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# American Indian adolescents in substance abuse treatment: Diagnostic status

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**Abstract**

The goal of this study was to describe the prevalence of *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV) psychiatric disorders among a sample of American Indian (AI) adolescents in residential substance abuse treatment. Data on 89 AI adolescents admitted to a tribally operated residential substance abuse treatment program were collected. Participants reported using a mean of 5.26 substances; 20% percent met DSM-IV criteria for four or more substance use disorders. Marijuana abuse/dependence was the most common substance use disorder (84.3%). Eighty-two percent met criteria for at least one DSM-IV nonsubstance use disorder, the most common of which was conduct disorder (74.2%). These results suggest strong diagnostic parallels between these AI adolescents and their non-AI counterparts who have participated in similar studies, including the considerable diagnostic complexity that was common among the participants in this study. These diagnostic patterns suggest that emerging practices for treating substance-abusing adolescents that have been developed for use with non-AI adolescents warrant consideration for use with AI youths. © 2006 Elsevier Inc. All rights reserved.

*Keywords:* Indian, North American; Adolescence; Substance abuse treatment centers; Substance-related disorders; Comorbidity

## 1. Introduction

Community-based studies have consistently documented rates of substance use and substance use disorders among American Indian (AI) adolescents that are significantly higher than those identified among their non-AI counterparts (Beals et al., 1997; Beauvais, 1996; Blum, Harmon, Harris, Bergeisen, & Resnick, 1992; Costello, Farmer, Angold, Burns, & Erkanli, 1997; Federman, Costello, Angold, Farmer, & Erkanli, 1997). These studies have also documented higher rates of comorbidity between substance use and nonsubstance use psychiatric disorders among AI adolescents (Beals et al., 1997; Costello et al., 1997; Federman et al., 1997). It is not surprising then that the correlates and consequences of the use of alcohol and other substances among AI adolescents are ongoing public health concerns (U.S. Department of Health and Human Services, 2001). This is despite longstanding recognition by communities, clinicians, and policy makers, as well as several key policy initiatives, and an array of preventive and clinical interventions (Hawkins, Cummins, & Marlatt, 2004; Manson, 2001; Novins, Spicer, Beals, & Manson, 2004; U.S. Congress Office of Technology Assessment, 1990; U.S. Department of Health and Human Services, 2001).

The last major policy initiative for the treatment of AI adolescents was the Omnibus Drug Act of 1986, which provided funding for 12 regional residential substance abuse treatment programs (RSATPs) specifically for adolescents (Novins, Beals, Shore, & Manson, 1996). Because of the limited availability of outpatient services, these RSATPs have become the key treatment setting for AI adolescents with severe substance use problems (Manson, 2001; Novins et al., 1996; Novins, Fleming, Beals, & Manson, 2000).

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Research regarding RSATPs for AI adolescents is extremely limited, with only three studies published in the last 15 years. Taken together, these studies have concluded that these adolescents have complex and serious substance use problems, as well as a high prevalence of nonsubstance use psychiatric symptomatology (Husted, Johnson, & Redwing, 1995; Johnson & Stewart, 1990; Novins et al., 1996). Unfortunately, because these studies relied on treatment record reviews, did not use *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV; American Psychiatric Association, 1994) definitions of mental disorders, and did not employ structured diagnostic interviews (Husted et al., 1995; Johnson & Stewart, 1990; Novins et al., 1996), they leave unanswered key questions regarding the prevalence and patterns of substance use and nonsubstance use psychiatric disorders in this important population.

In contrast, several studies of non-AI adolescents in RSATPs and other substance abuse treatment settings have used DSM criteria and structured diagnostic interviews (Aarons, Brown, Hough, Garland, & Wood, 2001; Deykin & Buka, 1997; Garland et al., 2001; Riggs, Baker, Mikulich, Young, & Crowley, 1995; Whitmore et al., 1997). These studies found that non-AI youths in substance abuse treatment usually meet criteria for multiple substance use disorders (Aarons et al., 2001; Riggs et al., 1995; Whitmore et al., 1997). For example, Whitmore et al. reported that male adolescents in an RSATP and female adolescents in a day treatment program met criteria for an average of 3.8 and 3.4 substance use disorders, respectively. Male adolescents were more likely than female adolescents to meet criteria for marijuana, inhalant, and hallucinogen dependence (Whitmore et al., 1997). Alcohol and marijuana use disorders were the most common substance use disorders in these studies (past-year rates of 22–43%), followed by hallucinogens, stimulants, and cocaine (2–15%; Aarons et al., 2001; Riggs et al., 1995; Whitmore et al., 1997).

