

# Prevalence of Attention-Deficit/Hyperactivity Disorder and Conduct Disorder Among Substance Abusers

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**Background:** This cross-sectional study sought to determine the prevalence of attention-deficit/hyperactivity disorder (ADHD) and conduct disorder among adults admitted to 2 chemical dependency treatment centers. It was hypothesized that ADHD alone or in combination with conduct disorder would be overrepresented in a population of patients with psychoactive substance use disorders.

**Method:** Two hundred one participants were selected randomly from 2 chemical dependency treatment centers. Standardized clinical interviews were conducted using the Structured Clinical Interview for DSM-IV, the Addiction Severity Index, and DSM-IV criteria for ADHD. Reliabilities for the diagnostic categories were established using the Cohen kappa, and the subgroups of individuals with and without ADHD and conduct disorder were compared.

**Results:** Forty-eight (24%) of the participants were found to meet DSM-IV criteria for ADHD. The prevalence of ADHD was 28% in men (30/106) and 19% in women (18/95; NS). Seventy-nine participants (39%) met criteria for conduct disorder, and 34 of these individuals also had ADHD. Overall, individuals with ADHD (compared with those without ADHD) were more likely to have had more motor vehicle accidents. Women with ADHD (in comparison with women without ADHD) had a higher number of treatments for alcohol abuse. Individuals with conduct disorder (in comparison with those without conduct disorder) were younger, had a greater number of jobs as adults, and were more likely to repeat a grade in school, have a learning disability, be suspended or expelled from school, have an earlier age at onset of alcohol dependence, and have had a greater number of treatments for drug abuse. They were more likely to have a lifetime history of abuse of and/or dependence on cocaine, stimulants, hallucinogens, and/or cannabis.

**Conclusion:** A significant overrepresentation of ADHD exists among inpatients with psychoactive substance use disorders. Over two thirds of those with ADHD in this sample also met criteria for conduct disorder. Our sample had a very large overlap between ADHD and conduct disorder, and the major comorbidities identified here were attributable largely to the presence of conduct disorder. Individuals who manifest conduct disorder and/or ADHD represent a significant proportion of those seeking treatment for psychoactive substance use disorders. They appear to have greater comorbidity and may benefit from a treatment approach that addresses these comorbidities specifically through medical and behavioral therapies.

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Substance abuse remains a major national problem. Because treatment failures are common with standard substance abuse therapy, attempts have been made to delineate subgroups of patients who may benefit from a tailored treatment approach.<sup>1,2</sup> In the 1980s, several large studies examined the psychiatric comorbidities among individuals with psychoactive substance use disorders.<sup>3–8</sup> These studies, however, did not report on the prevalence of attention-deficit/hyperactivity disorder (ADHD). It is now recognized that ADHD does not necessarily resolve during adolescence.<sup>9–14</sup> In fact, longitudinal studies of children with ADHD demonstrate that up to 65% of these patients continue to manifest symptoms as adults.<sup>12,15,16</sup> Preliminary reports indicate that the co-occurrence of ADHD and psychoactive substance use disorders is more common than expected by chance.<sup>17–23</sup> However, most of these studies either consist of relatively small samples or use less-than-optimal diagnostic criteria (e.g., self-report surveys rather than clinical assessment). One exception is the study by Levin et al.,<sup>24</sup> which reported that while 10% of cocaine abusers were diagnosed with ADHD as children and adults, an additional 11% were found to have ADHD symptomatology as adults without significant childhood symptoms.

The presence of conduct disorder is a well-recognized risk factor for psychoactive substance use disorders and also has been shown to mediate the development of these disorders among individuals with ADHD.<sup>12,15,25,26</sup> Jensen and colleagues<sup>27</sup> concluded that the comorbidity of conduct disorder among children with ADHD predicts a significant increase in severe and persistent deleterious out-

comes. However, recent work has shown ADHD to be an independent risk factor in some samples. For example, Biederman and colleagues<sup>28</sup> reported that ADHD without other psychiatric comorbidity conferred a greater risk for all categories of substance use disorder. Moreover, Milberger et al.<sup>29</sup> found that ADHD was associated with higher rates and earlier onset of psychoactive substance use disorders, independent of comorbid psychiatric disorders in a sample of high-risk siblings. Indeed, Biederman et al.<sup>30</sup> found that ADHD may be associated with a chronological pattern of psychoactive substance use disorders in which early alcohol use disorder increases the risk for subsequent drug use disorder and early substance abuse increases the risk for chronic dependence. Consistent with this finding, Wilens et al.<sup>31</sup> reported that individuals with ADHD exhibit a longer duration of psychoactive substance use disorders and a longer time to remission than individuals without ADHD. ADHD may also be a significant barrier to successful treatment of these disorders.<sup>32</sup>

