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Risk Factors for Adolescent Substance Abuse and Dependence: Data From a National Sample

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A national household probability sample of 4,023 adolescents aged 12 to 17 years was interviewed by telephone about substance use, victimization experiences, familial substance use, and posttraumatic reactions to identify risk factors for *Diagnostic and Statistical Manual of Mental Disorders*– (4th ed.; American Psychiatric Association, 1994) defined substance abuse/dependence. Age and ethnicity data were available for 3,907 participants. Major findings were (a) adolescents who had been physically assaulted, who had been sexually assaulted, who had witnessed violence, or who had family members with alcohol or drug use problems had increased risk for current substance abuse/dependence; (b) posttraumatic stress disorder independently increased risk of marijuana and hard drug abuse/dependence; and (c) when effects of other variables were controlled, African Americans, but not Hispanics or Native Americans, were at approximately 1/3 the risk of substance abuse/dependence as Caucasians.

Use of illicit drugs such as marijuana appears to be increasing across most of the adolescent age span (Gfroerer, 1995, National Household Survey of Drug Abuse [NHSDA] Data Table 3a; Monitoring the Future [MTF], 1997, Data Table 1a). According to the NHSDA, marijuana use in 1997 was highest among individuals aged 18 to 24 years (22%) and among youth aged 12 to 17 years (16%). Past-year rates of cocaine use were 4% in the 18- to 24-year age group and 2% in children aged 12 to 17 years. Rates of substance use disorders (as opposed to use, per se) in this age group are less well established.

Several investigators have suggested that violence plays a role in adolescent and adult substance abuse. In these conceptualizations, substance use represents a strategy to cope with the stress produced by interpersonal aggression (Bean, 1992; Brown, 1989; Dembo et al., 1987; Ireland & Widom, 1994; Lindberg & Distad, 1985). Hypothetically, distress produced by assault drives individuals to engage in behaviors that reduce negative emotions, such as situational avoidance or drug use (Kilpatrick, Acierno, Resnick, Saunders, & Best, 1997). That is, use or abuse of substances following assault may be an effective, but maladaptive, strategy to diminish negative affect. Support for this learning-theory model is provided by studies that demonstrate an association between affect regulation and substance use (e.g., Brown, 1989; Hernandez, 1992; Levenson, Oyama, & Meek, 1987; Stasiewicz & Maisto, 1993; see also Stewart, 1996).

The coping theory of substance use presupposes that increased negative affect following exposure to stressors, as opposed to stressor exposure, per se, increases the likelihood and intensity of use. Clinically significant reactions to negative life events, such as those manifested in symptoms of posttraumatic stress disorder (PTSD), might be expected to have strong relationship with substance use behaviors. Using data from the National Women's Study (NWS), Epstein, Saunders, Kilpatrick, and Resnick (1998) found support for this hypothesis by demonstrating that the relationship between childhood rape and adult alcohol abuse was mediated by PTSD. Similarly, in her review of studies assessing the relationship between alcohol abuse and trauma, Stewart (1996) stated that trauma severity was positively related to risk of alcohol abuse, but PTSD seemed to be a better predictor than victimization of alcohol use disorders. Consistent with theory, individuals high in anxiety sensitivity, particularly those with PTSD or panic disorder, appear particularly susceptible to the calming effects of alcohol.

Whether the potentially causal role of victimization and postvictimization psychopathology in substance abuse is applicable to adolescents remains to be determined. However, the alarming rate at which children witness violence or are physically and sexually assaulted underscores the need for further study. For example, Dembo et al. (1992) reported sexual abuse prevalences of 60% and 20% for incarcerated female and male adolescents, respectively. The prevalence of physical abuse was 40% to 50% for both genders. In their national sample of 2,000 children aged 10 to 16 years, Finkelhor and Dziuba-Leatherman (1994) found that 22% of children reported suffering lifetime (nonfamilial) assault.

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Isolating the risk of substance use associated with victimization is a complex task because substance use and victimization may be risk factors for one another. For example, the National Adolescent Health Survey (Windle, 1994) found that youth who used alcohol, marijuana, or drugs were at increased risk of victimization, with female substance users at particularly elevated risk of sexual assault. Windle noted that much of this effect was related to an increased propensity of adolescent substance users to engage in "risky" behaviors (e.g., frequenting places where victimization potential was great). On the other hand, Kilpatrick et al. (1997) demonstrated the contributing role of assault in substance abuse using longitudinal data from the NWS. These investigators determined that individuals with no history of assault who were newly assaulted were more than twice as likely to use and abuse substances as nonassaulted women, even after controlling for effects of preassault substance abuse.

Other investigations of the relationship between childhood victimization and subsequent substance abuse have produced mixed results. Many studies of both adult and child samples have found an association between childhood assault and drug or alcohol abuse (see Briere, 1988; Browne & Finkelhor, 1986; Burnam et al., 1988; Dembo et al., 1987; Duncan, Saunders, Kilpatrick, Hanson, & Resnick, 1996; Miller, Downs, Gondoli, & Keil, 1987; Polusny & Follette, 1995; Rohsenow, Corbett, & Devine, 1988; Zierler et al., 1991). For example, Duncan et al. analyzed NWS data and found that victims of child physical assault were more likely to have used—or currently use—marijuana, prescription drugs, and hard drugs. Child physical assault victims were also more likely to have driven while intoxicated, to have had an alcohol-related arrest, and to have had substance-related legal problems and problems with family and friends.

Many child studies have yielded findings consistent with those of adult studies (see Dembo et al., 1987, 1992; Hernandez, 1992). Other studies, however, have not (Ireland & Widom, 1994; Widom, Ireland, & Glynn, 1995). For example, Widom et al. reported that childhood neglect, but not childhood physical or sexual assault, increased risk of adult alcohol use for women but not for men. Ireland and Widom used substance-related arrests as their dependent measure and found no differences in arrest rates for abused boys or girls during adolescence but did note an increase in arrest rates for previously abused girls during adulthood. Of course, causal inferences in such cross-sectional studies are based on correlational, rather than experimental, designs that yield data that may be biased (Briere, 1992). Such bias may be due to erroneous temporal ordering of events, incomplete or incorrect recall of distal events, or inconsistent measurement of events.

