

The Role of Psychiatric Disorders in Predicting Drug Dependence Treatment Outcomes

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Objective: Previous research has demonstrated that psychiatric disorders are common among people who abuse alcohol and drugs, but few studies have examined the relationship of psychiatric disorders to drug treatment outcome. The authors conducted such an examination.

Method: They successfully reinterviewed 401 drug-dependent subjects (94% of the baseline in-treatment sample) and determined their drug abuse status at follow-up 12 months later.

Results: Analyses indicated that several baseline psychiatric disorders predicted worse outcomes at follow-up. Major depression predicted using a larger number of substances and having more drug dependence diagnoses and symptoms. Alco-

hol dependence predicted more dependence diagnoses, antisocial personality disorder predicted using a larger number of substances, and generalized anxiety disorder predicted having more dependence diagnoses. Outcomes among men were more closely associated with psychiatric status than outcomes among women, except for phobias, which predicted a better outcome among women.

Conclusions: These results are unique in their assessment of individuals dependent on illicit substances. Overall, the authors found that women with phobias had better outcomes and that men with psychiatric disorders in general, men with major depression, and men with antisocial personality disorder had worse outcomes.

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Among people in treatment for substance use disorders, there are unusually high rates of other coexisting psychiatric disorders (1). Moreover, comorbid psychiatric symptoms complicate treatment of illicit drug use disorders and are associated with higher rates of relapse following completion of substance use treatment programs (2). Because of these complications, understanding the extent and natural history of dual diagnosis, including possible differences in treatment outcomes based on the coexistence of particular psychiatric disorders, is important. Investigations need to include a focus on variations in rates of drug relapse based on the nature of specific comorbid psychiatric disorders.

Previous studies have emphasized the importance of simultaneously examining different psychiatric disorders, including personality disorders, to predict treatment outcomes of subjects participating in substance use treatment programs (3). Finding clear correlations between specific comorbid psychiatric disorders and an altered risk of relapse for those in substance use treatment would have important implications for predicting treatment outcomes and, possibly, for reducing the risk of relapse by appropriately treating the comorbid psychiatric disorder.

We examined comorbid psychiatric disorders in a group of drug-dependent subjects newly admitted to treatment in order to examine the role of psychiatric disorders in predicting drug dependence treatment outcomes. This study addresses the following questions: 1) Does the pres-

ence of specific other psychiatric disorders among drug-dependent subjects influence 1-year treatment outcomes? 2) Does the relationship of comorbid psychiatric disorders to outcome differ for drug-dependent men and women? 3) Are antisocial personality disorder and depression independent predictors of outcomes among drug-dependent men and women? The role of other psychiatric disorders in predicting drug dependence treatment outcomes is the focus of this paper.

Method

Subjects

Data for this study come from the Substance Abuse and Risk of AIDS Study, a longitudinal study funded by the National Institute on Drug Abuse (NIDA) of substance abusers who were recently admitted to drug treatment facilities in St. Louis. Complete details about study methods are given elsewhere (4). In brief, these facilities were representative of the treatment populations most at risk for HIV in the St. Louis area and included a variety of treatment modalities: both public outpatient methadone clinics in the area, two drug-free outpatient programs, two drug-free inpatient programs, an outpatient program for drug-abusing prostitutes, and a residential recovery shelter for women.

In general, subjects were selected randomly from lists of newly admitted patients. Injection drug users were oversampled at one site because one study focus was HIV risk behaviors and injectors were of particular interest. The total number of subjects drawn from the total of 524 eligible patients was 512, for a completion rate of 98%. The subjects of focus for the current study, drawn from the group of 512 patients, were 425 individuals with dependence on at least one illicit substance at baseline; 401 of

these 425 subjects were reinterviewed at follow-up, for a completion rate of 94%.

Instruments and Interviewing

Because this study obtained subjects from lists of individuals admitted to treatment, the study group can best be considered a clinical epidemiological sample. The investigators were not affiliated with any of the treatment programs and used them as recruitment sites. Therefore, it was impractical to use clinical instruments for assessment. To help assure the validity of responses to the nonclinical psychiatric interview, all subjects were free of noticeable intoxication at the time of evaluation and had been in treatment for at least 2 weeks, so that potential confounds resulting from transient, withdrawal-associated symptoms were not likely to be included. This time lag is based on research suggesting that detoxification is a highly unstable period in which to conduct psychiatric diagnostic interviews because many psychiatric symptoms will improve spontaneously with abstinence (5–7).