Conduct disorder and its chronic adult form, antisocial personality disorder, are associated with increased comorbid features such as criminal behavior, violent behavior, and increased risk for human immunodeficiency virus.<sup>33-37</sup> Conduct disorder also has been shown to confer a poorer prognosis for treatment of psychoactive substance use disorders.<sup>38</sup> There have been few controlled studies of medications used for conduct disorder that have shown any benefit.<sup>39</sup> Several studies have shown that behavioral modalities for the treatment of antisocial personality disorder have not been of great benefit.<sup>33,40-42</sup> Since pharmacotherapy (e.g., psychostimulant medications) has been found to manage symptoms of ADHD in adults,<sup>43-45</sup> such intervention may prove to be a useful adjunct in the treatment of psychoactive substance use disorders for patients with concurrent ADHD. This study sought to determine the prevalence of ADHD and conduct disorder among a sample of adults seeking treatment for psychoactive substance use disorders at 2 chemical dependency treatment centers.

## METHOD

### Participants

The participants were adults admitted to 2 chemical dependency treatment centers. The sites were chosen to offer a representative sample of the population presenting with psychoactive substance use disorders. One site, located in an affluent suburb of Detroit, Mich., served a high percentage of individuals with private health insurance. The second site, although located in a rural area, drew primarily from an urban population of lower socioeconomic status. Each center was visited twice weekly by a research assistant. At each visit, the research assistant selected a random sample from the patients who were admitted to the inpatient unit over the preceding few days.

Patients were included if they were 18 to 65 years of age and able to read English well enough to complete self-report questionnaires (not reported on in this article). Since approximately three quarters of the patients at each site were men, women were over-sampled in an attempt to enroll equal proportions of women. Written consent was obtained from all participants, and the study was approved by the Institutional Review Board of Wayne State University School of Medicine.

### Assessment Measures

Participants in the study were interviewed 4 to 7 days after admission to the unit to ensure that effects of drug detoxification were minimal at the time of the interview. Interviews of 2 to 3 hours were conducted by 3 advanced graduate students in psychology. Sessions included the Structured Clinical Interview for DSM-IV (SCID),<sup>46</sup> the Addiction Severity Index (ASI),<sup>47,48</sup> and a structured clinical interview for ADHD based on the DSM-IV criteria. Each subject was queried about the symptoms of ADHD he or she experienced as a child and as an adult. A rating based on expression of the 9 inattentive and 9 hyperactive/impulsive symptoms as a child and as an adult was made by the interviewer after probing for specific examples to validate each symptom. The symptoms were rated on a 4-point Likert scale with descriptors of "not at all," "a mild problem," "a moderate problem," and "a severe problem." Only symptoms that were rated as moderate or severe were considered to be positive. To be diagnosed with ADHD, the subject must (1) have met full DSM-IV criteria for ADHD (i.e., have at least 6 of the 9 inattentive and/or hyperactive/impulsive symptoms to a significant degree) as an adult, (2) have met full DSM-IV criteria for ADHD as a child (in retrospect), and (3) have no other psychiatric disorder that would better explain the ADHD symptomatology (e.g., schizophrenia or drug-induced ADHD symptoms).

Diagnostic reliability was established by systematic training of the 3 interviewers by one of the authors (A.T.), a clinical psychologist with extensive experience in the diagnosis of child and adult ADHD. In addition, the first 25 cases were submitted to group analysis with the senior clinical psychologist. A random subset of participants had their interview audiotaped; this group comprised 23 (11%) of the 201 participants, including 7 participants who were diagnosed with ADHD.

Each of the audiotapes was reviewed and re-rated by the 2 interviewers who did not perform the original interview. The Cohen kappa for interrater reliability was computed for the threshold level (6 or more of the ADHD symptoms) for the childhood inattentive symptoms ( $\kappa = 0.86$ ), the childhood hyperactive/impulsive symptoms ( $\kappa = 0.88$ ), the adult inattentive symptoms ( $\kappa = 0.71$ ), the adult hyperactive/impulsive symptoms ( $\kappa = 0.86$ ), and the overall diagnosis of ADHD ( $\kappa = 0.72$ ).