Inconsistent findings are not unexpected when considering the tremendous methodological variability characterizing studies in this area. Investigations have differed in terms of age (e.g., adult long-term retrospective report vs. adolescent proximal report of childhood substance use), quality or validity of victim/nonvictim classification (e.g., official records vs. voluntary self-disclosure vs. behaviorally specific assessment), definitions of problem substance use (e.g., use-related arrest vs. standardized diagnostic classification vs. use-related problem frequency), limited or overly general substance analyses (e.g., separate assessment of marijuana and hard drug use vs. assessment of combined categories of substances), and sample type (e.g., small clinical vs. large general-population samples and one gender vs. both genders).

The present study, the National Survey of Adolescents (NSA), addressed each of these concerns. First, the NSA used a large, randomly selected nationally representative community sample of adolescents of both genders. Second, a standardized traumatic event assessment method (e.g., Dansky, Saladin, Brady, Kilpatrick, & Resnick, 1995; Resnick, Kilpatrick, Dansky, Saunders, & Best, 1993) was used to detect a broad spectrum of violent experiences. Third, *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM–IV*; American Psychiatric Association, 1994) diagnostic-level data regarding PTSD and alcohol, marijuana, and hard drug abuse/dependence were gathered. In addition, risk relationships were determined separately for alcohol, marijuana, and hard drugs. Fourth, analyses controlled for effects of demographic and familial factors that might affect risk of substance abuse, such as age, gender, race, and parental substance use (see Bennett & Kemper, 1994). (For example, being male appears to increase risk of problem substance use in later adolescence [Johnston, O'Malley, & Bachman, 1991]. In addition, children whose parents are substance users or abusers are also at increased risk of problem use [Beman, 1995; Bennett & Kemper, 1994; Brown, 1989; Hernandez, 1992; Maltzman & Schweiger, 1991]. Thus, to identify unique risk of problem substance use associated with victimization, one must also address and statistically control the effects of these demographic and familial factors.)

The objectives of this study were as follows: (a) to assess the impact of familial substance use on adolescent substance abuse/dependence; (b) to assess the effect of physical assault, sexual assault, and witnessed violence on risk of adolescent substance abuse/dependence; and (c) to assess the independent impact of PTSD on substance abuse risk.[1]

We hypothesized that familial alcohol abuse or drug use would independently increase risk of all forms of adolescent substance use. In addition, we hypothesized that sexual assault, physical assault, and witnessed violence would increase risk of adolescent alcohol, marijuana, and hard drug abuse/dependence and that these effects would be apparent even after effects of demographic variables and familial substance use variables were considered. Finally, we predicted that the presence of PTSD would further increase risk of abuse after controlling for the effects of all other variables.

Method

Participants

Participants were from the NSA, a research project in which a household probability sample of 4,023 adolescents between the ages of 12 and 17 years were interviewed by telephone. Of this total, 3,161 were a national probability household sample of adolescents and 862 were a probability oversample of adolescents from households in areas designated as central cities by the 1990 U.S. Census. The NSA central city oversample was designed to increase the number of racial/ethnic minority respondents. This sampling strategy resulted in a slightly higher proportion of minority respondents than the U.S. Bureau of the Census (1988) 1995 population

[1] This article limits its focus to the *DSM–IV*-defined abuse of, or dependence on, alcohol, marijuana, or hard drugs. We did not assess for abuse or dependence on cigarettes; hence, this substance is not included here. However, a manuscript describing risk factors for cigarette use is under review in another journal.

estimates for adolescents. Likewise, the NSA sample age cohorts of 12- and 17-year-olds appeared to be somewhat underrepresented. To correct for any demographic discrepancies between the NSA and U.S. population proportions introduced by the oversample or other factors, we weighted data on the basis of age, race, and gender. That is, for data-weighting purposes, each participant was classified along each of these three dimensions (e.g., 13 years old–African American–male, 14 years old–Hispanic–female). Data from participants in each of these classification categories were then multiplied by a weighting coefficient calculated to bring this sample in line with U.S. Bureau of the Census 1995 estimates in terms of age, race, and gender.

Adolescents potentially excluded from the study were those residing in institutional settings or in households without a parent or guardian and those whose parents did not speak English or Spanish. According to the 1990 census, only 5% of U.S. households did not have telephones. Boyle and Kilpatrick (1993) found that less than 2% of parents of adolescents from households with telephones did not speak English or Spanish. Thus, we estimated that the sampling frame provided coverage for at least 93% of U.S. adolescents living in households.

A parent or guardian in each household was interviewed briefly prior to each adolescent interview. Of 5,367 eligible households (i.e., households with at least 1 adolescent between the ages of 12 and 17 years), (a) 4,836 parents completed interviews (90% of eligible households), (b) 4,236 parents gave permission for their adolescent to be interviewed (79% of eligible households and 88% of cases with completed parent interviews), and (c) 4,023 adolescents agreed to participate and actually completed interviews (75% of eligible households, 83% of households with completed parent interviews, and 95% of households with parent permission). This 75% participation and completion rate is slightly higher than rates obtained in other major studies of adolescents (e.g., Ageton, 1983; Finkelhor & Dziuba-Leatherman, 1994).

The following demographic data are weighted and limited to the NSA subsample of participants providing both age and race information. This subsample included approximately equal numbers of male (n = 2,003) and female (n = 1,904) adolescents. Of the 3,907 participants, 2,821 were White, non-Hispanic (72%); 590 were African American, non-Hispanic (15%); 46 were Asian (1%); 311 were Hispanic (8%); and 139 were Native American (4%). For data-analytic purposes, the 42 Asians were combined with the White, non-Hispanic group, the group they most closely approximated in terms of victimization and substance abuse variables (i.e., there were no significant differences between these groups in rates of sexual assault; physical assault; witnessed violence; and alcohol, marijuana, or hard drug abuse). The age breakdown was as follows: 12-year-olds (n = 647), 13-year-olds (n = 659), 14-year-olds (n = 655), 15-year-olds (n = 670), 16-year-olds (n = 645), and 17-year-olds (n = 630).