All subjects were interviewed face-to-face by researchers using the National Institute of Mental Health Diagnostic Interview Schedule, version III-R (DIS) (8) and the NIDA Risk Behavior Assessment (9). The DIS has been used extensively in psychiatric epidemiological studies and can be administered with adequate reliability by nonclinicians (10). In a study of a closely related instrument, the reliability and validity of subjects' self-reported date of onset of symptoms were high (11). Although there have been concerns about the validity of the DIS in diagnosing clinical psychiatric disorders (12–14), a study comparing the DIS and the Structured Clinical Interview for DSM-III-R among subjects with co-occurring substance and nonsubstance psychiatric disorders, reliability of the DIS was adequate for many disorders (15). Furthermore, reliability and validity of DIS diagnoses have been shown to be fair to good for most disorders among drug abusers (16, 17).

In all cases, written informed consent was obtained before administration of any research instruments.

Study Variables

Diagnostic algorithms written and checked by the authors of the DIS were used to compute lifetime prevalence rates of the DSM-III-R disorders. The DIS was used to assess for drug dependence, alcohol dependence, and the following comorbid disorders: panic, phobia, generalized anxiety disorder, major depression, dysthymia, mania, antisocial personality disorder, schizophrenia, obsessive-compulsive disorder, anorexia, and bulimia. A variable called "any psychiatric disorder" was defined as the presence of any of the 11 comorbid conditions, and "number of disorders" was defined as the number of comorbid conditions (range=0–11).

Study outcomes observed were based on their presence or absence at 1-year follow-up. These outcomes were 1) number of different illicit drugs used at follow-up, 2) number of DSM-III-R illicit drug dependence criteria met at follow-up, and 3) number of illicit drugs for which full DSM-III-R dependence diagnostic criteria were met at follow-up. The definitions of gender were based on interviewer observation, and race/ethnicity was based on respondent self-report (subjects were read a list of racial and ethnic groups and were asked to pick the group with which they were most closely identified).

Statistics

SAS statistical programs (18) were used to analyze the data. Descriptive statistics include demographic characteristics and the proportion of subjects reporting particular DSM-III-R substance dependence disorders and psychiatric disorders at baseline. Where the rate of a comorbid psychiatric disorder was at least 10%, analyses were conducted to determine whether that disorder predicted a differential outcome at 1 year. The first set of analyses

TABLE 1. Baseline Demographic Characteristics, Lifetime Drug Dependencies, and Other Lifetime Psychiatric Disorders Present in at Least 10% of the Subjects in the Drug Dependence Outcomes Study (N=401)

Characteristic	N	%
Male	264	66
African American	243	61
High school graduate	224	56
Never married	195	49
Unemployed	273	68
One or more children	285	71
Lifetime drug dependencies ^a		
Cocaine	273	68
Heroin	189	47
Cannabis	124	31
Other opiate	100	25
Amphetamine	70	17
Sedative	69	17
Phencyclidine	39	10
Other lifetime psychiatric disorders ^a		
Alcohol dependence	251	63
Any psychiatric disorder ^b	298	74
Antisocial personality disorder	177	44
Phobic disorder	164	41
Major depression	100	25
Dysthymia	49	12
Generalized anxiety disorder	41	10

^a Diagnosed according to the National Institute of Mental Health Diagnostic Interview Schedule, version III-R.