In addition to complex and serious substance use problems, these studies have identified a high prevalence of nonsubstance use psychiatric disorders (called "mental disorders" hereafter) among non-AI adolescents in substance abuse treatment (Deykin & Buka, 1997; Garland et al., 2001; Riggs et al., 1995; Whitmore et al., 1997). Conduct disorder (CD) was the most common mental disorder reported in these studies (past-year rates of 32.1–100.0%), followed by attention deficit/hyperactivity disorder (ADHD; 10.0–21.1%), and major depressive disorder (MDD; 8.9–23.0%; Garland et al., 2001; Riggs et al., 1995; Whitmore et al., 1997). Deykin and Buka (1997) focused specifically on the prevalence of posttraumatic stress disorder (PTSD) among substance-dependent adolescents in RSATPs and reported past-month rates of 19.2%. Female adolescents had a higher rate of PTSD than male adolescents (40.0% vs. 12.2%, respectively). In the study of Whitmore et al., male adolescents in an RSATP and female adolescents in a day treatment program did not differ in the prevalence of CD, ADHD, or MDD.

This study follows a previous one that examined the prevalence of substance use and comorbid psychiatric symptomatology among 64 AI adolescents admitted to an RSATP (Novins et al., 1996). In the prior study, which involved the review of participant treatment records, polysubstance use was common, with 22.2% of participants reporting the use of four or more substance classes. Alcohol and marijuana were the most commonly used substances (95.2% and 79.4%, respectively). Female adolescents were more likely than male adolescents to report the use of cocaine and amphetamines (and reported the use of more substance classes overall). Although this study did not generate estimates of substance use disorders, a high percentage of the sample reported problems related to alcohol use, including blackouts (75.6%) and damage to relationships (51.6%). Comorbid psychiatric symptomatology was noted in the records of 68.0% of the sample, with 48.9% noting significant antisocial behavior, 43.8% noting a previous suicide attempt, and 34.0% noting significant depressive symptoms.

This study builds on this previous work and provides important guidance for clinical services for AI adolescents in RSATPs by employing DSM definitions of mental disorders and structured diagnostic interviews—their first such use in an RSATP for this special population. The study was designed to answer the following questions: What is the prevalence of DSM-IV substance use and mental disorders among a sample of AI adolescents admitted to an RSATP? Does the prevalence of substance use and mental disorders differ by gender? Is there a relationship between specific substance use disorders and mental disorders?

## 2. Materials and methods

### 2.1. Setting

We recruited participants from a 24-bed RSATP for male and female AI adolescents. In working with AI communities, protecting the confidentiality of the tribes and tribal clinical programs is considered as important as protecting the confidentiality of the individual participants (Norton & Manson, 1996). Therefore, this program is described generally as being operated by a southeastern AI tribe and is funded by the Indian Health Service. The program is designed to provide specialized treatment to patients with substance use disorders, including those with mental disorders. The staff includes male and female behavioral health professionals encompassing the fields of substance abuse counseling, counseling psychology, education, and nursing. A number of recreation therapists and cultural experts complement the professional staff. Outside psychiatric services are used for patients with mental disorders who require concurrent psychopharmacologic treatment. Most of the professional and technical staff are themselves AIs.

### 2.2. Participants

Using a consecutive-admission study design, we recruited patients admitted to this RSATP between October 1998 and May 2001. Of 120 patients approached, 93 (77.5%) youths and their parents agreed to participate in the study. Those who agreed to participate in the study did not differ from those who refused in terms of age or gender. In addition, four participants who consented to participate left the RSATP within their first week of treatment and were therefore not eligible for our interview (described below in more detail), resulting in a final sample size of 89. Of the 89 participants, 20 did not complete the diagnostic interview because they left treatment early. Thus, some participants consented to participate, but were discharged from the program before the research staff were able to conduct this interview. For these participants, we imputed data regarding their diagnostic status and symptom endorsement. We chose to impute these data to allow us to make full use of the available data and to reduce the bias that might be introduced by relying on a partial sample (Croy & Novins, 2005; Pigott, 2001; Schafer & Graham, 2002). This method for analyzing studies with missing data is becoming increasingly common (Croy & Novins, 2005; Musil, Warner, Yobas, & Jones, 2002). For example, data from the recently completed National Epidemiologic Study of Alcohol and Related Problems are available to the public in a data set, with all missing values replaced with imputed values (Grant, Kaplan, Shepard, & Moore, 2003). Data were imputed with the expectation–maximization (EM) method (Little & Rubin, 1987) using data available from participants' treatment records. These treatment records included a number of standard measures, such as the Minnesota Multiphasic Personality Inventory—Adolescent Version (Hathaway & McKinley, 1989) and the Youth Self Report (Achenbach, 1991), as well as RSATP-specific questionnaires that included many items that were highly correlated with measures generated by the diagnostic interview. The EM process consists of two iteratively repeated steps. In the first step (expectation), means, variances, and covariances are computed. In the second step (maximization), multiple regression equations are built from the means, variances, and covariances, and equations are used to impute the missing data for each variable. After the missing data for each variable have been filled in with predicted values from multiple regression equations, new means, variances, and covariances are computed, and the cycle repeats. Although results were comparable when we conducted the analyses with and without these imputed data, we report only results from analyses of the imputed data, as recommended by Schafer and Graham (2002) and Pigott (2001), because omitting observations with missing data can leave a biased data set for analysis.