Sampling

Sample selection and interviewing were conducted by Schulman, Ronca, and Bucuvalas, Inc., a New York–based survey research firm. The NSA used a multistage, stratified, area probability, random digit dialing, six-step sampling procedure, the details of which are available from Dean G. Kilpatrick. This procedure produced a representative sample of adolescents based on geographic stratum, age, gender, and race based on U.S. Bureau of the Census (1988) data. A central city oversample was also selected to increase the number of interviewed crime victims.

Measures[2]

A highly structured telephone interview was designed to collect information about several topics, including demographic characteristics, adolescent and familial substance use/abuse patterns, witnessed violence, and experience of sexual and physical assault. The interview procedure is described in the following section. Demographic variables were measured using standard questions used by the U.S. Bureau of the Census (1988) to categorize age, education, and race.

Age. Age was measured as the current age in years at the time of the interview (range = 12–17 years).

Gender. Male or female.

Race. Four race groups were represented as three indicator variables: African American, Hispanic, and Native American, with White/Caucasian as the reference category.

Nonexperimental alcohol use. Nonexperimental alcohol use was assessed by determining whether respondents had ingested five or more drinks on a given day over the past year. A drink was defined as a 12-oz (340-g) can of beer, 4 oz (113 g) of wine, or a shot (approximately 1 oz [28 g]) of liquor.

Nonexperimental marijuana and hard drug use. Nonexperimental marijuana and hard drug use was measured by a series of questions that first inquired whether the respondent had ever ingested marijuana or hard drugs, including cocaine, heroin, inhalants, LSD, or prescription drugs (i.e., sedatives, stimulants, painkillers, and steroids) taken nonmedically. Prescription drugs were placed in this category because their subjective effects, addictive potential, and lethality more closely approximate other hard drugs. Only those respondents reporting that they had used a substance "at least 4 times" in their lives were asked about past-year substance use. Hence, our use rates are lower than those reported in other studies in which a single use could qualify a respondent as a user.

Age of onset for nonexperimental substance use. Onset of nonexperimental alcohol use was defined as the age at which respondents reported that they "began drinking five or more drinks of alcohol on a given day"; onset of nonexperimental marijuana use was defined as the reported age of first use only for those respondents who used marijuana at least four times. Similarly, onset of nonexperimental hard drug use was defined as the reported age at first use only for those respondents who used, on at least four or more occasions, cocaine, heroin, inhalants, LSD, or prescription drugs (i.e., sedatives, stimulants, painkillers, and steroids) nonmedically.

Substance abuse/dependence. Our interest was in determining risk factors for problem use of substances. Hence, participants meeting either *DSM–IV* abuse or dependence criteria were considered in one group. Diagnoses were assigned through a structured clinical interview developed by Dean G. Kilpatrick and reflected exact *DSM–IV* criteria for abuse or dependence for each type of substance (alcohol, marijuana, and other hard drugs). To reduce retrospective report bias, thereby increasing validity of the substance abuse/dependence diagnoses, we limited the time frame of these diagnoses to the past year (see Appendix for further description).

Sexual assault and physical assault. Both forms of assault were measured using contextually orienting prefatory statements followed by behaviorally specific closed-ended questions (see Appendix for further description).

Witnessed violence. Witnessed violence was defined as directly observing someone being shot, stabbed, sexually assaulted, mugged, robbed, or threatened with a weapon.

Familial alcohol problems. See Appendix.

Familial drug use. See Appendix.

PTSD. The PTSD measure was a modified version of the NWS PTSD module (Kilpatrick et al., 1998) based on *DSM–IV* criteria (see Appendix for additional discussion of this measure).

Procedure

Interviews were conducted in English or Spanish, depending on the respondent's preference, using computer-assisted telephone interviewing technology, in which irrelevant questions were skipped. Supervisors per-

[2] Additional description of study measures can be found in the Appendix. Further detailed explanation is available from Dean G. Kilpatrick.

formed random checks of each interviewer's assessment behavior and data entry accuracy at least twice during each shift while monitoring interviews on their own computers.

An important concern was whether the adolescent could answer interview questions freely and privately. Two steps were taken to increase the likelihood that adolescents could answer questions with reasonable privacy. First, interviewers specifically asked if the adolescents were in a situation in which they could be assured of privacy and could answer freely. If the adolescents indicated that they could not, the interviewer offered to call back at another time when privacy was more likely. Second, the interview schedule was designed primarily with closed-ended questions. Therefore, adolescents could respond to questions with a simple "yes" or "no," a number (e.g., for age), the role of a person (e.g., "a neighbor"), or other one-word or one-phrase answers. Therefore, even if someone were listening to an adolescent's answers, the person would not overhear anything that would place the respondent at risk. At the end of the interview, recontact and payment information (i.e., name and address) was collected. This information was not combined with the master data file. Adolescents received an NSA certificate of participation and a check for $5 as compensation for their time. The field period for this study was January to May 1995.

Participant Protection

Federal law governing research studies funded by the U.S. Department of Justice provides strong confidentiality protection for study participants in that investigators are precluded from disclosing any information obtained in the study without participant consent. In addition, the NSA took additional measures to increase protection of adolescent participants. First, adolescents were identified who might be in current danger on the basis of whether they (a) had been sexually assaulted in the past year, (b) had been hit by a family member in the past year, or (c) had not disclosed the sexual or physical assault to anyone. Second, each adolescent designated as being in potential danger was interviewed by a child-focused clinician on the project team to ascertain the extent to which they were in current danger. Third, those judged to be in current danger were encouraged to make a voluntary report to child protective services. Fourth, the clinician was prepared to make a report to child protective services if an adolescent in danger was unwilling to do so, although this never proved to be necessary. Fifth, all the adolescents were asked if they would like the toll-free number of Child Help, a national telephone counseling program for at-risk youth. Approximately one half of all the participants requested this number.