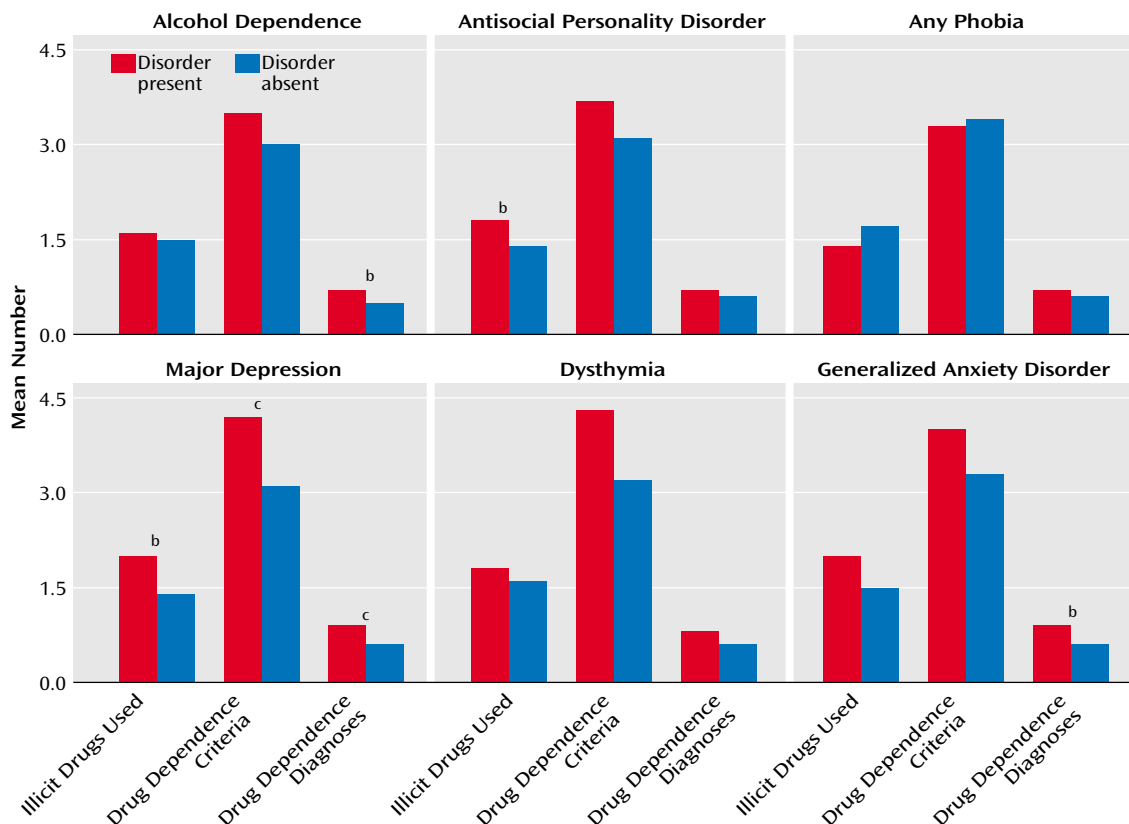
^b Defined as the presence of panic, phobia, generalized anxiety, major depression, dysthymia, mania, antisocial personality, schizophrenia, obsessive-compulsive disorder, anorexia, and/or bulimia.

tested each comorbid psychiatric disorder separately by using the Wilcoxon test to assess for significant differences in number of illicit drugs used, number of illicit substance dependence criteria met (across all substances), and number of illicit substance dependence diagnoses. The Wilcoxon test was chosen because of the ordinal nature of the outcomes.

Following the univariate tests, we tested multivariate regression models using age, race, and the psychiatric disorder of interest as independent variables (19). Dependent variables were the number of illicit drugs used, number of illicit substance dependence criteria endorsed (across all substances), and number of illicit substance dependence diagnoses at follow-up. Separate models were constructed for men and women. To examine the relation of antisocial personality disorders and major depression to treatment outcome, models were tested separately among men and women with age, race, antisocial personality disorder, and major depression as independent variables. To correct for the potential problem of increased type II error rate in the face of multiple tests, results were considered significant when the outcome was associated with the predictor at a type I error rate of $p < 0.02$, based on a Bonferroni correction for the three outcomes in each family of tests and a single Type I error rate of $p < 0.05$ (20). Results were considered possibly significant when $0.02 \leq p < 0.05$.

Because the sample includes unequal proportions of men and women, all tables include presentation of the actual results according to gender, not just whether the results were statistically significant. Statistically nonsignificant results for the smaller group can then be inspected to determine whether they are of a similar size and direction as for the larger group. If results are of a similar absolute magnitude but not statistically significant for the smaller group, this may indicate that the sample size was inadequate to compare the groups, but if results are dissimilar in absolute magnitude, it is unlikely that sample size alone could explain the group differences.

