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Nine-Year Psychiatric Trajectories and Substance Use Outcomes:

An Application of the Group-Based Modeling Approach

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Abstract

This study identifies longitudinal psychiatric trajectories of 934 adult individuals entering chemical dependency treatment in a private, managed care health plan and examines the relationship of these trajectories with substance use (SU) outcomes. The authors apply a group-based modeling approach to identify trajectory groups based on repeated measures of psychiatric severity for 9 years and identify four distinct groups. Results of multivariate logistic generalized estimating equation models find an association between psychiatric trajectories and long-term SU. Older cohorts and life course measures of marital status and employment status as individuals changed over time are related to drug and some alcohol outcomes.

Keywords

longitudinal substance use outcomes; psychiatric trajectories; group-based modeling; managed care; adult chemical dependency patients

Co-occurring psychiatric and substance use (SU) conditions are a major clinical and policy concern (Havassy, Alvidrez, and Owen 2004; Helzer and Pryzbeck 1988; Kessler et al. 1996; Mertens et al. 2003; Timko, Dixon, and Moos 2005). Psychiatric conditions are highly prevalent among individuals with SU problems (Alaja et al. 1998; Harris and Edlund 2005; Kessler et al. 1996; Mendelson et al. 1986; Moos, Brennan, and Mertens 1994), and research has found that interventions directed at psychiatric problems during chemical dependency (CD) treatment lead to improved treatment outcomes (Chi, Satre, and Weisner 2006; McLellan et al. 1993; Ray, Weisner, and Mertens 2005; Saxon and Calsyn 1995). Psychiatric severity is also a well-established predictor of SU outcomes, quality of life, and subsequent health status (Charney et al. 2005; Friedmann et al. 2003; Moos, Nichol, and Moos 2002; Ray, Weisner, and Mertens 2005; Ritscher et al. 2002; Schaar and Ojehagen 2003).

However, research on long-term mental health (MH) outcomes and their relationship with SU outcomes is sparse. An earlier study of the current sample measuring medical service use and cost for 5 years found that psychiatric and medical severity declined steeply in the immediate postintake period but remained stable thereafter, and that psychiatric and medical severity were consistently associated with higher inpatient and emergency room (ER) use over time (Parthasarathy and Weisner 2005). Another study examining cocaine-dependent men and women 5 years following treatment discharge also found reduced levels of psychological

distress for both genders (Grella, Joshi, and Hser 2003). A 12-year follow-up study of psychiatric symptomatology among cocaine-dependent men in a Veterans Affairs program found that the Hopkins Symptom Checklist–58 scores for depression, anxiety, obsessive–compulsiveness, and interpersonal sensitivity showed continuous improvement from baseline to 12-year follow-up for those with 5 or more years of cocaine abstinence, whereas those with fewer years of abstinence showed improvement from baseline to 1 year but no significant change from 1 year to 12 years (Herbeck et al. 2006). The findings of these studies suggest an overall improving psychiatric trajectory for individuals with SU problems after treatment entry, but there might be subpopulations with different longitudinal psychiatric trajectories. The course of psychiatric problems over time and the relationship between long-term psychiatric and SU outcomes among individuals in CD treatment remain unclear.

Understanding long-term psychiatric trajectory has important values in guiding research and intervention development for recovery of individuals with SU problems. Alcohol and drug dependence are chronic conditions, and recovery is a multidimensional concept, involving more than abstinence from alcohol and other nonprescribed drugs (McLellan, Chalk, and Bartlett 2007). Currently, there is a great deal of interest in understanding and measuring the concept of recovery. An initial definition was developed in a recent meeting of researchers and clinicians (Betty Ford Institute Consensus Panel in press). In addition to abstinence, it includes related domains of physical health and MH, spirituality, and improved social functioning. Knowledge of long-term MH status and its relationship to SU outcomes will provide useful insights in developing the concept and measuring recovery.