Data Analysis

Prevalence data and substance use comorbidity data are presented first, followed by major analyses. The primary data-analytic strategy involved identifying and quantifying risk relationships between study variables and substance abuse/dependence. Thus, data are presented in terms of sample prevalence and odds ratios (ORs). ORs are ratios between two odds, each of which is a ratio. Specifically, the OR describes the odds of a categorical outcome at one level of a categorical predictor variable relative to the odds of the outcome at a comparison level (i.e., the "reference category"). For example, if "male gender" is the reference category, an OR of 0.80 for being "female" indicates that the outcome is 20% less likely in women relative to men. The OR for a continuous variable reflects the relative odds associated with a unit increase in the predictor (e.g., per point on a multipoint scale). ORs increase exponentially for each unit increase in the predictor variable (e.g., if age is coded per year, an OR of 1.40 indicates that the odds of the outcome increase 40% for a 1-year change, 96% [$1.40^2 = 1.96$] for a 2-year change, etc.).

We first attempted to establish general relationships by determining univariate ORs through chi-square analyses. Next, to delineate unique effects of study variables with respect to one another, we determined multivariate ORs through logistic regression using the SPSS statistical package for Windows (Norusis, 1993). Type I error in univariate analyses was controlled through a Bonferroni correction for setting individual test statistical significance criterion levels (Stevens, 1992). The individual test alpha level was set at $p < .01$, resulting in a setwise alpha level of .096. For multivariate analyses, an alpha level of .05 was chosen a priori.

Results

Prevalence of Study Variables[3]

Overall prevalence of sexual assault; physical assault; witnessed violence; familial alcohol use; familial drug use; current PTSD; and *DSM–IV*-defined past-year alcohol, marijuana, and hard drug abuse/dependence are presented in Table 1.

Substance Use Disorder Comorbidity

A total of 276 adolescents (7% of the sample) met the diagnostic criteria for alcohol, marijuana, or hard drug abuse/dependence. Within this subsample, 41% ($n = 113$) met the criteria for alcohol abuse/dependence only, 3% ($n = 9$) met the criteria for marijuana abuse/dependence only, and 14% ($n = 37$) met the criteria for hard drug abuse/dependence only; 11% ($n = 29$) met the criteria for alcohol and marijuana abuse/dependence, 3% ($n = 7$) met the criteria for alcohol and hard drug abuse/dependence, 5% ($n = 14$) met the criteria for marijuana and hard drug abuse/dependence, and 3% ($n = 7$) met the criteria for alcohol, marijuana, and hard drug abuse/dependence.

Among the 37 hard drug abusers, 29% reported problems with cocaine, 42% with LSD, 14% with stimulants, 7% with heroin, 2% with tranquilizers, 6% with sedatives, 5% with pain medication, and 1% with inhalants; 3% had steroid-related problems (note that these are not mutually exclusive categories).

Univariate Analyses

Risk relationships between relevant demographic, familial substance use, and victimization variables (e.g., sexual assault) and past-year substance abuse/dependence (defined as *DSM–IV* abuse *or* dependence) are presented in Tables 2 and 3. Elevated risk of alcohol, marijuana, and hard drug abuse/dependence was associated with increased age, familial substance use, physical or sexual assault, witnessed violence, and PTSD status. When the Bonferroni correction was applied, gender and racial status were not significantly related to risk of substance abuse/dependence.

Multivariate Analyses

To examine the unique impact of each variable on problem use of each substance over and above effects of other variables, we used a five-step hierarchical logistic regression in which ORs of variables entered on each step were adjusted for those of other variables entered both on that step and on preceding steps (see Table 4). Grouping was rationally driven so as to maximize relevance of findings. Demographic variables were entered first (i.e.,

[3] Additional prevalence data regarding substance use and substance abuse/dependence breakouts by psychopathology, age, race, gender, and geographic region are available from Dean G. Kilpatrick.

Table 1
Overall Prevalence of Sexual Assault; Physical Assault; Witnessed Violence; Familial Alcohol Abuse; Familial Drug Use; Current PTSD; Alcohol, Marijuana, and Hard Drug Nonexperimental Use; and Alcohol, Marijuana, and Hard Drug Abuse/Dependence in the Total Sample (N = 4,023)

Variable	Unweighted *n*	Unweighted prevalence (%)	Weighted prevalence (%)	Population estimate[a]
Sexual assault (SA)	327	8	8	1,800,000
Physical assault (PA)	940	23	22	5,000,000
Witnessed violence (WV)	1,663	41	39	8,800,000
Any victimization (SA, PA, or WV)	1,995	50	47	10,600,000
Familial alcohol abuse	562	14	13	2,900,000
Familial drug use	401	10	9	2,000,000
Current PTSD	211	5	5	1,100,000
Past-year alcohol use[b]	606	15	14	3,100,000
Past-year marijuana use[c]	400	10	9	1,900,000
Past-year hard drug use[c]	93	2	2	500,000
Past-year alcohol abuse/dependence	179	4	4	900,000
Past-year marijuana abuse/dependence	165	4	4	800,000
Past-year hard drug abuse/dependence	41	1	1	200,000
Past-year any substance abuse/dependence	309	8	7	1,500,000

Note. PTSD = posttraumatic stress disorder.
[a] Based on U.S. Bureau of the Census 1995 estimate that U.S. population of adolescents is 22.3 million. Rounded to nearest 100,000. [b] These rates reflect past-year use episodes in which five or more drinks were consumed on a given day. [c] These rates reflect past-year use among only those adolescents who reported that they had used these substances at least four times in their lifetime.

