The Role of Community Services and Informal Support on Five-Year Drinking Trajectories of Alcohol Dependent and Problem Drinkers*

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ABSTRACT. *Objective*: The purpose of this study was to examine how informal support and community services impact the course of alcohol disorders by examining the trajectories of alcohol consumption over 5 years in dependent and problem drinkers. *Method*: Alcohol dependent adults (n = 600) and problem drinkers (n = 992) were identified through probability surveys in the general population and in public and private treatment programs throughout a California county. Participants were interviewed at baseline and again 1, 3 and 5 years later. Models controlling for demographic characteristics, problem severity, community services and recovery-oriented social networks were estimated, using a multi-level, mixed model to predict alcohol consumption over time. *Results*: A significant trend of reduced drinking over time was observed for both dependent and problem drinkers. Recovery-oriented social networks and AA participation predicted decreased consumption for both groups. Contacts with medical, mental health, welfare and legal systems were predictive of reduced consumption for problem drinkers. In the dependent group, only contacts with mental health agencies marginally predicted decreased consumption. *Conclusions*: Findings point to the importance of developing mechanisms for better identifying problem drinkers in the course of contacts with health and social service systems and for facilitating use of self-help groups and positive changes in social networks. Development of recovery-oriented social networks should be emphasized to extend the benefits of treatment for dependent individuals. (*J. Stud. Alcohol* **64:** 862-873, 2003)

UNDERSTANDING THE ROLES community services and social networks play in the course of drinking could have important implications for clinical and community-level interventions. Numerous studies have demonstrated the importance of treatment over time (Finney and Moos, 1992; Hser et al., 1993, 1997; Shaw et al., 1997; Simpson et al., 2002). Other research, however, shows that many individuals improve without treatment and that treatment effects can be enhanced by other factors. Such factors may include contacts with medical and mental health clinics, welfare and criminal justice agencies and changes in social networks (Humphreys et al., 1997; Regier et al., 1993; Timko et al., 2000; Weisner and Matzger, 2003).

Additional studies suggest that treatment and nontreatment influences need time to have an effect on drinking trajectories. Skog and Duckert (1993) found that more change in alcohol problems occurred as time elapsed, suggesting a gradual process of change for many individuals. Hser and colleagues have also found that long-term change in drug users does not typically result from a single treatment episode (Hser et al., 1997). A limited number of studies have followed alcoholics over extended periods (see also Finney and Moos, 1992; Vaillant, 1995, 1996), and their findings demonstrate the importance of long-term research. Many questions remain about the factors related to change. Existing studies seldom include individuals with a wide range of severity, examine demographically diverse groups or compare individuals with treatment to those without; and they often fail to take other drug use into account. Long-term studies of community samples often emphasize alcohol, while many corresponding clinical studies focus on other substances.

To further our understanding of the course of drinking and the roles that services and informal influences play, we examined trajectories of alcohol consumption in dependent and problem drinkers drawn from representative samples of treated and untreated individuals. We used measurements at baseline and 1 year, 3 years and 5 years later. The treatment group consists of individuals entering public and private programs in a northern California county. The untreated group is a probability sample of alcohol dependent and

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problem drinkers from the same county. The four interview points make possible analytical techniques designed to examine long-term trajectories of drinking. To date, no long-term studies have examined the full range of problem severity in comprehensive and comparable probability samples of untreated and treated individuals, nor have any studies compared the influences of community agencies and informal supports on drinking over time.

Our conceptual framework draws on the medical utilization and outcome literatures (Aday and Anderson, 1974; Aday et al., 1999), while incorporating relevant modifications from the alcohol and drug literatures (e.g., Hser et al., 1997; Vaillant, 1998; Weisner and Schmidt, 2001). Our approach is also influenced by 1-year outcomes in our samples. We found that having attended treatment, having social networks of individuals who were not heavy drinkers or drug users, being older and having lower psychiatric and alcohol severity at baseline were related to abstinence and to nonproblematic drinking 1 year later (Weisner et al., 2003). Our model examines demographic characteristics (e.g., age, gender and ethnicity); problem severity (e.g., alcohol dependence symptoms and alcohol-related social consequences, as well as the severity of drug, psychiatric, medical, social, legal and employment problems); formal services (chemical dependency treatment and contacts and interventions from medical, mental health, welfare and criminal justice agencies); and informal supports (AA, social networks and interventions by family members) on drinking trajectories over time.