We also use a life course perspective to examine long-term SU patterns (National Institute on Alcohol Abuse and Alcoholism 2006). This is based on the literature stating that there are multiple levels of influences on SU-related behaviors that vary by life stages (e.g., biochemical, cognitive, social; Windle and Davies 1999). Major life events such as marriage or employment status may in particular affect SU outcomes (Curran, Muthén, and Harford 1998; Gotham, Sher, and Wood 2003; McKay et al. 2005; Miller-Tutzauer, Leonard, and Windle 1991), but few studies have examined these factors and SU outcomes over repeated long-term follow-ups among clinical populations. The youngest in our sample have aged from 18 to 29 years at baseline to 27 to 38 by the 9-year follow-up and the midage groups from 30 to 39 and 40 to 49 to 39 to 48 and 49 to 58, respectively. They have each moved from at least one life stage to another, with marriage and employment status potentially influencing SU outcomes.

This study examines psychiatric trajectories of individuals entering CD treatment in a private, managed care health plan. Few studies have examined both MH and SU outcomes in these populations, although managed care is a major provider of health and behavioral health services today. We examine whether there are distinct clusters of individuals with homogeneous longitudinal psychiatric trajectories and assess relationships among individual characteristics (including repeated measures of life events of marriage and employment status at baseline and each follow-up), psychiatric trajectories, and SU outcomes over 9 years. We hypothesize that psychiatric severity will change in concert with SU outcomes and that successful experiences of life events will be related to positive outcomes.

Method

Treatment Programs

The study site was Kaiser Permanente (KP) Chemical Dependency Recovery Program (CDRP) in Sacramento, California. Northern California KP is a large, private, nonprofit, group-model health plan covering 40% of the commercially insured population of the region and providing both CD and psychiatric services internally. The CDRP provides traditional outpatient and day treatment programs. Both are group based with similar content, including supportive group

therapy, education, relapse prevention, and family therapy, with individual counseling available as needed, but day treatment has 4 times the amount of each type of service. Both programs last for 8 weeks, with 10 months of aftercare available. The psychiatry department is located in a separate building from the CD department and provides short- or long-term individual and group psychotherapy, education, and medication management.

Study Sample

The sample consisted of 1,204 adult men and women (age 18 and older) admitted to CD treatment at the study site between April 1994 and April 1996. Patients meeting criteria for alcohol or other drug dependence or abuse and admitted to the CDRP were provided a complete description of the study and offered the choice of accepting random assignment to the day hospital treatment or outpatient program at the site. Those who refused randomization but agreed to participate in the other aspects of the study were also recruited and received “treatment assignment as usual.” Interview data were collected at baseline and at 6 months, 1 year, 5 years, 7 years, and 9 years after intake. Institutional review board approval has been continually obtained from the Kaiser Research Foundation Institute and the University of California, San Francisco. Written informed consent was obtained. Detailed description of the programs and the study has been published elsewhere (Weisner et al. 2000; Weisner et al. 2003).

For this study, we selected participants who had (a) at least one follow-up interview within 1 year and (b) at least one follow-up interview from 1 year through 9 years ($n = 934$). Comparison of included ($n = 934$) and excluded ($n = 270$) participants indicated that those included in the trajectory analyses were more likely to be female (35.2% vs. 25.6%, $p < .01$) or having household income equal to or greater than \$40,000 (45.5% vs. 36.2%, $p < .01$); no statistically significant differences were found between the two groups on age, ethnicity, dependence type, education measured at baseline, psychiatric Addiction Severity Index (ASI) measures from baseline through 9 years, and abstinence status from 6 months through 9 years (all p values $> .10$).

Measures

MH outcomes—We used the Psychiatric Composite scale from the ASI to measure psychiatric severity at baseline as a control and at 6 months, 1 year, 5 years, 7 years, and 9 years as outcomes. The ASI is a valid and reliable instrument that examines types and severity of substance abuse, employment, medical, psychiatric, family and social, and legal problems in the prior 30 days. For each domain, a score ranging from 0 to 1 is provided, with higher scores indicating greater severity (McLellan et al. 1992).

SU outcomes—Consistent with the program goal, we focused on alcohol and drug abstinence (during the prior 30 days at each follow-up interview). We also asked respondents information on days using any drug or five or more drinks in the prior month at each interview.