age, race, and gender). Effects of familial alcohol and drug use on adolescent substance use were examined next. Thus, any effects noted for these variables represent significance after controlling for effects of demographic variables. Victimization variables were entered following demographic and familial variables to evaluate whether effects of victimization on substance abuse/dependence were not simply the result of demographic differences or familial substance use. Witnessed violence is qualitatively different than directly experienced physical or sexual assault in that the respondent was not the object of aggression. Thus, this variable was entered on a separate step. Moreover, because we were most interested in the effects of direct assault on substance use, witnessed violence was entered after assault variables. PTSD status was entered on the fifth and final step because this variable measured a constellation of symptoms rather than a specific event or situation. Thus, our interest was whether or not PTSD increased risk of substance abuse and dependence after controlling for effects of demographics, familial substance use, and victimization. Thus, step ORs (see Table 4) given for effects of age, gender, and race are adjusted for each other; ORs given for familial history of problem alcohol use and for familial history of drug use are adjusted for each other and for demographic variables; ORs given for physical assault and sexual assault are adjusted for each other and for all aforementioned variables; ORs given for witnessing violence are adjusted for all aforementioned variables; and finally, ORs for PTSD diagnostic status are adjusted for all aforementioned variables. Also obtained were final model ORs (see Table 4), which represent the impact of each variable on risk of problem substance use while simultaneously controlling for effects of every other variable.

For the most part, predictors of increased risk of substance abuse/dependence that were significant at each step in the multivariate analyses remained so in the final model. Focusing, therefore, on final model ORs, we found that higher age and experience

Table 2
Past-Year Rates of Substance Abuse/Dependence as a Function of Age (Weighted)

	Alcohol abuse/ dependence		Marijuana abuse/ dependence		Hard drug abuse/ dependence	
Age (years)	%	*n*	%	*n*	%	*n*
12	0	1	0	1	0	0
13	1	7	1	6	0	3
14	1	7	2	14	0	1
15	3	20	6	38	1	6
16	8	54	7	44	2	14
17	11	67	7	44	2	14

Note. $n = 3{,}907$.

Table 3
Univariate Odds and Past-Year Prevalence (Weighted) of Alcohol Abuse/Dependence, Marijuana Abuse/Dependence, and Hard Drug Abuse/Dependence

	Alcohol abuse/dependence			Marijuana abuse/dependence			Hard drug abuse/dependence		
Risk factor	%	*n*	OR	%	*n*	OR	%	*n*	OR
Age (per year)[a]			2.04***			1.66***			1.82***
Gender									
Male	5	93	1.00	4	88	1.00	1	19	1.00
Female	3	63	0.70	3	58	0.68	1	18	1.01
Race									
Caucasian	4	124	1.00	4	110	1.00	1	31	1.00
African American	3	16	0.63	2	12	0.47	0	1	0.22
Hispanic	4	12	0.92	5	16	1.46	1	3	0.86
Native American	3	4	0.78	6	9	1.73	2	2	1.85
Familial alcohol problem									
No	3	103	1.00	3	100	1.00	1	17	1.00
Yes	10	53	3.68***	9	47	3.38***	4	20	7.92***
Familial drug use									
No	4	132	1.00	3	107	1.00	1	21	1.00
Yes	7	24	1.89**	11	40	4.14***	5	16	7.89***
Physical assault									
No	3	76	1.00	2	64	1.00	0	8	1.00
Yes	9	81	3.93***	9	83	4.84***	3	29	12.35***
Sexual assault									
No	3	114	1.00	3	112	1.00	1	21	1.00
Yes	13	42	4.55***	11	35	3.80***	5	16	8.59***
Witnessed violence									
No	2	39	1.00	1	24	1.00	0	4	1.00
Yes	7	117	4.87***	8	123	8.42***	2	33	13.22***
Current PTSD									
No	4	131	1.00	3	115	1.00	1	26	1.00
Yes	13	25	3.98***	16	32	6.17***	6	11	8.68***

Note. n = 3,907. Bonferroni correction requires $p < .01$ to maintain a setwise alpha at .096. The reference category is indicated by an OR of 1.00. OR = odds ratio; PTSD = posttraumatic stress disorder.
[a] This continuous variable was analyzed through single-predictor logistic regression; the n for this variable is 3,907 (see Table 2 for age-based prevalences).
** $p < .01$. *** $p < .001$.

of sexual assault, physical assault, and witnessed violence elevated risk of alcohol, marijuana, and hard drug abuse/dependence over and above effects of all the other variables. Male respondents were at greater risk of alcohol and marijuana abuse/dependence relative to female respondents. Interestingly, race-based effects were maintained when effects of victimization, familial substance use, and PTSD status were controlled, with African Americans at greatly reduced risk of abuse/dependence relative to Caucasians. Familial substance use problems were associated with increased adolescent substance abuse after controlling for effects of demographic variables. PTSD status was associated with increased risk of marijuana and hard drug abuse/dependence but not alcohol abuse/dependence.[4]

Age of Onset: Substance Use and Victimization

Risk of substance abuse or dependence was consistently elevated in adolescents who had been victims of assault or who had witnessed violence. We conducted an analysis of covariance (ANCOVA) for each substance class in the subset of substance abusers to determine if victimized adolescent substance abusers began using a given substance earlier than nonvictimized abusers. Age of first use among abusers served as the dependent variable, whereas history of any observed or experienced victimization (i.e., sexual assault, physical assault, or witnessed violence) was the independent variable. Current age was the covariate because it is related to both the likelihood that one has been victimized and the age at first substance use (e.g., a child who is presently 13 years old cannot have already initiated use at 14 years). For adolescents with alcohol abuse/dependence, the main effect of experienced victimization showed a trend toward significance, $F(1, 125) = 3.63$, $p = .059$, and the covariate current age was also significant, $F(1, 125) = 62.61$ $p = .000$. The average (noncovariate-adjusted) age of nonexperimental alcohol use onset in victimized youth was 14.4 years compared with 15.1 years for nonvictimized youth. For adolescents with marijuana abuse/depen-

[4] We conducted a second set of multivariate analyses to test Gender × Victimization (i.e., sexual assault, physical assault, and witnessed violence) interaction effects for each type of substance. Only one of nine interaction terms in these analyses was statistically significant (physically assaulted boys were slightly more likely to use marijuana than physically assaulted girls).

definition) compared with the mean ages of onset (for victims) of nonexperimental alcohol (M = 14.4 years), $\chi^2(192, N = 248) = 231, p < .05$; marijuana ($M$ = 13.4 years), $\chi^2(176, N = 184) = 207, p = .05$; and hard drug use ($M$ = 13.1 years), $\chi^2(135, N = 95) = 172, p < .05$.