FIGURE 1. Impact of Presence of Lifetime Psychiatric Disorders at Baseline on 1-Year Drug Dependence Treatment Outcomes in the Drug Dependence Outcomes Study (N=401)^a



^a Substance dependence and other psychiatric disorders were diagnosed according to the National Institute of Mental Health Diagnostic Interview Survey, version III-R. Outcome was measured in terms of 1) number of different illicit drugs used at follow-up, 2) number of DSM-III-R illicit drug dependence criteria met at follow-up, and 3) number of illicit drugs for which full DSM-III-R dependence diagnostic criteria were met at follow-up.

^b $p < 0.05$, based on Wilcoxon test.

^c $p < 0.02$, based on Wilcoxon test.

Results

Subjects' demographic characteristics are presented in Table 1. The sample of 401 was diverse in that 61% were African American and 66% were men. The majority had graduated from high school, were unemployed, and had never married. Most had at least one child, and the mean age was 32.5 years ($SD=6.5$).

All subjects were dependent on at least one illicit substance according to sample selection criteria; however, the particular substance dependence patterns varied. The most common substance dependence was cocaine, followed by heroin, cannabis, other opiates, amphetamines, sedatives, and phencyclidine. Other illicit substances (hallucinogens and inhalants) were prevalent in less than 10% of the sample and were not considered further.

Alcohol dependence was the most common co-occurring psychiatric disorder with a prevalence of 63%. Also quite common were antisocial personality disorder, phobic disorder, major depression, dysthymia, and generalized anxiety disorder (Table 1). Mania, schizophrenia, obsessive-compulsive disorder, anorexia, and bulimia were

all prevalent in less than 10% and so were not included in predictive models. Any psychiatric disorder (defined as the presence of any comorbid condition other than alcohol dependence) was found in 74%; thus, as found by many authors, comorbidity was the rule rather than the exception.

Impact of Psychiatric Disorders on Outcomes

Figure 1 illustrates the impact of specific psychiatric disorders on 1-year drug treatment outcomes in patients with other lifetime psychiatric disorders in addition to lifetime drug dependence.

For subjects with alcohol dependence, the mean number of illicit drugs used, mean number of dependence criteria met for any substance, and mean number of substances for which full dependence diagnostic criteria were met at follow-up were 1.6, 3.5, and 0.7, respectively, compared with for subjects without alcohol dependence, the mean number of illicit drugs used, mean number of dependence criteria met for any substance, and mean number of substances for which full dependence diagnostic criteria were met at follow-up were 1.5, 3.0, and 0.5, re-

TABLE 2. Prediction of 1-Year Drug Dependence Treatment Outcomes by Specific Comorbid Psychiatric Disorders Among Men and Women in the Drug Dependence Outcomes Study (N=401)

Comorbid Psychiatric Disorder	Beta for Outcome ^a					
	Illicit Drugs Used		Drug Dependence Criteria		Drug Dependence Diagnoses	
	Men	Women	Men	Women	Men	Women
Any psychiatric disorder	0.17	-0.19	-0.03	0.75	0.10	0.05
Number of disorders	0.26**	-0.12	0.42*	0.23	0.19**	-0.02
Alcohol dependence	-0.12	-0.02	0.57	0.04	0.16	0.04
Antisocial personality disorder	0.43*	0.11	0.61	0.70	0.15	0.01
No phobia	0.01	0.77**	-0.20	0.18	0.16	0.08
Major depression	0.51*	-0.13	0.88	0.49	0.44**	-0.09
Dysthymia	0.61	-0.46	0.77	0.64	0.42	-0.14
Generalized anxiety disorder	0.55	-0.04	1.23	-0.74	0.48*	-0.23

^a Beta statistic from logistic regression controlling for race and age. Outcome was measured in terms of 1) number of different illicit drugs used at follow-up, 2) number of DSM-III-R illicit drug dependence criteria met at follow-up, and 3) number of illicit drugs for which full DSM-III-R dependence diagnostic criteria were met at follow-up.

* $p < 0.05$. ** $p < 0.02$.

spectively. The difference in number of dependence diagnoses was possibly significant at $p = 0.02$.