Individual characteristics—Demographic characteristics including age (classified in four age groups: younger than 30, 30 to 39, 40 to 49, and 50 and older), gender, race/ethnicity, income, and education were collected at baseline. Data on two measures of significant life course events—marital status and employment status—were collected at baseline and at each follow-up. For measures of severity at baseline, we examined all seven ASI composite scales and used a checklist of questions based on the Diagnostic Interview Schedule for Psychoactive Substance Dependence, Diagnostic and Statistical Manual of Mental Disorders (4th ed., text revision; *DSM-IV-TR*; American Psychiatric Association 2000) to provide a *DSM-IV-TR* diagnosis for alcohol and drug (11 substance types) dependence and abuse (Caetano and

Raspberry 2000; Ray, Weisner, and Mertens 2005; Weisner et al. 2001; Weisner et al. 2000; Weisner et al. 2003).

Statistical Analysis

Data were analyzed using SAS Version 9.1 (SAS Institute Inc, Cary, NC). To examine the general longitudinal trend of psychiatric ASI composite scores throughout the 9 years, we calculated and graphed average psychiatric ASI scores at each time point (baseline, 6 months, 1 year, 5 years, 7 years, and 9 years). Significant differences in psychiatric ASI scores over-time and between specific time points were examined using a linear mixed modeling approach for longitudinal data with unequally spaced repeated measures.

We next examined whether there were distinct psychiatric trajectory classes posttreatment entry within the sample by using a SAS procedure based on mixture modeling for estimating developmental trajectories (PROC TRAJ; Jones, Nagin, and Roeder 2001). The procedure uses a semipara-metric classification method to identify discrete trajectory groups of individuals with homogeneous longitudinal traits on the basis of their patterns of repeated measures. Individuals with missing observations can be included, because PROC TRAJ uses all values available from each case to estimate an individual's timeline, making case-wise deletion unnecessary. The variables used in the estimation of the latent psychiatric trajectories posttreatment entry were indicators of the time point of follow-up measurement (6 months, 1 year, 5 years, 7 years, and 9 years) and the psychiatric ASI scores measured at each time point. The latent class model was estimated under the assumption of a varying (rather than fixed) number of latent classes. Choice for the optimal number of classes was guided by the Bayesian Information Criterion (BIC), the recommended and currently most widely used criteria for model fit.

All 934 individuals in the study sample were classified into their most probable psychiatric trajectory group based on the posterior probabilities. Once each individual was assigned to a psychiatric trajectory group, we conducted analyses in three steps. First, we compared individual characteristics and SU outcomes by psychiatric trajectory groups, using Kruskal-Wallis tests for continuous variables and chi-square or Fisher exact tests for categorical variables. Second, we conducted a series of logistic regression analyses to examine association between each baseline individual characteristic and SU outcome, using Generalized Estimation Equation (GEE) techniques to account for repeated measures of SU outcomes at 6 months, 1 year, 5 years, 7 years, and 9 years. We examined two dichotomous measures of SU outcomes—drug abstinence and alcohol abstinence during prior 30 days—and ran separate sets of models for each. Predictor variables associated with the dependent variables at $p \leq .10$, or identified *a priori* in the literature (Brennan and Moos 1996; Ray, Weisner, and Mertens 2005; Schutte et al. 2001; Simpson, Joe, and Broome 2002; Weisner et al. 2003) or conceptual model, were included in the final models. Third, we fit multivariate logistic GEE models to estimate the relationship of psychiatric trajectory groups and marital and employment status at follow-ups with SU outcomes, controlling for the factors identified in the second stage. We repeated the second and third steps on dichotomized measure of abstinence from five or more drinks in the prior month to examine the relationship of psychiatric trajectories and heavy drinking.

Results

Average Psychiatric Severity Throughout the 9 Years

Figure 1 presents average psychiatric severity from baseline to 9 years posttreatment entry. On average, psychiatric status improved dramatically from baseline to 6 months posttreatment entry ($p < .0001$), then increased at 5 years. Contrast analyses indicated that psychiatric ASI

scores at 5, 7, and 9 years were significantly higher than measures at 6 months and 12 months (all $p < .0001$), although the magnitudes of differences were much smaller compared to the difference between baseline and 6 months.