Participants were between 13 and 18 years old and represented 27 different AI tribes. Sixty-five percent ($n$ = 58) were male. The most common referral source was the legal system (31.5%), followed by the mental health service sector (15.7%) and the social welfare, substance abuse, and general health sectors (each referring 13.5% of the participants). Only 25% of the participants came from a home with both biological parents present (compared to 62.1% for AI children and adolescents in national statistics; Fields, 2001); 28.1% were not in school prior to their admission to the RSATP (compared to 15% for AI adolescents in national statistics; Freeman & Fox, 2005). More than half of the participants reported social networks that included individuals with active substance use problems, and 66.3% of adolescents reported being a victim of physical or sexual abuse (compared to 21.3% for AI children and adolescents in national statistics; U.S. Department of Health and Human Services, Administration on Children, Youth, and Families, 2005).

Thirty-nine percent of the participants completed the therapeutic component of the program. Twenty-six percent of participants were discharged before completing the program when the clinical staff determined that they would not benefit further by extending their stay. Two participants (2%) were discharged from the program because the clinical staff determined that their problems, such as severe mood disorders, could be better addressed in another treatment setting. Thirty-three percent were discharged for noncompliance with program rules or left against medical advice.

### 2.3. Procedure

Study procedures were reviewed and approved by the Colorado Multiple Institutional Review Board (IRB), the Indian Health Service IRB, and the participating tribe's IRB. All participants were eligible for the diagnostic interview after residing in the facility for a minimum of 7 days. We used this criterion to reduce the potential effects of the stress of admission and initial detoxification from substance use on participants' responses to the interview (Whitmore et al., 1997). Participants were interviewed in a private room in the RSATP. Ninety percent of interviews were completed within 35 days of admission. The average interview length was 76 minutes. In addition, participants' treatment records were reviewed after their discharge from the RSATP. Data were abstracted from these records using a standardized technique. For both interviews and treatment record reviews, extensive quality control procedures verified that this data abstraction was conducted in a standardized and reliable manner.

### 2.4. Measures

#### 2.4.1. Gender

Data regarding participants' gender were abstracted from participants' treatment records.

#### 2.4.2. DSM-IV diagnoses

Diagnoses were generated from a diagnostic interview that consisted of six modules of the Diagnostic Interview

Schedule for Children, Youth Version (DISC-IV-Y), and the Substance Abuse Module of the Composite International Diagnostic Interview (CIDI-SAM).

The DISC-IV-Y is a highly structured interview for children that can be administered by trained nonclinician interviewers to determine both DSM-IV diagnoses and specific diagnostic criteria (Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000). The psychometric characteristics of the DISC have been summarized elsewhere (Friman et al., 2000; Schwab-Stone et al., 1996; Shaffer et al., 1996, 2000). Our research group assessed the cultural appropriateness of the DISC-IV-Y through intensive item-by-item analyses by focus groups of AI clinicians, parents, and youths from two AI tribes. This process was identical to the one described by Beals, Manson, Mitchell, Spicer, and The AI-SUPERPFP Team (2003) for the CIDI. However, although the review of the CIDI (including the substance abuse module of the CIDI, or the CIDI-SAM, described below) resulted in several modifications to improve its comprehensibility and cultural appropriateness, the focus group review of the DISC-IV-Y failed to identify any necessary changes. We believe that this is because the DISC-IV-Y is the fourth version of this interview, and the field experience with the previous version enabled the developers of the interview to construct questions that assured comprehensibility and cultural appropriateness across diverse communities. We also believe that because the DISC-IV-Y was designed specifically for use with children as young as 12 years of age, the developers needed to ask the questions as simply as possible, thus avoiding some of the complex question structures that required modification in the CIDI-SAM.

We used the DISC-IV-Y to generate the following DSM-IV diagnoses over the past year: generalized anxiety disorder (GAD), PTSD, MDD, ADHD, oppositional defiant disorder (ODD), and CD. Although the DISC-IV-Y is able to generate diagnoses for both the past month and the past year, we chose to focus on diagnoses within the past year to assure adequate coverage of the participants' diagnostic status prior to their admission to the RSATP. Analyses were calculated using Version J scoring algorithms.