Interrater reliability was also determined for the SCID diagnoses of oppositional defiant disorder as a child ( $\kappa = 0.87$ ) and as an adult ( $\kappa = 0.98$ ), conduct disorder ( $\kappa = 0.88$ ), lifetime depression, dysthymia ( $\kappa = 0.67$ ), generalized anxiety disorder ( $\kappa = 0.89$ ), social phobia ( $\kappa = 0.71$ ), and post-traumatic stress disorder ( $\kappa = 0.77$ ). The interrater reliability on the SCID for psychoactive substance use disorders was also found to be acceptable, with the Cohen kappa results ranging between 0.80 and 0.98 for the individual substance use disorders.

### Statistical Analyses

The data were analyzed using version 7.5 of the SPSS-PC software program (SPSS Inc., Chicago, Ill.). Student *t* tests (2-tailed) and chi-square analyses were used to compare differences between groups. Separate analyses were done for men and women. Analysis of variance and logistic regression models were also used to simultaneously examine the influence of conduct disorder and ADHD. Many of the data are presented in 2 × 2 tables created using the variables of ADHD and conduct disorder to demonstrate the separate and combined effects of these factors.

## RESULTS

To determine if the sample was representative of the population in the 2 substance abuse treatment centers, demographic data were collected from an additional sample of 125 clients who refused to participate in the study or who were discharged from treatment before an interview could be arranged. In comparison with those individuals who refused participation, the 201 participants differed significantly in that they were younger (mean age = 35.1 vs. 38.5 years,  $p = .002$ ), had a greater mean length of stay in the inpatient unit (21 vs. 18 days,  $p < .001$ ), and were more likely to have never married or to be divorced (72% vs. 54%,  $p = .003$ ). However, there were no differences regarding employment status ( $p = .62$ ), ethnicity ( $p = .09$ ), gender ( $p = .23$ ), education status ( $p = .06$ ), or total number of admissions ( $p = .32$ ).

Among the 201 participants, the diagnosis of ADHD (as a child and as an adult) was made in 48 individuals (24%), of whom 30 were men (28% prevalence) and 18 were women (19% prevalence; NS). Conduct disorder

Table 1. Demographics<sup>a</sup>

Variable	Non-ADHD, Non-CD (N = 108)	CD Only (N = 45)	ADHD Only (N = 14)	ADHD + CD (N = 34)	Significance
Test site (Site A)	60 (56)	28 (62)	8 (57)	23 (68)	$p = .66$
Age, y, mean ± SD	38.2	32.9	36.9	31.4	$p = .00$
Socioeconomic status <sup>b</sup>					$p = .05$
Low	27 (25)	17 (38)	6 (43)	6 (18)	
Low middle	67 (62)	25 (56)	4 (29)	20 (59)	
Middle	13 (12)	2 (4)	4 (29)	8 (24)	
High	1 (1)	1 (2)	0 (0)	0 (0)	
Gender, M	45 (42)	31 (69)	8 (57)	22 (65)	$p = .01$
Ethnicity					$p = .09$
White	83 (77)	32 (71)	13 (93)	31 (91)	
African American	25 (23)	13 (29)	1 (7)	3 (9)	
Education					$p = .30$
Less than 12th grade	24 (22)	11 (24)	1 (7)	13 (38)	
High school graduate	33 (31)	11 (24)	7 (50)	11 (32)	
Part college	27 (25)	12 (27)	3 (21)	9 (26)	
Training school	16 (15)	7 (16)	3 (21)	0 (0)	
College graduate	8 (7)	4 (9)	0 (0)	1 (3)	
Marital status					$p = .06$
Married	31 (29)	9 (20)	4 (29)	7 (21)	
Separated/divorced	45 (42)	14 (31)	3 (21)	7 (21)	
Never married	32 (30)	22 (49)	7 (50)	20 (59)	
Employed	60 (56)	20 (44)	6 (43)	16 (47)	$p = .47$
No. of jobs as an adult, mean	7.3	10.0	10.2	13.5	$p = .05$
Repeated a grade	16 (15)	16 (36)	2 (14)	17 (50)	$p = .00$
Learning disability	5 (5)	7 (16)	2 (14)	8 (24)	$p = .01$
Suspended or expelled from school	40 (37)	34 (76)	7 (50)	27 (79)	$p = .00$

<sup>a</sup>All values shown as N (%) unless otherwise specified.