Posttreatment Entry Psychiatric Trajectories

To focus on posttreatment entry psychiatric trajectories over the 9 years, we examined trajectories based on psychiatric ASI scores from 6 months to 9 years, with special interest in whether subgroups with distinct longitudinal developmental trajectories existed. We conducted a series of analyses fitting trajectory models for two through six classes. Comparison among the two-class (BIC = -1,969.15), the three-class (BIC = -1,910.05), the four-class (BIC = -1,873.07), the five-class (BIC = -1,881.13), and the six-class (BIC = -1,892.29) models suggests that a four-trajectory model offers the best fit for the data (see Figure 2). Group 1 consisted of those who had consistently low psychiatric ASI scores over time (low-severity group). Group 2 consisted of individuals whose psychiatric ASI scores worsened from 6 months through 9 years (deteriorating group). The third trajectory group consisted of individuals whose psychiatric ASI scores improved with time (improving group), and the fourth trajectory group consisted of individuals who had high psychiatric severity throughout time (high-severity group). The percentages shown at the bottom of Figure 2 indicate the probability that a randomly chosen individual from the sampled population would be a member of each group.

Demographic Characteristics by Psychiatric Trajectories

We examined the mean posterior probabilities of assignment to psychiatric trajectory groups and found strong separations among groups (see Table 1). All individuals were classified into the psychiatric trajectory group to which they had the highest probability of belonging. Of the 934, 338 (36%) were classified into the low-severity group, 256 (27%) into the deteriorating group, 174 (19%) into the improving group, and 166 (18%) into the high-severity group. Table 2 summarizes comparisons of baseline individual characteristics by psychiatric trajectory group. We found no differences between the groups at baseline in age, dependence type, education level, index CD treatment length of stay, and alcohol and legal ASI scores. Compared to the other three groups, the high-severity group had higher proportions of women, as well as White and lower income individuals, but lower proportions of those who were married or employed. The high-severity group also had higher drug, family/social, medical, and psychiatric ASI scores (all p values $< .01$).

SU Outcomes over Time by Psychiatric Trajectory Groups

Table 3 presents SU outcomes from 6 months through 9 years by psychiatric trajectory group. The low-severity group had the highest drug abstinence rates throughout the 9 years, and drug abstinence rates for the improving psychiatric group increased steadily over time. The high psychiatric severity group had the lowest drug abstinence rates across the 9 years, and the rates continued to decrease from 5 years onward. Drug abstinence rates also gradually decreased for the deteriorating psychiatric trajectory group. Consistent with these findings, when analyzing days of drug use in the past 30 days at each time point, we found large increases from 5 years onward for the high-severity group and from 1 year onward for the deteriorating psychiatric trajectory group. Differences in drug abstinence rates and days of drug use across psychiatric trajectory groups were significant at 5 years, 7 years, and 9 years (all p values $< .001$).

Comparisons of alcohol abstinence rates by psychiatric trajectories throughout the 9 years indicated more stability for the improving group than the other three groups, and that group's abstinence rates remained the highest from 5 years onward. The deteriorating group had higher alcohol abstinence rates at 6 months and 1 year but had a large decrease at 5 years. The low-severity group had the lowest alcohol abstinence rates from 5 years onward; however,

individuals in this group reported the fewest days drinking five or more drinks across time, indicating less problematic use.