The CIDI-SAM allows for the comprehensive evaluation of substance use and substance-related psychiatric disorders and can be administered by trained nonclinician interviewers (Cottler, Robins, & Helzer, 1989). Although the DISC-IV-Y does include a module for the assessment of substance-related psychiatric disorders, it generates specific diagnoses for alcohol and marijuana, placing all remaining substances into an "other substances" category. We felt that the ability to distinguish specific substance abuse/dependence disorders was particularly important for assessing adolescents admitted to an RSATP. The CIDI-SAM interview has been used among adolescents in an RSATP (Crowley, Macdonald, Whitmore, & Mikulich, 1998; Riggs, Mikulich, Whitmore, & Crowley, 1999) and has been shown to be a reliable instrument among diverse populations (Horton, Compton, & Cottler, 2000). The interview is both reliable and valid (Cottler et al., 1989; Robins, Wing, Wittchen, & Helzer, 1988). The version of the CIDI-SAM used in this study included modifications to make it more culturally appropriate for AIs and has been used previously in studies of AI adults (Mitchell, Beals, Novins, Spicer, & The AI-SUPERPFP Team, 2003) and adolescents (Duclos et al., 1998). Modifications in the CIDI-SAM primarily consisted of simplifying questions that community members felt were overly complex, or providing an alternative wording of questions that community members felt were difficult to understand. The other major modification to the CIDI-SAM involved the questions related to peyote use. Because peyote can be used for religious purposes, it was excluded from the typical list of hallucinogens. Instead, a separate series of questions asked about the nonceremonial (i.e., illicit) use of peyote and whether this use met diagnostic criteria for hallucinogen abuse or dependence in the past year.

We used the CIDI-SAM to generate past-year DSM-IV diagnoses for the abuse of and dependence on alcohol, marijuana, and other substances (sedatives, tranquilizers, stimulants, analgesics, inhalants, cocaine, hallucinogens, and heroin). Although the CIDI-SAM is able to generate diagnoses for a number of different time periods (i.e., past month, past 6 months, past year, and lifetime), we focused on diagnoses within the past year to assure both adequate coverage of the participants' diagnostic status prior to their admission to the RSATP and to match the time frame of the DISC-IV-Y. Diagnoses were rendered by computer algorithms.

#### *2.4.3. Substance use*

We determined whether each participant reported lifetime use of the 10 classes of substances assessed by the CIDI-SAM, as noted above.

#### *2.4.4. Subthreshold psychiatric symptomatology*

Using data generated from the DISC-IV-Y and the CIDI-SAM, we determined whether each participant endorsed significant subthreshold symptomatology for a substance use disorder (one or two symptoms of substance dependence, but no symptoms of substance abuse; Pollock & Martin, 1999), CD (two symptoms from Criterion A; Zoccolillo, Pickles, Quinton, & Rutter, 1992), ADHD (eliminating Criterion B; Applegate et al., 1997), PTSD (Criterion A and at least one symptom each from Criteria B, C, and D; Stein, Walker, Hazen, & Forde, 1997), and MDD (i.e., minor depression—at least two symptoms from Criterion A, including A1 or A2; American Psychiatric Association, 1994).

### *2.5. Data analyses*

All data were analyzed using SPSS for Windows, version 12 (SPSS, 2001). First, we calculated the prevalence of substance use disorders, mental disorders, and subthreshold symptomatology by gender. Second, we examined the patterns of mental diagnoses by substance use disorders. Because of the

small sample size, we conducted these analyses for only those psychiatric diagnoses and substance use disorders with a prevalence of at least 11.2% ($n$ = 10). We used chi-square tests (Fisher exact test when fewer than five respondents were expected in any particular cell) and Mann–Whitney $U$ tests to test for differences by gender and diagnosis, as well as for the relationship between specific substance use and mental disorders. We calculated Spearman rank correlations to test for relationships between the numbers of substance use and mental disorders (Rosner, 2000). To balance the reduction of risk of type I error resulting from multiple analyses with the risk of increasing type II error in a study with such a small sample size, the Holm simultaneous testing procedure (Chandler, 1995; Holm, 1979; Neter, Kutner, Nachtsheim, & Wasserman, 1996) was employed to adjust the criteria for statistical tests for multiple comparisons. The Holm procedure is comparable to the Bonferroni procedure (Holland & Copenhaver, 1988) in that they are both used for simultaneous tests. However, the Holm procedure adjusts for each level of the test (specifically, the level against which each $p$ value is compared) as the investigator conducts a series of analyses, whereas the Bonferroni procedure does not. This difference results in the increased power of the Holm procedure. All $p$ values reported reflect these adjustments.