Abbreviations: ADHD = attention-deficit/hyperactivity disorder, CD = conduct disorder.

<sup>b</sup>For socioeconomic status, the "high middle" and "high" subgroups were combined.

was diagnosed in 79 individuals (39%), 34 of whom also had ADHD. Only one individual with conduct disorder did not meet criteria for antisocial personality disorder. Bivariate analyses revealed a number of differences between those with and without ADHD. However, most of these differences were accounted for by the presence of conduct disorder. After controlling for conduct disorder, individuals with ADHD reported a greater number of driving accidents than those without ADHD (3.3 vs. 2.0;  $p = .03$ ), and women with ADHD had a significantly greater number of treatments for alcohol abuse or dependence (2.6 vs. 1.2;  $p = .03$ ). As shown in Table 1, there were no statistically significant differences between the 4 subgroups in test site, ethnicity, educational level attained, marital status, or employment status. However, those with ADHD were more likely to have a higher socioeconomic status. Individuals with conduct disorder were significantly younger and more likely to be male, have repeated a grade, have been diagnosed with a learning disability, have been suspended or expelled from school, and have held more jobs as an adult.

The psychiatric comorbidities of the 4 subgroups are described in Table 2. There were no statistically significant differences between the subgroups with regard to depression, generalized anxiety disorder, bipolar disorder, social phobia, or posttraumatic stress disorder. Individu-

als with conduct disorder, ADHD, and both conduct disorder and ADHD were more likely to have manifested oppositional defiant disorder than were the non-ADHD, non-conduct disorder subgroup. It is interesting to note that individuals with both conduct disorder and ADHD were significantly more likely to have had onset of conduct disorder prior to age 10 (i.e., childhood onset). As noted, all of the individuals (with one exception) in our sample who had conduct disorder also met criteria for antisocial personality disorder. The variables related to substance abuse per se are shown in Tables 3 and 4. The age at onset of alcohol dependence was significantly earlier in the subgroups with conduct disorder with a trend toward earlier onset among those with ADHD without conduct disorder. However, the age at onset for dependence on all other drugs was not statistically significant. The conduct disorder and ADHD subgroups had significantly greater number of treatments for drug abuse or dependence. There were no significant differences between the subgroups on the ASI.

With regard to the type of drugs used, there were no differences in the proportion of individuals who had either lifetime or current abuse or dependence on alcohol, sedative-hypnotics, or opioids. However, the conduct disorder subgroup was significantly more likely to have been diagnosed with lifetime dependence on cocaine, stimulants, hallucinogens/phencyclidine, and/or cannabis. Current abuse or dependence did not differ between these subgroups.

## DISCUSSION

The present findings demonstrate that a disproportionate number of individuals who entered 2 representative centers for chemical dependency treatment met DSM-IV diagnostic criteria for adult ADHD. These individuals reported clinically significant ADHD symptoms beginning in childhood and persisting into adulthood that were not

**Table 2. Comorbidities<sup>a</sup>**

Disorder	Non-ADHD,				Significance
	Non-CD (N = 108)	CD Only (N = 45)	ADHD Only (N = 14)	ADHD + CD (N = 34)	
ODD as child	21 (19)	32 (71)	9 (64)	30 (88)	p = .00
ODD as adult	20 (19)	27 (60)	8 (57)	25 (74)	p = .00
Childhood onset CD	n/a n/a	14 (31)	n/a n/a	20 (59)	p = .02
Depression, lifetime	42 (39)	20 (44)	8 (57)	14 (41)	p = .46
GAD, lifetime	16 (15)	7 (16)	4 (29)	7 (21)	p = .50
Bipolar disorder, lifetime	2 (2)	1 (2)	1 (7)	0 (0)	p = .43
Social phobia, lifetime	17 (16)	4 (9)	2 (14)	6 (18)	p = .66
PTSD, lifetime	10 (9)	5 (11)	2 (14)	5 (15)	p = .80

<sup>a</sup>All values shown as N (%). Abbreviations: GAD = generalized anxiety disorder, n/a = not applicable, ODD = oppositional defiant disorder, PTSD = posttraumatic stress disorder.