Multivariate Analysis of the Relationship of Psychiatric Trajectories to Drug and Alcohol Abstinence

Table 4 presents results of GEE logistic analyses of the relationship of psychiatric trajectories with both drug and alcohol abstinence, adjusting for gender; baseline age group; education; income; marital status; employment; alcohol, drug, medical, and psychiatric severity; treatment modality and length of index treatment stay. Psychiatric trajectories were associated with drug abstinence but not with alcohol abstinence. Compared to the low psychiatric severity group, individuals in the other three groups were less likely to report drug abstinence during follow-up periods. Length of stay of the index treatment episode was positively associated with drug abstinence. Baseline drug ASI composite scores were negatively, whereas baseline medical ASI composite scores were positively, associated with follow-up drug abstinence. Baseline marital and employment status were not significantly associated with subsequent drug abstinence, but being married and employed during follow-ups were positively associated with abstinence from drugs throughout time. No association was found between gender and drug abstinence, but those in the older age groups were more likely to be abstinent from drugs than those in the youngest age group (i.e., younger than 30 years old).

There were no significant relationships between psychiatric trajectories and alcohol abstinence throughout the 9 years. However, being in the low or improving psychiatric severity groups and married at follow-up points predicted being less likely to report five or more drinks per day at follow-ups (not shown). Similar to analysis of drug abstinence, we found that those who had longer index treatment stays and were in the three older age groups were more likely to be abstinent from alcohol. Women were more likely to be abstinent from alcohol than men.

Discussion

Consistent with some prior research, this study found that on average, psychiatric status of adult individuals with SU problems improved within 6 months after entering treatment but then deteriorated at 5 years. Thus, there may be a short-term treatment effect for these patients, although this may also be partially due to a higher level of severity at entry followed by regression to earlier levels, or “regression to the mean.” The order and type of the MH problems may also play a role. Compared to the change from baseline to 1 year, the increase in psychiatric ASI scores from 1 year onward may seem marginal, and there are no guidelines about clinical significance of the changes. Nevertheless, the findings underline the important issue of maintaining improvement in psychiatric status longitudinally for these patients.

Four distinct trajectories emerged, however, when we applied a group-based modeling approach to examine developmental trajectories of psychiatric outcomes from 6 months posttreatment entry to 9 years. Two of the groups had less variation across time in psychiatric severity: For about one third of the sample, psychiatric severity remained low throughout the 9 years, whereas for about one fifth of the sample, psychiatric severity remained high. The other two groups had changes in psychiatric severity throughout time in reverse directions: one decreased in psychiatric severity, and the other increased throughout the 9 years.

Results of multivariate logistic GEE models indicated that psychiatric trajectories throughout the 9 years were associated with drug abstinence. Compared to the low psychiatric severity group (and the improving group in bivariate analysis), individuals in the high or deteriorating groups were less likely to report abstinence from drugs during follow-up periods. Of note is that the relationship with psychiatric trajectories is not the same for alcohol and drug abstinence, with a stronger relationship to drug abstinence. Bivariate analyses indicated that

the four psychiatric trajectory groups had similar alcohol use outcomes in the first year after treatment entry. After the first year, the improving group maintained a more stable abstinence level, but the deteriorating and low-severity groups had large decreases at 5 years. Similarly, a large decrease in abstinence rates at 5 years from using five or more drinks per day was also found for the deteriorating group but not for the low-severity group. The results suggest that on average, there is more heavy drinking in the deteriorating group at later follow-ups. In multivariate analyses, psychiatric trajectories were not related to alcohol abstinence, but being in the low-severity or improving groups predicted being less likely to report five or more drinks per day at follow-ups. Thus, the relationship is more strongly related to level of drinking rather than abstinence.

There were no differences in most demographic characteristics or SU severity at baseline or in length of index CD treatment across the psychiatric trajectories. However, there were important differences between the high-severity group and other groups, with the former having higher proportions of women, and individuals with lower social economic status (SES), and higher problem scores across the ASI family/social, medical, and psychiatric domains. Other studies have found gender and ethnic differences in psychiatric severity among individuals in CD treatment (Galen et al. 2000; Niv and Hser 2006), but none has examined gender and ethnic differences in psychiatric trajectories throughout a long-term follow-up. The mechanism of the associations between these demographic characteristics and psychiatric trajectories is yet to be examined. One study found that health effects of socioeconomic disadvantage accumulate throughout the life course (Singh-Manoux et al. 2004), and access and use of treatment (including CD and MH) and other services might be mediated factors. Importantly, when controlling for psychiatric trajectories, women were more likely to be alcohol abstinent than men, but no association was found between gender and drug abstinence.