Table 1
Prevalence of past-year substance use disorders,[a] by gender

| | Total sample (%) | Male adolescents (%) | Female adolescents (%) |
|---|---|---|---|
| Any substance use disorder | 94.4 | 98.1 | 88.6 |
| Marijuana | 84.3 | 88.9 | 77.1 |
| Alcohol | 67.4 | 64.8 | 71.4 |
| Stimulants | 22.5 | 22.2 | 22.9 |
| Cocaine | 15.7 | 9.3 | 25.7 |
| Tranquilizers | 13.5 | 16.7 | 8.6 |
| Sedatives | 11.2 | 14.8 | 5.7 |
| Analgesics | 11.2 | 14.8 | 5.7 |
| Hallucinogens | 10.1 | 16.7 | 0.0* |
| Inhalants | 4.5 | 1.9 | 8.6 |
| Heroin | 1.1 | 1.9 | 0.0 |
| Number of substance use disorders | | | |
| 0 | 5.6 | 1.9 | 11.4 |
| 1 | 25.8 | 29.6 | 20.0 |
| 2 | 34.8 | 37.0 | 31.4 |
| 3 | 13.5 | 13.0 | 14.3 |
| 4 or more | 20.2 | 18.5 | 22.9 |

*Note*. Diagnostic status is as reported by participants interviewed with the CIDI-SAM (see text for details).
$n$ = 89 (58 Male adolescents and 31 female adolescents).
[a] DSM-IV abuse or dependence of substance class is listed.
* Statistically significant gender difference (Holm-adjusted $p$ < .05).

## 3. Results

### *3.1. Substance use and substance use disorders*

These AI adolescents reported using a mean of 5.26 substances. Marijuana was the most commonly used substance (100% of participants), followed by alcohol (96.6%), stimulants (57.3%), and cocaine (50.6%). The past-year prevalences of DSM-IV substance use disorders are displayed in Table 1. Twenty percent met DSM-IV criteria for four or more substance use disorders. Marijuana abuse/dependence was the most common substance use disorder (84.3%), followed by alcohol abuse/dependence (67.4%), stimulant abuse/dependence (22.5%), and cocaine abuse/dependence (15.7%). Male adolescents were more likely to meet criteria for hallucinogen use disorders (16.7% vs. 0.0%; $\chi^2$ = 6.49, $p$ = .040). No gender difference was evident in the number of substances used (5.4 vs. 5.0 for male and female adolescents, respectively, Mann–Whitney $U$ = 869.50, $p$ = .522; number of substance use disorders: 2.5 vs. 2.3 for male and female adolescents, respectively, Mann–Whitney $U$ = 933.50, $p$ = .921). Five participants (5.6%) did not meet diagnostic criteria for any substance use disorders, despite their admissions to an RSATP. Four of these participants met criteria for a subthreshold substance use disorder.

### *3.2. Mental disorders*

The past-year prevalence of DSM-IV mental disorders is displayed in Table 2. Eighty-two percent of participants met criteria for at least one DSM-IV nonsubstance use disorder; 27.0% met criteria for two or more such disorders. CD was the most common nonsubstance use disorder (74.2%), followed by ADHD (18.0%) and MDD (14.6%). Male adolescents were more likely to meet criteria for CD (83.3% vs. 60.0%; $\chi^2$ = 6.033, $p$ = .042).

### *3.3. Subthreshold psychiatric symptomatology*

Eighteen percent of participants met criteria for a subthreshold substance use disorder; 43% met criteria for at least one subthreshold mental disorder (7.9% for subthreshold CD; 25.8% for subthreshold ADHD; 13.5% for subthreshold PTSD; and 10.1% for subthreshold MDD). Most participants with subthreshold substance use disorders met criteria for another substance use disorder (77.8%). Likewise, the vast majority of participants with subthreshold mental disorders met full diagnostic criteria for another mental disorder (89.5%).

### *3.4. Relationships of substance use and mental disorders*

The relationship of DSM-IV substance use and mental disorders is displayed in Table 3. CD was more common among participants who met criteria for marijuana abuse/dependence ($\chi^2$ = 8.493, $p$ = .028, Fisher exact test). ADHD was more common among participants who met criteria for stimulant ($\chi^2$ = 8.485, $p$ = .021, Fisher exact test), tranquilizer ($\chi^2$ = 9.646, $p$ = .028, Fisher exact test), sedative ($\chi^2$ = 7.834, $p$ = .045, Fisher exact test), and analgesic abuse/dependence ($\chi^2$ = 13.492, $p$ = .008, Fisher

Table 2
Prevalence of past-year mental disorders,[a] by gender

| | Total sample (%) | Male adolescents (%) | Female adolescents (%) |
|---|---|---|---|
| Any comorbid disorder | 82.0 | 88.9 | 71.4 |
| Disruptive behavior disorders | 78.7 | 87.0 | 65.7* |
| CD | 74.2 | 83.3 | 60.0* |
| ODD | 3.4 | 1.9 | 5.7 |
| ADHD | 18.0 | 20.4 | 14.3 |
| Anxiety/depressive disorders | 19.1 | 13.0 | 28.6 |
| PTSD | 10.1 | 5.6 | 17.1 |
| GAD | 2.2 | 0.0 | 5.7 |
| MDD | 14.6 | 7.4 | 25.7 |
| Number of comorbid disorders | | | |
| 0 | 18.0 | 11.1 | 28.6 |
| 1 | 55.1 | 66.7 | 37.1 |
| 2 or more | 27.0 | 22.2 | 34.3 |