**Table 3. Substance Abuse Variables<sup>a</sup>**

Variable	Non-ADHD,				Significance
	Non-CD (N = 108)	CD Only (N = 45)	ADHD Only (N = 14)	ADHD + CD (N = 34)	
Age at onset, dependence					
Alcohol	26.7	19.3	22.2	19.2	p = .00
Cannabis	20.4	16.4	14.0	15.0	p = .15
Stimulants	23.0	24.3	15.0	18.5	p = .55
Opioids	25.1	23.1	None	23.4	p = .89
Cocaine	27.2	24.7	26.2	27.2	p = .57
Age at onset, abuse					
Alcohol	25.0	18.0	25.3	15.7	p = .41
Cannabis	18.8	16.6	16.0	14.7	p = .18
Stimulants	21.2	20.6	None	15.0	p = .80
Opioids	22.6	23.5	None	23.0	p = .99
Cocaine	22.7	28.8	None	19.2	p = .34
No. of treatments for alcohol abuse/dependence	1.5	1.8	2.5	2.0	p = .32
No. of treatments for drug abuse/dependence	1.1	2.2	1.7	1.7	p = .03

<sup>a</sup>All values shown as means.

**Table 4. Structured Clinical Interview for DSM-IV Lifetime Diagnoses<sup>a</sup>**

Diagnosis	Non-ADHD,				Significance
	Non-CD (N = 108)	CD Only (N = 45)	ADHD Only (N = 14)	ADHD + CD (N = 34)	
Alcohol use disorder					p = .98
Abuse	15 (14)	6 (13)	2 (14)	4 (12)	
Dependence	71 (66)	32 (71)	9 (64)	24 (71)	
Cocaine use disorder					p = .00
Abuse	4 (4)	6 (13)	0 (0)	5 (15)	
Dependence	48 (44)	28 (62)	6 (43)	22 (65)	
Stimulant use disorder					p = .05
Abuse	4 (4)	7 (16)	2 (14)	3 (9)	
Dependence	6 (6)	5 (11)	1 (7)	9 (26)	
Hallucinogens/ PCP use disorder					p = .00
Abuse	6 (6)	14 (31)	1 (7)	4 (12)	
Dependence	3 (3)	2 (4)	0 (0)	6 (18)	
Cannabis use disorder					p = .00
Abuse	36 (33)	18 (40)	3 (21)	12 (35)	
Dependence	10 (9)	18 (40)	2 (14)	11 (32)	
Sedative/hypnotic use disorder					p = .12
Abuse	5 (5)	8 (18)	1 (7)	2 (6)	
Dependence	9 (8)	6 (13)	2 (14)	5 (15)	
Opioid use disorder					p = .49
Abuse	6 (6)	2 (4)	2 (14)	3 (9)	
Dependence	24 (22)	14 (31)	1 (7)	9 (26)	

<sup>a</sup>All values shown as N (%). Abbreviation: PCP = phencyclidine.

attributable to other psychiatric diagnoses, including psychoactive substance use disorders. Our sample had relatively high rates of conduct disorder and a large overlap between those diagnosed with ADHD and conduct disorder. Community-based samples place the prevalence of ADHD at approximately 5% to 9% of children.<sup>49</sup> Studies in the community on the prevalence of ADHD in adults have not been completed, but longitudinal studies of children with ADHD have found that persistence of ADHD symptoms into adulthood ranges from 11% to 65%.<sup>12,15</sup> Assuming this estimate, the prevalence rate of ADHD in adults would be approximately 1% to 2%. The 24% rate of ADHD found in this study of patients in inpatient chemical dependency treatment is 5-fold higher than the childhood rate for ADHD and at least 10-fold higher than the expected rate of ADHD in the adult population.

Studies have found that 20% to 60% of patients with psychoactive substance use disorders have comorbid conduct disorder and/or antisocial personality disorder.<sup>50,51</sup> Therefore, our findings of 39% prevalence of conduct disorder is consistent with other samples. The relationship between psychoactive substance use disorders and conduct disorder/antisocial personality disorder has been well established. Conduct disorder is a predictor of psychoactive substance use disorders in adolescents and adults, especially with onset in childhood (before the age of 10).<sup>52,53</sup> Earlier onset and conduct disorder symptoms of greater severity are predictors of worse psychoactive substance use disorder outcomes.<sup>54</sup> Finally, adults with antisocial personality disorder have more severe substance use and worse treatment prognosis.<sup>36,55-58</sup> Consistent with these earlier findings, we report that individuals with conduct disorder had a great deal of associated problems such as a greater number of jobs as an adult, more grade retentions in school, higher prevalence of learning disabilities and suspensions from school, earlier age at onset of alcohol dependence, and greater number of treatments for drug abuse.