Although age was not significantly associated with psychiatric trajectories, our findings suggest that older age groups had higher odds of being abstinent from alcohol, drugs, and heavy drinking throughout time. This is consistent with general population literature (Adams et al. 1990; Johnstone et al. 1996; Karlamangla et al. 2006), and there is a possibility that age is a moderator variable. We also found that over time, marriage and employment status were positively associated with drug abstinence but not alcohol abstinence. The finding, in the context of a life course perspective, suggests that normative changes in developmental/social roles will be associated with the course of SU and recovery, and the association might be interrelated throughout time.

There are several limitations of this study. The sample was drawn from a private program that may differ from public samples. Although the literature would not suggest different results, findings may differ for individuals in CD treatment who have less access to MH treatment. In addition, the sample was drawn from one geographic area, which may not generalize to other areas of the country. Managed care is, however, a major organizational model for private and public health care today, including many state Medicaid arrangements.

As with all observational studies, our results cannot be interpreted as causal. Our attrition rate compares favorably to other long-term studies. Although our post hoc analysis was able to provide information about persons not included in the longitudinal analyses, long-term outcomes for approximately 20% of our original cohort are missing. As we noted, persons excluded from our analyses because they did not respond to at least one interview within 1 year and at least one from 1 year to 9 years were different in a number of ways from those included in our analyses, but we found no differences between included and excluded in psychiatric ASI composite scores from baseline through 9 years or abstinence status from 6 months through 9 years. Thus, attrition may produce some bias in our determinations of predictors of abstinence and may affect the generalizability of the results to the population base

of treatment patients. However, one prior study found that results from models predicting outcome based on the “easiest to locate” 60% of a sample are similar to those based on 90% to 100% of the final sample (Hansten et al. 2000).

The study has important policy and clinical implications. We found four distinct groups having different psychiatric trajectories that were associated with SU outcomes throughout the 9 years after treatment entry. We also found variation of SES and demographic characteristics that were associated with psychiatric trajectories as well as SU outcomes. These findings, along with those from other studies, highlight the importance that treatment policy recognize the vast heterogeneity in CD populations and provide appropriate and individualized services. Not only is there a great deal of heterogeneity in types and severity of SU disorders, the same range exists for psychiatric severity. CD programs have traditionally often had an orientation that if treatment results in good SU outcomes, other problems, such as psychiatric, will also improve. It is clear that this is not always the case. It is likely that unresolved psychiatric problems are predictors of relapse; as we have seen, this is particularly the case for drug use and heavy drinking. It is also possible that the relationship between psychiatric and SU problems is reciprocal. It would behoove clinical practice to conduct thorough clinical assessments of co-occurring problems and to measure progress in psychiatric status, as well as in SU, during treatment and throughout time. Aftercare programs should include attention to resolution of psychiatric as well as SU problems. Although it is beyond the scope of the present study, we encourage future research to examine the effects of posttreatment CD and psychiatric services received, and self-help meetings attended, on psychiatric trajectories and SU outcomes throughout time, as questions remain to be answered about when—and for whom—do services intervening psychiatric problems interfere with or enhance the likelihood of “sustained” and “stable” sobriety (Betty Ford Institute Consensus Panel in press).

Latent trajectory class approach has been increasingly used in addiction research (Clark et al. 2006; Xie, Drake, and McHugo 2006). Unlike the random coefficient growth curve modeling approach, which aims to model the population average growth curve, this novel analytical technique allows us to identify distinct longitudinal developmental pathways within the study population. To our knowledge, this study is one of the first studies to examine long-term psychiatric trajectories in CD patients using the method. Our findings of four psychiatric trajectories and their relationships with SU outcomes offer opportunities to better understand these patients and the services that might improve their long-term recovery.