*Note*. Diagnostic status is as reported by participants interviewed with the DISC-IV-Y (see text for details). CD = conduct disorder; ODD = oppositional defiant disorder; ADHD = attention deficit/hyperactivity disorder; PTSD = posttraumatic stress disorder; GAD = generalized anxiety disorder; MDD = major depressive disorder.
$n = 89$ (58 Male adolescents and 31 female adolescents).
[a] Nonsubstance use psychiatric disorders.
* Statistically significant gender difference (Holm-adjusted $p < .05$).

exact test). MDD was more common among participants who met criteria for stimulant abuse/dependence ($\chi^2 = 8.601$, $p = .021$, Fisher exact test). PTSD was more common among participants who met criteria for stimulant ($\chi^2 = 11.225$, $p = .012$, Fisher exact test) and sedative abuse/dependence ($\chi^2 = 11.071$, $p = .032$, Fisher exact test). Participants who met criteria for marijuana (Mann–Whitney $U = 274.00$, $p = .012$), stimulant (Mann–Whitney $U = 346.00$, $p < .007$), cocaine (Mann–Whitney $U = 278.00$, $p = .012$), tranquilizer (Mann–Whitney $U = 260.50$, $p = .024$), sedative (Mann–Whitney $U = 224.00$, $p = .028$), and analgesic (Mann–Whitney $U = 175.00$, $p = .012$) use disorders met criteria for a greater number of mental disorders than those who did not have these specific substance use disorders. Finally, there was a positive relationship between the number of substances used and mental disorders (table available from the authors on request). Thus, only 8.7% of participants who had one substance use disorder had two or more mental disorders compared to 66.7% of participants with four or more substance use disorders (Spearman $R = 0.489$, $p < .001$).

## 4. Discussion

This study is the first to describe the prevalence and patterns of DSM-IV substance use and mental disorders among AI adolescents admitted to an RSATP. Indeed, the use of structured diagnostic interviews using DSM-IV criteria among AI adolescents in a substance abuse treatment setting is unprecedented. Many of the findings confirm hypotheses regarding these AI youths that sprang both from previous studies of this patient population that used less rigorous designs and from those of non-AIs in similar substance abuse treatment settings.

First, as suggested by these other studies, AI adolescents in RSATPs used multiple substances and met criteria for multiple substance use disorders. Indeed, only three participants reported using a single substance in their lifetime and more than two thirds met criteria for more than one substance use disorder. One notable difference in these patterns from studies of non-AI adolescents in similar settings is the relative prevalence of the use and abuse/dependence of alcohol and marijuana. In studies of non-AI adolescents, rates of alcohol use and alcohol use disorders

Table 3
Relationships of past-year substance use and mental disorders

| | | | Participants with specific substance use disorders[a] (%) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| All participants | $n$ | All participants ($n$ = 89) | Marijuana ($n$ = 75) | Alcohol ($n$ = 60) | Stimulants ($n$ = 20) | Cocaine ($n$ = 14) | Tranquilizers ($n$ = 12) | Sedatives ($n$ = 10) | Analgesics ($n$ = 10) |
| Specific mental disorders[b] | | | | | | | | | |
| CD | 66 | 74.2 | 80.0* | 78.3 | 75.0 | 78.6 | 91.7 | 90.0 | 90.0 |
| ADHD | 16 | 18.0 | 20.0 | 18.3 | 40.0* | 35.7 | 50.0* | 50.0* | 60.0 |
| MDD | 13 | 14.6 | 17.3 | 16.7 | 35.0* | 28.6 | 16.7 | 20.0 | 20.0 |
| PTSD | 9 | 10.1 | 10.7 | 10.0 | 30.0* | 28.6 | 16.7 | 40.0* | 30.0 |
| Number of mental disorders[c] | | | | | | | | | |
| 0 | 16 | 18.0 | 13.3* | 15.0 | 0.0* | 0.0* | 0.0* | 0.0* | 0.0* |
| 1 | 49 | 55.1 | 54.7 | 53.3 | 45.0 | 42.9 | 41.7 | 50.0 | 30.3 |
| 2 or more | 24 | 27.0 | 32.0 | 31.7 | 55.0 | 57.1 | 58.3 | 50.0 | 70.0 |