There are a number of potential explanations for the association of ADHD and psychoactive substance use disorders. First, there may be a behavioral linkage between these 2 conditions. For example, individuals with ADHD may be more likely to experiment with alcohol or drugs owing to the impulsivity inherent in their disorder. Genetic links may also play a role. Recent studies have revealed an association between dopamine D<sub>4</sub> receptor polymorphism, ADHD, and novelty-seeking behavior.<sup>59-61</sup> In research that characterized different types of alcoholics, Cloninger et al.<sup>62</sup> described one, referred to as "Type Two," that has many attributes akin to those of individuals with ADHD.

Both adoption and twin studies have found evidence of genetic and environmental influences in antisocial personality disorder and psychoactive substance use disorders.<sup>63</sup> For example, Crowe<sup>64</sup> found antisocial personality

disorder in 13% of adopted offspring of incarcerated female offenders compared with 2% of matched controls, and Cadoret<sup>65</sup> found antisocial personality disorder in 22% of adoptees with antisocial parents in comparison with none from a matched control group. Similar findings were reported by Mednick and colleagues.<sup>66</sup> In a literature review, DiLalla and Gottesman<sup>67</sup> estimated pairwise concordance rates of 0.87 for monozygotic twins and 0.72 for dizygotic twins for juvenile delinquency and 0.51 for monozygotic twins and 0.22 for dizygotic twins for adult criminal behaviors.

The diagnosis of ADHD is closely linked to that of conduct disorder and antisocial personality disorder. Approximately 28% to 50% of adolescents with ADHD have coexisting conduct disorder.<sup>15,68</sup> As mentioned, it is well recognized that conduct disorder and antisocial personality disorder are strong risk factors for psychoactive substance use disorders.<sup>12</sup> Therefore, it is not surprising to observe high rates of conduct disorder and antisocial personality disorder in a sample of inpatients with psychoactive substance use disorders. However, the extraordinary confluence of conduct disorder and antisocial personality disorder (approximately 70%) in those with ADHD is most impressive. Recent evidence suggests that ADHD plus conduct disorder may have a familial association and be etiologically distinct from ADHD without conduct disorder.<sup>69</sup>

Earlier studies of adolescents with ADHD found that those diagnosed with both ADHD and conduct disorder had a high rate of subsequent substance abuse. However, youth with ADHD and without conduct disorder did not appear to have a higher rate of alcohol or other drug abuse compared with control groups.<sup>15,16,70</sup> Both Tarter<sup>71</sup> and Halikas et al.<sup>72</sup> reviewed these data and concluded that the etiologic link between ADHD and substance abuse is the comorbidity of conduct disorder. On the other hand, recent studies by Biederman and colleagues<sup>28-31</sup> demonstrate that ADHD may present an independent risk factor for psychoactive substance use disorders. The present study confirms the strong association between conduct disorder and psychoactive substance use disorders, but also reveals that individuals with both ADHD and conduct disorder were more likely to have childhood onset of conduct disorder than were those with conduct disorder alone. Despite the earlier onset of conduct disorder in those with ADHD, ADHD (owing to a requirement for significant symptoms to occur earlier than 7 years of age) precedes the development of conduct disorder and may increase the risk of developing conduct disorder.<sup>73</sup> The fact that the diagnosis of ADHD conferred few additional comorbid features (over those conferred by conduct disorder/antisocial personality disorder) does not mean it is irrelevant. Although conduct disorder intuitively explains the development of psychoactive substance use disorders and much of its comorbidity, adults with ADHD have significant educational, occupational, and psychiat-

ric comorbidity that significantly impairs daily functioning.<sup>9-12</sup> In addition, recent reports suggest that ADHD may act synergistically with conduct disorder to produce increased risk and severity of psychoactive substance use disorder symptomatology.<sup>74,75</sup>

While there is no accepted medical treatment for conduct disorder, emerging evidence demonstrates the efficacy of medical treatment for adults with ADHD.<sup>43-45</sup> With increasing age, the symptoms of antisocial personality disorder often decrease, and an individual in a recovery process may find that ADHD symptoms (such as inattention, disorganization, mental and physical restlessness, and impulsivity) now represent significant impediments to regaining social, occupational, and educational productivity. Several reports have suggested that medical treatment for ADHD may have benefit in individuals with co-existent psychoactive substance use disorders.<sup>76-81</sup>