Discussion

Major findings of this study were as follows: (a) A significant proportion of adolescents (more than 10% of 17-year-olds) had current substance abuse or dependence; (b) both experienced and observed violence elevated risk of past-year problem substance use; (c) familial alcohol problems were also independently related to increased risk of adolescent alcohol and hard drug abuse/dependence but not marijuana problem use (by contrast, familial drug use increased risk of marijuana and hard drug abuse/dependence but not alcohol abuse/dependence); (d) PTSD independently increased risk of marijuana and hard drug use disorders but not alcohol abuse/dependence; and (e) when effects of other demographics, victimization history, and familial substance use were controlled, Caucasians were three to nine times more likely to meet the criteria for substance abuse/dependence relative to African Americans. Hispanics and Native Americans did not differ from Caucasians in terms of race-based risk.

This is the first study to assess prevalence of *DSM–IV*-defined substance abuse or dependence in a nationally representative sample of adolescents. The proportion of adolescents with substance abuse/dependence was sufficiently high to be clinically important. Among 17-year-olds, 10% met the criteria for past-year alcohol abuse/dependence, 7% met the criteria for marijuana abuse/dependence, and 2% met the criteria for hard drug abuse/dependence. For the total sample of youth aged 12 to 17 years, prevalence of alcohol and marijuana abuse/dependence was approximately 4% and prevalence of hard drug abuse/dependence was about 1%. Comparatively, the NCS (Warner, Kessler, Hughes, Anthony, & Nelson, 1995) reported that prevalence of drug dependence among drug users aged 15 to 24 years was 5% for women and 10% for men.

Past-year prevalence of substance use reported by nonexperimental users in our sample was somewhat lower than those reported in the MTF Study (Johnston, O'Malley, & Bachman, 1995a, 1995b). This is due to the fact that our past-year use data for each substance were collected only for participants who had used that substance at least four times or, in the case of alcohol, had consumed five or more drinks on a single occasion. As such, incidental users, such as those included in the MTF Study and NHSDA use rates, were not counted as users in this study.

In multivariate analyses, increased age was strongly associated with increased risk of substance abuse or dependence. A very interesting finding was reduced risk of substance abuse or dependence for African Americans relative to Caucasians, particularly after controlling for victimization effects. Neither Hispanic nor Native American respondents displayed differential risk when compared with Caucasians. These findings were consistent with those of other studies (e.g., Johnston et al., 1995a, 1995b; Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995; Widom et al., 1995; Windle, 1994). Although ethnically based differences in self-disclosure or other culturally based sources of reporting bias might be partially responsible for this finding, the consistency with which lower rates of African American substance abuse are noted across studies implies operation of other factors.

Consistent with the findings of Miller et al. (1987), risk of alcohol and hard drug abuse/dependence, but not marijuana abuse/dependence, was doubled, over and above effects of other variables, in children with family members who abused alcohol. Conversely, familial drug use increased risk of marijuana and hard drug abuse but not alcohol abuse. Apparently, the modeling effect of familial substance use was specific, leading to increased use of similar types of substances in adolescents.

The relevance of familial substance use to determining risk of adolescent substance abuse may also be affected by increased risk of assaultive violence among children of adult substance users. For example, Maltzman and Schweiger (1991) reported that 81% of their sample of treatment-seeking female adolescents whose parents used drugs had been physically or sexually assaulted compared with 57% of female patients whose parents did not use drugs. Thus, parental substance use appears to increase risk of adolescent substance use directly and by increasing risk of physical and sexual abuse, which then further increases risk of use (see below). Our data support this in that the magnitude of ORs associated with familial substance use was reduced when victimization and other factors were controlled.

Of greatest importance were findings related to victimization and witnessed violence. Although a conservative analytic strategy was used, experience of either physical or sexual abuse or assault uniquely increased risk of past-year alcohol abuse/dependence by a factor of about two. Similar findings were obtained for marijuana abuse/dependence and hard drug abuse/dependence. Interaction effects for gender on each form of victimization were analyzed and revealed no substantive differences by gender.

We proposed that observed violence is also highly stressful and potentially precipitates maladaptive coping responses, such as substance use or abuse. This position was strongly supported. Indeed, witnessing violence was among the most powerful risk factors for substance use disorders, tripling risk of abuse/dependence for all substances after effects of demographics, familial substance use, and victimization were controlled. The negative psychological impact of witnessed violence on children and adolescents has been previously documented (Fitzpatrick & Boldizar, 1993; Groves, 1997; Ollendick, 1996), and our results support this conclusion with respect to substance abuse/dependence. However, a portion of the effect of witnessed violence may be attributable to other related factors, particularly delinquency. Specifically, the violence witnessed might be that of peers engaging in delinquent acts, which are defined, in part, by substance use. Peer substance use is strongly associated with personal substance use (Swaim, Oetting, Edwards, & Beauvais, 1989). Therefore, a substantial proportion of the effect of witnessed violence on substance use may be due to delinquency status rather than to effects of witnessed violence, per se. On the other hand, observing interpersonal aggression such as domestic violence might be particularly frightening to children, leading to extremely high levels of negative affect. The fact that domestic violence is typically ongoing and that an adolescent's ability to escape from households in which domestic violence is occurring is limited may serve to further exacerbate negative affect. Substance abuse might well then be a result of the inappropriate coping style postulated above.