This table reports column percentage (i.e., the percentage of participants with a specific type of substance use disorder who met criteria for the comorbid disorder in that row).
Diagnostic status as reported by participants interviewed with the CIDI-SAM and the DISC-IV-Y (see text for details). CD = conduct disorder; ADHD = attention deficit/hyperactivity disorder; MDD = major depressive disorder; PTSD = posttraumatic stress disorder.
[a] Only those specific DSM-IV diagnoses with a prevalence of at least 11.2% ($n \geq 10$) are shown.
[b] Contrast of participants with a specific substance use disorder to those without that disorder, by chi-square test.
[c] Contrast of participants with a substance use disorder to those without that disorder, by Mann–Whitney $U$ test.
* Holm-adjusted $p < .05$.

were invariably higher than the rates for marijuana. In this study, these rates were comparable. This is consistent with school-based studies, which found that AI adolescents have higher rates of marijuana use than their non-AI counterparts (Beauvais, 1992; Blum et al., 1992; Plunkett & Mitchell, 2000) and that marijuana use appears especially critical for the development of polysubstance use in AI communities (Novins & Baron, 2004; Novins, Beals, & Mitchell, 2001). It is also possible that these patterns may be reflective of a bias in the referral of AI youths with marijuana abuse/dependence to this program relative to those that serve non-AI youths (Aarons et al., 2001; Riggs et al., 1995; Whitmore et al., 1997).

It was interesting that five participants did not meet criteria for abuse or dependence of any substance despite admission to a highly restrictive treatment setting. There are several potential explanations for these findings. For example, four of these five participants met criteria for a subthreshold substance use disorder, indicating the presence of substance-related problems that were elicited by the CIDI-SAM but failed to fit into the standard DSM-IV framework for substance abuse or dependence. Thus, the failure of these adolescents to meet criteria for substance abuse or dependence may be related to an inherent weakness in these criteria in their use with diverse cultural groups such as AIs (O’Nell & Mitchell, 1996; Westermeyer, 1996), adolescents (Hasin et al., 2003), or problematic substance users, more generally (Pollock & Martin, 1999). These possibilities have been suggested by other researchers and would likely require a combination of clinical and ethnographic interviews to be examined in treatment populations such as this one. Another potential explanation is the limited availability of outpatient substance abuse treatment for adolescents in many AI communities (Novins et al., 2000). This limited availability may result in the referral of some AI youths, particularly those who encounter legal problems, to an RSATP even if their substance use problems were less severe than would be necessary for admission to such a facility in non-AI communities. It is also possible that this reflects a referral bias in which providers are more likely to refer AI adolescents to RSATPs than non-AIs, even if their substance problems do not meet diagnostic thresholds. Finally, because these diagnoses were generated by adolescent responses to a diagnostic interview, it may be that these participants minimized their substance-related problems (or did not recognize their problems as being caused by their substance use) and would have met full diagnostic criteria if information from other sources, such as parents, had been available for use in our diagnostic algorithms. Studies with larger sample sizes that utilize multiple informants to generate diagnoses will be necessary to further clarify this issue.

Second, this study confirms a high prevalence of mental disorders among AI adolescents in an RSATP. Indeed, the rates reported here are higher than those reported previously, which relied on chart reviews, underscoring the fact that the presence of mental disorders is the norm among such youths. Similar to studies of non-AI adolescents in comparable treatment settings, CD is the most common mental disorder. Because subthreshold conditions were also common, particularly among participants who met full criteria for another mental disorder, it appears that these AI adolescents have complex sets of psychiatric symptomatology that may not fit easily within standard diagnostic categories.

Third, female and male participants in this study were highly comparable in terms of their rates of both substance use and mental disorders. Male adolescents were more likely than female adolescents to meet criteria for hallucinogen abuse/dependence and CD, but we were unable to identify other differences that would be expected based on studies of AI adolescents in the community, such as higher rates of MD and PTSD among female adolescents (Beals et al., 1997; Costello et al., 1997). These findings should be interpreted with considerable caution as the numbers of male and female patients in the sample are too small to provide a reliable test of these differences. Larger studies will be necessary to explore potential gender differences that appear substantial here but did not meet our criteria for statistical significance (e.g., cocaine abuse/dependence, PTSD, and MDD). Nonetheless, it is interesting that one study of non-AI adolescents reported similar findings (Whitmore et al., 1997).

Fourth, this study identifies a number of significant relationships between specific substance use disorders and specific mental conditions. Because data from these retrospective diagnostic interviews did not allow us to examine the order in which these problems developed, it is difficult to know if these youths’ substance use problems typically precede their mental symptomatology or develop later. However, it is interesting to note that some of these substances may ameliorate, albeit in a problematic way, some of the mental symptoms they endorsed (e.g., stimulants for youths with MDD and ADHD; sedatives for youths with PTSD). It is particularly striking that youths with a greater number of substance use disorders also have a greater number of mental disorders, suggesting that, as diagnostic complexity increases for substance use conditions, it increases for mental conditions as well.