Antisocial personality disorder also influenced substance abuse outcomes in that the presence of antisocial personality disorder seemed to increase the chances of a worse outcome at 1-year follow-up. For subjects with antisocial personality disorder, the mean number of illicit drugs used, mean number of dependence criteria met for any substance, and mean number of substances for which full dependence diagnostic criteria were met at follow-up were 1.8, 3.7, and 0.7, respectively, compared with 1.4, 3.1, and 0.6, respectively, for subjects without antisocial personality disorder. The difference in number of illicit drugs used was possibly statistically significant ($p = 0.03$). The differences in number of dependence criteria and diagnoses were not significant.

Phobias had a possible impact on substance abuse treatment outcomes in that subjects with phobias used fewer illicit substances at follow-up than subjects without phobias, but the difference was not statistically significant. For subjects with phobic disorders, the mean number of illicit drugs used, mean number of dependence criteria met for any substance, and mean number of substances for which full dependence criteria were met at 1-year follow-up were 1.4, 3.3, and 0.7, respectively, compared with 1.7, 3.4, and 0.6, respectively, for subjects without phobic disorders.

Major depression had the most consistent impact on substance outcomes at 1-year follow-up. For subjects with major depression, the mean number of illicit drugs used, mean number of dependence criteria met for any substance, and mean number of substances for which full dependence diagnostic criteria were met at 1-year follow-up were 2.0, 4.2, and 0.9, respectively, compared with 1.4, 3.1, and 0.6, respectively, for subjects without major depression. The differences were statistically significant or possibly significant for all three outcomes: illicit drugs used ($p = 0.02$), dependence criteria endorsed ($p = 0.01$), and dependence diagnoses met ($p = 0.006$).

Dysthymia had a minimal association with outcomes at 1-year follow-up. For subjects with dysthymia, the mean number of illicit drugs used, mean number of dependence criteria met for any substance, and mean number of substances for which full dependence diagnostic criteria were met at 1-year follow-up were 1.8, 4.3, and 0.8, respectively, compared with 1.6, 3.2, and 0.6, respectively, for subjects without dysthymia. None of the differences were statistically significant.

Similarly, generalized anxiety disorder had an association with a worse substance abuse treatment outcome at 1-year follow-up. For subjects with generalized anxiety disorder, the mean number of illicit drugs used, mean number of dependence criteria met for any substance, and mean number of substances for which full dependence diagnostic criteria were met at 1-year follow-up were 2.0, 4.0, and 0.9, respectively, compared with 1.5, 3.3, and 0.6, respectively, for subjects without generalized anxiety disorder. The difference in the number of dependence diagnoses was possibly statistically significant ($p = 0.04$).

Gender and Outcomes

As shown in Table 2, which presents results for "any psychiatric disorder," the number of comorbid psychiatric disorders and each separate psychiatric disorder were tested for association with drug treatment outcomes among men and women separately. All results were corrected for the effects of race and age by using regression modeling techniques. The beta statistics are presented, and the statistically significant ($p < 0.02$) and possibly significant ($p < 0.05$) values are marked. Differences between men and women were seen not only in the degree of statistical significance but also in the magnitude and (in some cases) the direction of the associations. Among men, major depression and the number of psychiatric disorders significantly predicted worse outcomes and antisocial personality disorder and generalized anxiety disorder were possibly associated with worse outcomes (Table 2). Among women, *absence* of phobias predicted worse outcomes, but no other psychiatric diagnosis among women had a significant or possibly significant relationship to

TABLE 3. Prediction of 1-Year Drug Dependence Treatment Outcomes by Presence of Comorbid Antisocial Personality or Major Depression Among Men and Women in the Drug Dependence Outcomes Study (N=401)

Group and Disorder	Beta for Outcome ^a		
	Illicit Drugs Used	Drug Dependence Criteria	Drug Dependence Diagnoses
Men			
Antisocial personality disorder	0.41*	0.59	0.13
Major depression	0.48	0.85	0.43**
Women			
Antisocial personality disorder	0.10	0.75	0.005
Major depression	-0.12	0.57	-0.09

^a Beta statistic from logistic regression controlling for race and age (i.e., models include race, age, antisocial personality disorder and major depression). Outcome was measured in terms of 1) number of different illicit drugs used at follow-up, 2) number of DSM-III-R illicit drug dependence criteria met at follow-up, and 3) number of illicit drugs for which full DSM-III-R dependence diagnostic criteria were met at follow-up.