The final variable examined, PTSD diagnostic status, differed qualitatively from other variables in that it was neither an event nor an objectively observable descriptive characteristic. In contrast to the findings of Epstein et al. (1998), PTSD status was not associated with increased alcohol abuse. However, a diagnosis of PTSD did increase risk of marijuana and hard drug abuse/dependence. Failure of PTSD to increase risk of alcohol abuse/dependence may be related to the conservative manner in which its effects were tested (i.e., entered last in the regression analyses). Moreover, current PTSD and current substance abuse/dependence were the foci of study, and it may be the case that factors that maintain problem substance use differ from those that originally cause it. Alternatively, it is not clear whether all symptoms of PTSD immediately manifest themselves (Stewart, 1996). Aspects of PTSD that exhibit a delayed or adult onset following childhood trauma would not be detected by the present cross-sectional investigation. It may also be the case that some classes of substances are more effective than others in reducing arousal, intrusive ideation, and avoidance. That is, abuse of alcohol might effectively "mask" some symptoms required to make a diagnosis of PTSD in that specific symptoms are temporarily ameliorated through use (Stewart, 1996).

Data regarding order of onset of nonexperimental substance use and victimization indicated that victimized youth begin using substances at an earlier age than nonvictimized youth. This supports the position that victimization plays a role in producing adolescent substance abuse or dependent behavior. The importance of this finding is underscored by the fact that adolescent substance abuse appears to be exceptionally resistant to change and is accompanied by a host of medical and mental health problems. In addition to direct negative health outcomes, increased substance use appears to set the stage for future victimization or revictimization (Windle, 1994), which, in turn, increases risk of additional substance abuse (Kilpatrick et al., 1997). Data from the present study suggest that this cycle often begins with victimization in the form of sexual assault, physical assault, or witnessed violence. However, it is important to note that neither an established order of onset nor significant predictive correlations following such an established order prove causation.

If substance abuse among many adolescents is a response to negative affect produced by assault or witnessed violence (e.g., drinking to reduce severe anxiety triggered by external and interoceptive stimuli associated with a victimization experience), then issues relating to victimization should be addressed in interventions for this problem. Likewise, substance abuse screens should be incorporated into assessments of children who have experienced victimization or witnessed violence. Moreover, high rates of past victimization in adults who abuse substances indicate that assessment of assault and witnessed violence backgrounds may also be an area relevant to treatment outcome.

The present investigation is unique in that it demonstrated the independent negative effects of physical abuse, sexual abuse, and witnessed violence on adolescent alcohol, marijuana, and hard drug use for both male and female adolescents. Previous investigations have typically considered only one form of abuse, with one gender, and one class of substances. Generalizability of these findings is further enhanced through use of a nationally representative sample of adolescents and *DSM–IV* diagnostic-level dependent measures. As such, impact of long-term retrospective report bias inherent in adult samples (Briere, 1992) was minimized.

This study was not without weaknesses. Some retrospective report bias was possible because this was not a longitudinal investigation. Moreover, the cross-sectional design of this study prohibits analysis of longer term impact of exposure (see Stewart, 1996). Another concern is common method variance. We used only one method of assessment: telephone interview. Hence, no cross-validation of study measures, either by significant other report or objective indexes, was possible. In addition, participants were limited to those residing in homes with telephones. Further, telephone assessment may not be the optimal method for assessing substance use among adolescents.

Overall, the findings of this study represent an important advance in identifying the relationship between violence and substance abuse in youth. Future studies with this population should incorporate longitudinal designs in order to capture both risk and resiliency factors associated with adolescent substance abuse and dependence. This information could then prove helpful in devising both preventive and tertiary interventions for adolescents.

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Appendix

Measurement of Current Substance Abuse/Dependence

Closed-ended questions that followed *DSM–IV* criteria formed a structured interview and were asked to determine whether abuse or dependence criteria were met during the past year for each type of substance (alcohol, marijuana, and other drugs). Note that presence of either abuse or dependence was sufficient to be categorized as having current substance abuse/dependence in this study. Abuse was defined as an affirmative answer to one of the following questions.

1. Has your use of [substance] ever caused you major problems with your family, your friends, school, or on the job?
2. Have you ever been high from [substance] in a situation where it increased your chances of getting hurt—like driving a car or boat, swimming, or crossing the street in heavy traffic?
3. Have you ever been arrested or had problems with the police because you were taking [substance]—like for driving while intoxicated, for being drunk and disorderly, or for stealing to get [substance]?
4. Have you ever continued to use [substance] in spite of having a lot of problems with your family about using them—problems like fights, arguments, or other relationship problems?
5. In the past year, how often have you driven while feeling the effects of [substance].

Dependence was defined as an affirmative answer to three or more of the following experiences preceded by this introduction: "Now I'd like to ask you a few questions about things that sometimes happen to people when they use [substance]. Have you ever had any of the following experiences since you started using [substance]?"

1. You had to increase the amount of [substance] you were taking to get high or to get the same effect that you did when you started taking it. Or when you took the same amount of [substance] over a long period of time, you got less of an effect than when you first started taking it.
2. Have you ever suddenly stopped or cut down a lot on the amount of [substance] you were using when you had been using heavily almost every day for a long time? If so, did suddenly stopping or cutting down on any drug you've ever taken make you sick or give you withdrawal symptoms? Have you ever used a drug to keep you from getting sick or having withdrawal symptoms?
3. You took more [substance] or used them for a longer period of time than you wanted to.
4. You often wanted to cut down the amount of [substance] you were taking or stop taking [substance] but were not able to. Or you actually tried to cut down or stop taking [substance] but weren't able to.
5. You spent a lot of time trying to get [substance], taking [substance], or trying to feel better after taking [substance].
6. Your [substance] use caused you to give up or spend less time in school, work, with friends or family, or in recreation activities.
7. You kept using [substance] even though it caused you psychological problems—like making you feel bad emotionally—or caused problems with your health.

Measurement of Familial Alcohol Problems

Familial alcohol problems were defined by an affirmative answer to one of the following questions: "Has anyone—either in your family or who lived with you, not counting you—drank alcohol (beer, wine) so much that it became a problem? For example, did anyone drink so much they got into fights with other people, or started to beat the kids, or couldn't get out of bed the next day, or had difficulty holding a job?"

