health behaviors, not only diagnosed disorders.[44,46,48] Health behaviors such as adolescent drug use may be modifiable risk factors that can be targeted to prevent future adverse health outcomes.[55] Efforts to prevent the particularly devastating forms of trauma such as physical, sexual, and domestic violence should be at the forefront. Researchers should continue to explore risk factors for the perpetration of this violence so as to inform policy and social welfare initiatives with an evidence-based primary prevention approach.

Although our measure of interpersonal violence comprised many of the indicators that are usually included in studies of childhood maltreatment (i.e., physical and sexual assault, domestic violence), our results also indicate that other forms of trauma are also associated with illicit drug use in adolescents when interpersonal violence exposure was controlled for in statistical models. Adolescents who experienced accidental PTEs were at elevated risk specifically for cocaine use. Prior work has shown that the association between unintentional or accidental events and adverse outcomes are generally less robust.[56,57] However, particularly in an adolescent sample, perhaps these accidents and illnesses pose more real threat of death than other events, thus making the "dose" of traumatic stress stronger in this category.[56-60] Future research should try to replicate these findings to determine whether this specificity of association persists in other populations and, if so, by what mechanism it may act. Specifically, researchers and clinicians should explore the nature of these events and their consequences, and try to determine whether the specific association with cocaine use has any relationship to the type of medical treatment received after these accidents or illnesses.

Events not disclosed to the survey team by participants were associated with higher risk for marijuana and nonmedical prescription drug use, in line with past work showing that other/private events are associated with onset of psychiatric disorders and persistence of PTSD.[44] This should be noted by researchers conducting future life events surveys, if study participants are less likely to report certain types of traumatic events. Healthcare workers and caregivers should also be aware of increased risk for drug use arising from undisclosed traumatic events.

The strongest effect sizes were for interpersonal violence and risk of cocaine and nonmedical prescription drug use, and for traumatic accidents and cocaine use. Future studies should explore whether these associations are driven by socio-environmental factors related to access to different drug types or whether there is something about the psychoactive effects of cocaine and some prescription drugs that is specifically sought by adolescents coping with traumatic memories.

The substantial confounding by parent substance misuse that we observed also deserves more attention in future studies. The associations between interpersonal violence and drug use outcomes were confounded by parent substance misuse, indicating a domestic environment with multiple forms of interrelated traumas for some children. Future studies should examine the mechanisms by which parental substance use and exposure to traumatic events are associated with adolescent substance use, for example through an influence on social norms and expectancies, modeling behavior, access to illicit substances, or by providing opportunity via low parental involvement or neglect.[3,6,33-38] These explorations were beyond the scope of the current study, but future research can inform priorities for intervention in harmful home environments for children and adolescents. By and large, parent substance misuse did not affect the associations between PTEs and drug use. Exceptions included other PTEs and marijuana use, and interpersonal PTEs and other drug use. This could be related to access to drugs in the home or neighborhood, as marijuana and certain types of other drugs may be more easily obtained by adolescents. Alternatively, this statistical interaction could represent a constellation of adversity related to family dysfunction, as discussed in prior studies.[10,46] Future work should use latent variable techniques to further explore these complex associations and pathways.

Given the breadth of exposures and outcomes assessed in the current study, it was beyond the scope of this article to assess the multiple possible mechanisms by which PTEs are associated with adolescent substance use. Future studies, ideally using longitudinal data, should continue to explore these patterns by conducting formal tests of mediation, assessing indirect effects of PTEs through distress and behavior disorders on substance use among both boys and girls. Additional avenues for future work include examination of the ways in which social norms, peer groups, sociodemographic factors, and drug availability affect these associations, and whether any protective factors exist that could be used to design interventions and educational campaigns for adolescents.

A number of limitations should be considered in interpreting these results. First, all associations reported here should be interpreted with caution, due to the cross-sectional nature of the data. However, our results are consistent with numerous prior studies[3,7,8,10] reporting associations between childhood trauma and drug use outcomes. Furthermore, the potential for reverse causation is minimized because we included only PTEs experienced before the age of 11 years and drug use after the age of 10 years.