* $p < 0.05$. ** $p < 0.02$.

outcomes. Overall, drug-dependent men with comorbid psychiatric disorders had worse outcomes than drug-dependent men without comorbid conditions; however, drug-dependent women with comorbid psychiatric disorders had better or similar outcomes as drug-dependent women without the comorbid conditions.

Gender, Antisocial Personality, and Depression

To further explore the relationship of antisocial personality disorder and major depression to drug outcomes, regression models among men and women were tested. These included these two diagnoses and controlled for the effects of race and age. As seen in Table 3, among men, both antisocial personality disorder and major depression were independently associated with illicit drug use and illicit dependence diagnoses, but no significant or possibly significant relationship of these predictors to outcomes was found among women.

Discussion

Our study confirms the impact of different comorbid psychiatric disorders on substance abuse treatment outcomes. The most common comorbid psychiatric disorders among drug abusers—alcohol dependence, antisocial personality disorder, depressive disorders, phobias, and generalized anxiety—were examined in this study, and several of these were found to have a significant impact on substance abuse treatment outcomes. The manner in which the disorders influenced drug abuse treatment outcomes, however, was different depending on the disorder and depending on the patient's gender. Men and women not only exhibited different patterns of psychiatric comorbidity, but their 1-year drug outcomes differed as well.

As demonstrated by Rounsaville et al. among alcoholics (21), the presence of most psychiatric diagnoses is associated with worse outcomes. Rounsaville et al. showed that antisocial personality disorder was associated with worse outcomes in both men and women but depression was associated with a better outcome among women. Similarly, we found that the relationship of psychiatric disorder to outcomes was much stronger for men than women. When examining outcomes among men and women separately, we found a trend for worse outcomes when psychiatric disorders were present only among men. Even the one reverse association (where phobic disorder possibly predicted a better outcome) was apparent only among the women.

According to these results, it appears that drug abuse treatment outcomes at 1 year among men were more influenced by comorbid psychiatric disorders than those among women. In previous work (4), we demonstrated that depression and phobia were more prevalent among women who were dependent on illicit drugs. Now we have shown that women with these conditions do not have worse outcomes than drug-dependent women without them.

Unlike Rounsaville et al. (21), who showed that co-occurring illicit drug dependence was associated with worse alcohol dependence treatment outcomes, we did not find a consistent association of co-occurring alcohol dependence with worse outcomes. We conclude that adding drug dependence to alcoholism may predict a worse outcome but adding alcoholism to drug dependence does not make a difference. Perhaps the outcomes for drug-dependent individuals are already so poor that the additional substance diagnosis makes no difference.

These findings may have implications for future approaches to drug dependence treatment in men with comorbid psychiatric disorders, particularly antisocial personality disorder and major depression. For example, would simultaneous management and treatment of comorbid psychiatric disorders, along with drug treatment, improve drug treatment outcomes at 1 year? Also, to what extent does the success of the treatment of comorbid psychiatric disorders affect drug abuse treatment outcomes, if at all?

Another interesting finding of this study was that women with phobias tended to report *less* drug use at follow-up. This raises questions about the relationship of phobic disorders to drug treatment outcomes among women. For example, could the presence of a phobic disorder in female subjects improve substance use treatment outcomes on the basis of temperament characteristics, such as harm avoidance (22)? Also, would the successful treatment of phobic disorders in drug-abusing women impede or enhance the success of substance abuse treatment? Furthermore, what factors might contribute to the significant differences in findings between male and female subjects? These questions remain to be addressed by future work.