Measurement of Familial Drug Use

Familial drug use was defined by an affirmative answer to one of the following questions: "Did anyone in your family or who lived with you, not counting you, use hard drugs, such as heroin, cocaine, speed, or uppers or downers, or have a drug problem? Again, please include as family not only family members who lived with you but also anyone else who lived in your home, as well as parents, brothers, sisters, grandparents not living with you." Note that although specific problems were required for familial alcohol problems, familial drug use was considered significant because the illicit nature of the behavior carries with it the potential for severely problematic outcomes.

Measurement of PTSD

The NWS PTSD module asks respondents if they have ever had a period of 2 or more weeks during which they experienced each PTSD symptom. When symptoms are content specific, respondents are asked to specify the content of that symptom. This procedure permits assessment of symptom presence in association with a wide variety of events. Information is then gathered about onset age and recency of all of the symptoms. The *DSM–IV* PTSD Field Trial Study (Kilpatrick et al., 1998) evaluated the degree of reliability between the NWS PTSD module, administered by nonclinicians, and the Structured Clinical Interview for *DSM–III–R*, the gold standard of PTSD measures administered by clinicians. The kappa coefficient of agreement between the two measures at the diagnostic level was .77 for lifetime PTSD and .71 for current PTSD (Kilpatrick et al., 1998). See Resnick et al. (1993) for a more thorough description of the NWS PTSD module.

Previous data from the NWS reported by Resnick et al. (1993) supported the construct validity of a two-stage assessment of (a) history of traumatic events (i.e., *DSM–IV* PTSD Criterion A) and (b) PTSD diagnoses assessed without requirement that the respondent link specific symptoms to specific traumatic events. The trauma screen used in that study of adult women yielded rates of traumatic events and event-specific PTSD rates that were comparable with those identified in other prevalence studies (e.g., Kessler et al., 1995). The present study used a similar two-stage assessment of traumatic events and assessment of PTSD symptoms that did not require linkage of symptoms with specific events. Here, we addressed the validity of this approach by (a) comparing the overall rate of exposure within our sample with the rate reported by Boney-McCoy and Finkelhor (1995) in a national study of adolescents and (b) reporting rates of PTSD in the presence or absence of a history of violence exposure. As reported in greater detail in the Results section, the overall prevalence of any type of victimization (i.e., sexual and physical assault and witnessed violence) was 47% of the total sample. In the Boney-McCoy and Finkelhor study, the prevalence was 41%. In the present sample, prevalences of PTSD among those with versus without a history of violence exposure were 9% and 2%, respectively. Moreover, in the present sample, all but 2 of the individuals with current PTSD and substance abuse/dependence reported experiencing sexual assault, physical assault, or witnessed violence. Both of these individuals indicated that they had been in a serious accident. These findings support the validity of the PTSD diagnosis in the sense that (a) those events that clearly meet the definition of a traumatic stressor are associated with significant rates of current PTSD and (b) in the absence of such events, PTSD was rare (indeed, nonexistent in participants providing data for this study), even though all the participants were assessed for PTSD symptoms.

Measurement of Sexual Assault

Sexual assault was measured using the following screening questions preceded by this introduction: "Sometimes a person may do sexual things to a young person that the young person doesn't want. These unwanted sexual things can happen to boys as well as girls and to young men as well as young women. People who try to do unwanted sexual things to young

(*Appendix continues*)

people are not always strangers but can be someone you know well, like a neighbor, teacher, coach, counselor, boss, baby-sitter, minister, or priest. They can even be a family member. People who try to make young people do unwanted sexual things aren't always men or boys—they can also be women or girls. I am talking about *any* experiences you've had where someone tried to make you do something sexual you didn't want to do, no matter who did it, how long ago it happened, or whether it was reported to police."

1. Has a man or boy ever put a sexual part of his body inside your private sexual parts, inside your rear end, or inside your mouth when you didn't want them to?
2. Has anyone, male or female, ever put fingers or objects inside your private sexual parts or inside your rear end when you didn't want them to?
3. Has anyone, male or female, ever put their mouth on your private sexual parts when you didn't want them to?
4. Has anyone, male or female, ever touched your private sexual parts when you didn't want them to?
5. Has anyone ever made you touch their private sexual parts when you didn't want them to?
6. [For boys] Has a woman or girl ever put *your* private sexual part in her mouth or inside her body when you didn't want her to?

Adolescents responding affirmatively to one or more of these questions were classified as sexual assault victims.

Measurement of Physical Assault

The following prefatory statement was used to measure physical assault, which was then followed by behaviorally specific questions: "Sometimes young people get hit, beat up, or physically assaulted by another person. The person who hits, attacks, or beats up a young person isn't always a stranger but can be someone who the young person knows well, even a family member or friend. The person doing the hitting can be older than the young person, about the same age, or even younger than the young person. Young people tell us they sometimes get hit, attacked, or beat up at school, in their neighborhood, or even at home. These types of attacks can even happen to small children sometimes. Many times, young people never tell anyone about these events."

1. Has anyone—including family members or friends—ever attacked you with a gun, knife, or some other weapon, regardless of when it happened or whether you ever reported it or not?
2. Has anyone—including family members and friends—ever attacked you without a weapon, but you thought they were trying to kill or seriously injure you?
3. Has anyone—including family members and friends—ever threatened you with a gun or knife but didn't actually shoot or cut you?
4. Has anyone—including family members and friends—ever beat you up, attacked you, or hit you with something like a stick, club, or bottle so hard that you were hurt pretty bad?
5. Has anyone—including family members and friends—ever beat you up with their fists so hard that you were hurt pretty bad?
6. Families have different ways of punishing young people if they think they have done something wrong. Some families spank young people as a form of punishment. Has a parent or some adult in charge of you ever spanked you so hard that you had to see a doctor because you were hurt so bad?
7. Has a parent or someone in charge of you ever spanked you so hard that you got bad marks, bruises, cuts, or welts?
8. Has a parent or someone in charge of you ever punished you by burning you, cutting you, or tying you up?

Adolescents who responded affirmatively to any of these questions were classified as having experienced a physical assault.

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