### *4.1. Limitations*

Although this is the first study to apply DSM-IV diagnostic criteria to AI adolescents admitted to an RSATP and thus represents a substantial advance of the scientific literature in this area, this study has a number of important limitations. First, these data are drawn from AI adolescents receiving treatment in an RSATP and should not be construed as representative of AI adolescents residing in the community. Although it is likely that adolescents referred to treatment for substance use problems will have higher rates of

substance use disorders than their nonreferred community counterparts, it is also highly likely that these adolescents also have much higher rates of mental disorders (e.g., Berkson's bias; Berkson, 1946). Indeed, although there is no community-based study of AI adolescents that serves as a good match to this study in terms of age, geographic region, tribal representation, and research methods, the studies that are available document rates of comorbidity between substance use and mental disorders that are much lower (e.g., 15–53%; Beals et al., 1997; Federman et al., 1997) than those observed here (i.e., 84.5%).

Second, data from the diagnostic interviews were self-reported and were not accompanied by parental information. Research with non-AI adolescents suggests that, although adolescents are likely to be better reporters of antisocial behaviors and substance use than are parents, parent reports may be particularly important for other diagnoses such as ADHD (Cantwell, Lewinsohn, Rohde, & Seeley, 1997; Jensen et al., 1999). Overall, inclusion of information from parents would have likely identified more symptomatology and diagnoses; thus, the rates reported for these conditions should be considered low estimates (Jensen et al., 1999; Shaffer et al., 1996).

Third, we were unable to determine the diagnostic status of the four participants who left the RSATP before 1 week of residence. It is possible that patients who leave an RSATP so rapidly differ from those who stay, and these differences may include a higher (or lower) prevalence of mental disorders.

Fourth, data for our diagnostic interviews were missing for 20 participants who agreed to participate in the study but left the program before we were able to interview them. For these participants, we chose to impute these data to allow us to make full use of the available data and to reduce the bias that might be introduced by relying on a partial sample (Croy & Novins, 2005; Pigott, 2001; Schafer & Graham, 2002). Although results were comparable when we conducted these analyses with and without imputed values, they were not identical. The median difference in estimates of specific DSM-IV disorders was $\pm 0.99\%$, and 14% of the statistical tests performed were discordant for analyses conducted with and without imputed values. Nonetheless, the results obtained from these data without these imputed values are consistent with our major study findings, and the differences between analyses with and without these imputed values most likely reflect a correction for biases introduced by only analyzing data for the portion of our sample with complete data.

Fifth, although this study used a rigorous design and state-of-the-art diagnostic interviewing, the small sample size and the single treatment setting necessitate that these findings be considered preliminary and in need of replication. Although directors of other Indian Health Service-funded regional RSATPs have told us that mental disorders are extremely common among the adolescents they serve, it is possible that the patterns of psychiatric diagnoses vary from program to program. Therefore, these results should be applied to the other regional RSATPs with some caution.

Sixth, caution is also warranted in comparing the results of this study to those of non-AI adolescents, as we would expect some variations across different clinical settings, as well as differences due to variations in research methods. For example, that the rates of PTSD in this study were lower than those reported by Deykin and Buka (1997) (19.2%) may be due to differences in treatment settings (tribal vs. state-operated RSATPs), selection criteria (this study examined all admissions to an RSATP, whereas a comparison study focused on those who met criteria for substance dependence), and/or the diagnostic interview employed (DISC-IV-Y vs. DIS). Only studies that use comparable methods across treatment settings and AI and non-AI treatment populations will allow for meaningful comparisons of the relative rates of mental disorders.

Finally, although diagnostic status is of key importance in understanding and serving these adolescents (and the extension of these constructs to this culturally distinct population of key scientific relevance), a number of issues that are beyond the scope of this study are important as we consider implications for service delivery and future research. For example, although this study examines diagnostic status, it does not assess the accuracy of diagnoses in this clinical setting—a critical component of treatment planning (American Academy of Child and Adolescent Psychiatry, 1997). Furthermore, these diagnostic patterns suggest that emerging practices for treating substance-abusing adolescents that have been developed for use with non-AI adolescents (e.g., Curry, Wells, Lochman, Craighead, & Nagy, 2003; Henggeler, Clingempeel, Brondino, & Pickrel, 2002) warrant consideration for use with AI youths. However, several additional issues need to be accounted for in this process. These include whether these models require adaptation to assure their cultural appropriateness for this population (U.S. Department of Health and Human Services, 2001), as well as whether these models are feasible given the real limitations in resources, both human and fiscal, in the treatment systems that serve them (Novins et al., 2000; U.S. Department of Health and Human Services, 2001). Overall, these findings suggest that such thoughtful considerations are both timely and appropriate.

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