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Psychiatric ASI scores

Figure 1.
Average Psychiatric Addiction Severity Index (ASI) Scores From Baseline to 9 Years

Psych ASI

Group Percents ~~1-1-1~~ 32.8 ~~2-2-2~~ 27.6 ~~3-3-3~~ 21.6 ~~4-4-4~~ 18.0

Figure 2.
Psychiatric Addiction Severity Index (ASI) Trajectories From 6 Months to 9 Years
Posttreatment Entry SAS PROC TRAJ Model

Table 1

Mean Posterior Probability of Psychiatric Trajectory Group Membership (Row) by Psychiatric Trajectory Group Assigned to (Column)

	Low Severity Group	Deteriorating Group	Improving Group	High Severity Group
Group 1	.86	.07	<.01	<.01
Group 2	.07	.78	.14	.07
Group 3	.07	.11	.82	.05
Group 4	<.01	.05	.05	.88

Table 2

Distribution of Baseline Individual Characteristics by Psychiatric Trajectory Group

	Low Severity Group (n = 338)	Deteriorating Group (n = 256)	Improving Group (n = 174)	High Severity Group (n = 166)	p
Age group (%)					
18 to 29	21.3	25.8	23.6	25.9	ns
30 to 39	39.9	35.2	32.8	38.0	
40 to 49	25.2	30.9	31.0	28.3	
50 and older	13.6	8.2	12.6	7.8	
Female gender (%)	21.0	35.9	42.5	55.4	<.0001
Ethnicity (%)					
White	67.8	77.7	81.5	81.9	.0018
Black	16.6	9.8	6.4	9.6	
Hispanic	10.1	9.8	6.9	7.2	
Other	5.6	2.7	5.2	1.2	
Dependence type (%)					
No dependence	14.2	9.4	8.1	10.8	ns
Alcohol only	41.4	43.4	46.0	38.6	
Drug only	27.2	29.7	28.7	30.7	
Both	17.2	17.6	17.2	19.9	
Income less than \$40,000 (%)	49.6	56.0	50.3	67.1	.0018
Education (%)					
Less than high school	13.4	9.5	17.4	17.1	ns
High school graduate	58.6	66.9	56.4	57.9	
College or more	28.0	23.6	26.2	25.0	
Married (%)	48.8	45.9	51.2	34.3	.0073
Employed (%)	62.2	59.2	60.5	45.1	.0027
Baseline ASI scores, mean					
Alcohol	0.45	0.45	0.49	0.43	ns
Drug	0.11	0.12	0.12	0.14	.0420
Employment	0.36	0.39	0.35	0.45	.0005
Family/social	0.35	0.39	0.43	0.46	.0002
Legal	0.11	0.12	0.09	0.11	ns

	Low Severity Group (<i>n</i> = 338)	Deteriorating Group (<i>n</i> = 256)	Improving Group (<i>n</i> = 174)	High Severity Group (<i>n</i> = 166)	<i>p</i>
Medical	0.31	0.38	0.41	0.48	.0006
Psychiatric	0.31	0.41	0.44	0.59	< .0001
Length of stay in weeks, mean	9.6	9.1	9.4	6.6	ns

Note: ASI = Addiction Severity Index; *ns* = not significant at *p* < .05 level.

Table 3
Substance Use Outcomes by Psychiatric Trajectory Groups, 6 Months Through 9 Years

	Low Severity Group (<i>n</i> = 338)	Deteriorating Group (<i>n</i> = 256)	Improving Group (<i>n</i> = 174)	High Severity Group (<i>n</i> = 166)	<i>p</i>
% abstinence from drug in past month at					
6 months	92.2	86.6	77.9	76.0	< .0001
1 year	87.9	88.8	81.6	84.9	ns
5 year	92.6	83.7	92.7	83.6	.0006
7 year	94.1	84.5	89.3	81.5	.0002
9 year	90.0	82.3	90.5	76.3	.0003
% abstinence from any alcohol in past month at					
6 months	63.5	70.1	62.9	60.0	ns
1 year	59.3	67.4	60.1	57.9	ns
5 year	47.7	49.4	64.6	59.9	.0008
7 year	47.7	49.3	62.3	57.5	.0131
9 year	50.2	56.7	64.9	56.1	.0347
% abstinence from five or more alcoholic drinks in past month at					
6 months	81.1	85.5	86.2	78.7	ns
1 year	82.6	83.1	79.2	74.2	ns
5 year	80.4	73.6	84.2	84.8	.0188
7 year	80.8	75.7	82.8	82.2	ns
9 year	87.2	77.3	85.8	78.4	.0126
Number of days using drugs in past month (<i>M</i>) at					
6 months	1.01	2.36	4.06	6.02	< .0001
1 year	1.55	2.42	3.57	5.92	.0001
5 year	2.18	4.12	3.50	6.64	< .0001
7 year	2.08	6.66	4.19	10.16	< .0001
9 year	3.12	9.74	4.71	11.54	< .0001
Number of days using alcohol in past month (<i>M</i>) at					
6 months	3.12	2.39	4.35	4.31	ns
1 year	3.48	3.21	3.88	5.02	ns
5 year	5.23	5.92	3.74	4.34	.0010