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References

- Regier DA, Farmer ME, Rae DS, Locke BZ, Keith SJ, Judd LL, Goodwin FK: Comorbidity of mental disorders with alcohol and other drug abuse: results from the Epidemiologic Catchment Area (ECA) study. *JAMA* 1990; 262:2511-2518
- McLellan AT, Luborsky L, Woody GE, O'Brien CP, Druley KA: Predicting response to alcohol and drug abuse treatment: role of psychiatric severity. *Arch Gen Psychiatry* 1983; 40:620-625
- Jainchill N, De Leon G, Pinkham L: Psychiatric diagnoses among substance abusers in therapeutic community treatment. *J Psychoactive Drugs* 1986; 18:209-213
- Compton WM, Cottler LB, Ben-Abdallah A, Phelps DL, Spitznagel EL, Horton JC: Substance dependence and other psychiatric disorders among drug dependent subjects: race and gender correlates. *Am J Addict* 2000; 9:113-125
- Husband SD, Marlowe DB, Lamb RJ, Iguchi MY, Bux DA, Kirby KC, Platt JJ: Decline in self-reported dysphoria after treatment entry in inner-city cocaine addicts. *J Consult Clin Psychol* 1996; 64:221-224
- Brown RA, Monti PM, Myers MG, Martin RA, Rivinus T, Dubreuil ME, Rohsenow DJ: Depression among cocaine abusers in treatment: relation to cocaine and alcohol use and treatment outcome. *Am J Psychiatry* 1998; 155:220-225
- Anthenelli RM: A basic clinical approach to diagnosis in patients with comorbid psychiatric and substance use disorders, in *Addiction Psychiatry*. Edited by Miller NS. Philadelphia, WB Saunders, 1996, pp 119-126
- Robins LN, Helzer JE, Cottler L, Golding E: National Institute of Mental Health Diagnostic Interview Schedule, version III, revised. St Louis, Washington University, Department of Psychiatry, 1989
- Needle R, Fisher DG, Weatherby N, Chitwood D, Brown B, Cesari H, Booth R, Williams ML, Watters J, Andersen M, Braunstein M: The reliability of self-reported HIV risk behaviors of drug users. *Psychol Addict Behav* 1995; 9:242-250
- Robins LN, Helzer JE, Croughan J, Ratcliff KS: The National Institute of Mental Health Diagnostic Interview Schedule: its history, characteristics, and validity. *Arch Gen Psychiatry* 1981; 38:381-389
- Robins LN, Helzer JE, Ratcliff KS, Seyfried W: Validity of the Diagnostic Interview Schedule, version II: DSM-III diagnoses. *Psychol Med* 1982; 12:855-870
- Anthony JC, Folstein M, Romanoski AJ, Von Korff MR, Nestadt GR, Chahal R, Merchant A, Brown CH, Shapiro S, Kramer M: Comparison of the lay Diagnostic Interview Schedule and a standardized psychiatric diagnosis. *Arch Gen Psychiatry* 1985; 42:667-675
- Helzer JE, Robins LN, McEvoy LT, Spitznagel EL, Stoltzman RK, Farmer A, Brockington IF: A comparison of clinical and Diagnostic Interview Schedule diagnoses. *Arch Gen Psychiatry* 1985; 42:657-666
- Hasin D, Grant B: Assessment of specific drug disorders in a sample of substance abuse patients: a comparison of the DIS and the SADS-L procedures. *Drug Alcohol Depend* 1987; 19:165-176
- Ross HE, Swinson R, Doumani S, Larkin EJ: Diagnosing comorbidity in substance abusers: a comparison of the test-retest reliability of two interviews. *Am J Drug Alcohol Abuse* 1995; 21:167-185
- Horton J, Compton WM, Cottler LB: Assessing psychiatric disorders among drug users: reliability of the revised DIS-IV (abstract), in *NIDA Research Monograph: Problems of Drug Dependence 1998*: NIH Publication 99-4395. Edited by Harris L. Washington, DC, National Institutes of Health, 1999, p 205
- Dascalu M, Compton WM, Horton JC, Cottler LB: Validity of DIS IV in diagnosing depression and other psychiatric disorders among substance users (abstract). *Drug Alcohol Depend* 2001; 63:S37
- SAS/STAT User's Guide, version 6, 4th ed, vol 1. Cary, NC, SAS Institute, 1989
- Bishop YM, Fineberg S, Holland P: *Discrete Multivariate Analyses*. Cambridge, Mass, MIT Press, 1975
- Grove WM, Andreasen NC: Simultaneous tests of many hypotheses in exploratory research. *J Nerv Ment Dis* 1982; 170:3-8
- Rounsaville BJ, Dolinsky ZS, Babor TF, Meyer RE: Psychopathology as a predictor of treatment outcome in alcoholics. *Arch Gen Psychiatry* 1987; 44:505-513
- Cloninger CR, Svrakic DM, Przybeck TR: A psychobiological model of temperament and character. *Arch Gen Psychiatry* 1993; 50:975-981