### Limitations

The generalizability of findings in this study may be limited in certain ways. The sample of 201 was drawn solely from 2 inpatient chemical dependency treatment centers. A degree of validation is garnered from the observation (data available from the authors) that the demographic data of these randomly selected participants are virtually identical to those of the substance abuse treatment population at large in the state of Michigan with regard to age, gender, ethnicity, socioeconomic status, and preferred drug. The sample did not include outpatients with psychoactive substance use disorders or non-treatment-seeking individuals, and it is not known if ADHD and/or conduct disorder would be found in a similar proportion among substance abusers selected in outpatient and/or community settings. Although adequate numbers of women were sampled to estimate the prevalence of ADHD, conduct disorder, and other comorbidities, the number of minorities who participated in the study was inadequate to provide meaningful data on the prevalence of ADHD and conduct disorder in this subpopulation. This study was not designed to include a control group of individuals without psychoactive substance use disorders to determine the prevalence of ADHD in the general adult population. However, Murphy and Barkley<sup>82</sup> recently reported an approximate rate of 4.7% of adults in the general population who met criteria (on a self-report scale) for ADHD.

The number of subjects with ADHD who did not have comorbid conduct disorder was very small (N = 13). Therefore, it was not possible to fully examine the relationship between ADHD without conduct disorder and psychoactive substance use disorders. We were unable to obtain parent, collateral, or educational reports on the study participants. It is not known how the inclusion of such information would affect our results. However, the study participants were not "seeking" an evaluation for ADHD. This fact combined with the lack of collateral in-

formation on childhood ADHD symptoms makes our data conservative in their estimate of the prevalence of ADHD.

In the absence of any validated clinical research assessment protocol for the diagnosis of ADHD in adults, the generally accepted clinical diagnosis (DSM-IV) was operationalized in a structured interview and then shown to be reliable in this sample. Recent reviews confirm the reliability of diagnosing ADHD in adults this way.<sup>83-85</sup> Indeed, they emphasize that ADHD is a clinical diagnosis, not one that can be made using self-report or laboratory testing. The DSM-IV criteria represent the state-of-the-art method for diagnosis of ADHD in adults.<sup>86</sup>

Finally, psychiatric assessments were made 4 to 7 days after admission to the treatment center when subjects may have still been experiencing withdrawal. Thus, it is possible that the symptoms of withdrawal could have been mistaken for ADHD symptoms and/or existing ADHD symptoms may have been exacerbated by the withdrawal. However, our assessment was designed to capture ADHD and conduct disorder as chronic, lifelong disorders and involved asking subjects about symptoms that were typical of their adult life as well as having been typical of themselves as children. Thus, it is not likely that the diagnoses of ADHD or conduct disorder were based on acute withdrawal symptomatology.<sup>75</sup>

### CONCLUSION

This study has ascertained that approximately one quarter of individuals entering inpatient substance abuse treatment met DSM-IV criteria for diagnosis of ADHD. This finding is consistent with previous reports that were based on small numbers or that employed different diagnostic criteria,<sup>17-23</sup> yet higher than that found in a recent study using similar diagnostic criteria.<sup>24</sup> Participants with ADHD were much more likely to have conduct disorder and antisocial personality disorder (and with earlier onset). Individuals with ADHD also had more motor vehicle accidents, and women with ADHD had a higher number of treatments for alcohol abuse. No differences were found between the ADHD group and the non-ADHD group in the use of specific types of drugs or in the other comorbidities studied once conduct disorder was added in multivariate analyses. Participants with conduct disorder were younger, had a greater number of jobs as an adult, and were more likely to repeat a grade in school, have a learning disability, be suspended or expelled from school, have an earlier age at onset of alcohol dependence, and have had a greater number of treatments for drug abuse. Those with conduct disorder also were more likely to have a history of abuse and/or dependence on cocaine, stimulants, hallucinogens, and cannabis.

These data confirm the strong association between conduct disorder/antisocial personality disorder and ADHD among individuals with psychoactive substance use disor-

ders. Because individuals with these 3 diagnoses are likely to have very high relapse rates, this extensive comorbidity underscores the need for intensive treatment of all comorbid conditions. Medical and behavioral treatments are emerging for ADHD and conduct disorder/antisocial personality disorder, making it important to recognize and treat patients with psychoactive substance use disorders specifically for these associated disorders.

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