	Low Severity Group (<i>n</i> = 338)	Deteriorating Group (<i>n</i> = 256)	Improving Group (<i>n</i> = 174)	High Severity Group (<i>n</i> = 166)	<i>p</i>
7 year	4.92	5.66	3.92	4.53	.0259
9 year	4.87	5.04	4.24	4.71	ns
Number of days using five or more alcoholic drinks in past month (<i>M</i>) at					
6 months	1.34	1.06	1.66	2.06	ns
1 year	1.09	1.29	1.46	2.28	ns
5 year	1.36	2.07	1.35	1.73	.0242
7 year	0.94	2.06	1.21	1.52	ns
9 year	0.93	1.68	1.35	1.75	.0125

Note: ns = not significant at *p* < .05 level.

GEE Logistic Regression Models of Relationships Between Psychiatric Trajectories and Alcohol and Drug Abstinence

Table 4

	Abstinence From Alcohol			Abstinence From Drugs		
	OR	95% C.I.	Type 3 p	OR	95% C.I.	Type 3 p
Psychiatric trajectory groups						
Deteriorating vs. low severity	ns	ns	ns	0.61	(0.42, 0.87)	.0090
Improving vs. low severity	ns	ns	ns	0.61	(0.40, 0.93)	.0292
High severity vs. low severity	ns	ns	ns	0.43	(0.29, 0.66)	.0002
Index treatment						
Length of stay (per 1 week increase)	1.04	(1.03, 1.05)	< .0001	1.04	(1.02, 1.06)	< .0001
Day hospital vs. treatment as usual	ns	ns	ns	ns	ns	ns
Baseline ASI composites						
Alcohol (per 0.1 increase)	0.95	(0.91, 0.98)	.0039	ns	ns	ns
Drug (per 0.1 increase)	ns	ns	ns	0.55	(0.47, 0.63)	< .0001
Medical (per 0.1 increase)	ns	ns	ns	1.04	(1.00, 1.07)	.0439
Psychiatric (per 0.1 increase)	ns	ns	ns	ns	ns	ns
Baseline demographic characteristics						
Age 30 to 39 vs. younger than 30	1.71	(1.32, 2.22)	< .0001	1.63	(1.17, 2.26)	.0053
Age 40 to 49 vs. younger than 30	2.23	(1.66, 3.01)	< .0001	ns	ns	ns
Age 50 and older vs. younger than 30	2.12	(1.41, 3.18)	.0003	3.44	(1.47, 8.07)	.0015
Female vs. male	1.57	(1.25, 1.96)	.0001	ns	ns	ns
Education	ns	ns	ns	ns	ns	ns
Income	ns	ns	ns	ns	ns	ns
Married vs. not	ns	ns	ns	ns	ns	ns
Employed vs. not	ns	ns	ns	ns	ns	ns
Marital and employment status at follow-ups						
Married vs. not	ns	ns	ns	1.31	(1.01, 1.68)	.0377
Employed vs. not	ns	ns	ns	1.43	(1.15, 1.78)	.0013

Note: GEE = Generalized Estimation Equation; OR = odds ratio; C.I. = confidence interval; ASI = Addiction Severity Index; ns = not significant at $p < .05$ level.