A second concern is the retrospective reporting of both PTEs and lifetime drug use. Although the potential for recall bias is reduced in younger participants with shorter lags between timing of event and reporting of event,[20-22] we still cannot rule out the possibility of underreporting of drug use due to social desirability bias and underreporting of PTEs due to forgetting or trauma-related nonacceptance. These biases could result in either overestimation or underestimation of results reported here. However, the prevalence of drug use reported in the NCS-A is consistent with or higher than that reported in other surveys,[50,61,62] and the prevalence of any exposure to PTEs is only slightly lower than that of adult samples,[44,63] suggesting that underreporting may not be of great concern in this study.

A third concern, as noted above, is that confounding of the association between PTEs and drug use could be due to parental substance misuse, for which we adjust in final models. However, parental substance misuse could also be a direct outcome of a PTE, if the event was experienced by both the parent and the child (e.g., death of a loved one, car accident). Including this variable in statistical models may therefore induce bias in these estimates. As we are unable to tease out the temporality of these variables in the NCS-A dataset, we present models both unadjusted and adjusted for parental substance misuse, for comparison. We also conducted interaction tests to assess moderation by parental substance misuse, and mostly found no significant differences, as noted above. Future studies should use longitudinal data to further explore these associations.

Fourth, another limitation is common to all studies using the PTSD Criterion A1 list of PTEs. This list of event types does not adequately capture the "dose" of the traumatic experience, the severity of the event, or the context in which the event was experienced.[64] This makes it difficult to determine whether familial and sexual violence experiences are more strongly associated with deleterious outcomes because they are chronic experiences of trauma occurring within a child's home, or because the events themselves are more "toxic."[59] Complementary research should continue to assess these more qualitative aspects of traumatic stress.

This study adds to the large body of research documenting the potentially toxic effects of psychological trauma to a wide range of behavioral and health outcomes beyond PTSD. These findings add to the childhood adversity literature by demonstrating, first, that PTEs experienced in childhood are associated with drug use in adolescence—a potentially modifiable health behavior—and therefore a target for intervention and treatment in youth; and second, that adolescents with a trauma history are a high-risk group for illicit drug use and may benefit from prevention efforts that specifically address traumatic memories and coping strategies for dealing with stressful life events. Future work should explore whether adolescents with a trauma history are more likely to develop chronic or harmful drug use than their nontraumatized peers. In combination with other signs and indicators, early drug use can act as a marker for adolescents who may need additional support or intervention. For clinicians, our results combined with other studies imply

that drug treatment programs may need to more directly address childhood trauma in their therapeutic approach. Early interventions targeting coping with trauma during this critical period of adolescence could have broad benefits to the health and wellbeing of adults. &

Accepted May 19, 2016.

Drs. Carliner, Keyes, and Martins are with Columbia University, New York. Dr. McLaughlin is with University of Washington, Seattle. Dr. Meyers is with State University of New York (SUNY) Downstate Medical Center, Brooklyn, NY. Dr. Dunn is with Massachusetts General Hospital, Boston.

This work is supported in part by National Institutes of Health grants T32DA031099 (Carliner, PI: Hasin), MH102403 (Dunn), AA021511 (Keyes), R01DA037866 (Martins), R01HD060072 (Martins), MH106482 (McLaughlin), and MH103291 (McLaughlin).

The funders had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; or decision to submit the manuscript for publication.

Preliminary results for this study were presented as an oral presentation at the College on Problems of Drug Dependence's 77th Annual Meeting, Phoenix, AZ, June 13–18, 2015.

Disclosure: Drs. Carliner, Keyes, McLaughlin, Meyers, Dunn, and Martins report no biomedical financial interests or potential conflicts of interest.

Correspondence to Hannah Carliner, ScD, MPH, Columbia University Mailman School of Public Health, 722 West 168th Street, #1030-F, New York, NY 10032; e-mail: hcarliner@mail.harvard.edu

0890-8567/$36.00/©2016 American Academy of Child and Adolescent Psychiatry

http://dx.doi.org/10.1016/j.jaac.2016.05.010

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