Prior research shows that demographic characteristics, such as age and gender, may greatly predispose individuals to long-term alcohol problems. National longitudinal studies have found rates of remission from alcohol problems to be consistently greater for women across all age and ethnic groups (Caetano and Kaskutas, 1995; Fillmore, 1987b). With regard to age, the clinical literature suggests that young adults do not have better outcomes and often do less well than older patients in treatment (Lemke and Moos, 2002; McLellan et al., 1997; Oslin et al., 2002; Satre et al., 2003). The general population literature, however, suggests that young adults are more likely to have trajectories of improvement—many mature out of problematic drinking as they take on major life roles—whereas older individuals have higher levels of chronicity (e.g., Fillmore, 1987a; Fillmore and Midanik, 1984).

The role that problem severity (including the severity of drug use, comorbid psychiatric and medical problems and social functioning) plays in influencing trajectories of alcohol problems is not well studied, although short-term studies have found it important (Gottheil, 1986; Hser et al., 2001; McKay et al., 1994; McLellan et al., 1983, 1997). Severe problems also increase the risk of readmission to treatment (Booth et al., 1991; Moos et al., 1994a,b; Taylor et al., 1986).

In this study, we focus particularly on formal and informal influences that may affect drinking trajectories. Prior studies suggest that specialized alcohol treatment can positively influence the course of long-term recovery from alcohol problems. Single episodes of care may alter alcohol problems in the short run; repeated episodes of treatment also appear to cumulate over time, producing beneficial outcomes (Edmunds et al., 1997; Finney and Moos, 1991; Hubbard et al., 1989), although, again, this premise has not been well studied.

Nonspecialty community services may influence long-term drinking outcomes. Dependent and problem drinkers are found in high numbers in many human service agencies, including emergency rooms, primary health care, welfare and criminal justice settings (Cherpitel, 1994; Helzer and Pryzbeck, 1988; Institute of Medicine, 1990; Regier et al., 1990; Weisner and Schmidt, 1992). Studies suggest that these services comprise a de facto system of care for those with alcohol disorders (Regier et al., 1993). The precise role of community contacts in altering the long-term course of problem drinking, however, has not been examined. Some studies do suggest that receiving services in community agencies for problems related to one's drinking may affect outcomes. For example, short-term studies have found significant added value in providing medical care to patients in recovery (Samet et al., 2001; Weisner et al., 2001; Willenbring and Olson, 1999). Adjunctive psychiatric services (Carroll et al., 1994; McLellan et al., 1993) and family counseling (McCrady et al., 1986; O'Farrell and Cutter, 1984) may also improve treatment outcomes. Whether they are independently helpful and have long-term influences has not been studied.

Finally, informal influences, including self-help participation and recovery-oriented social networks, may be effective in reducing alcohol problems. For example, long-term follow-ups of alcohol treatment patients have found that more cohesive and well-organized social networks led to more stable reductions in alcohol consumption (Finney and Moos, 1992; Humphreys et al., 1995, 1997, 1999). Vaillant (1995, 1996) found that treated alcoholics who had stable social networks and frequent AA meeting attendance had higher rates of abstinence after 8 years than did those without such resources. Self-help programs may assist their members in developing positive affiliations that reinforce reductions in alcohol use (Tonigan, 2001). A recent study showed that 1-year effects of AA were mediated by recovery-oriented social networks (Kaskutas et al., 2002). These informal influences have been more extensively examined in long-term studies than other factors in our model. However, they have seldom been studied in relation to a wide variety of demographic and severity characteristics.

This study examines the roles of formal and informal influences, as well as demographic and severity character-

istics, on 5-year drinking outcomes. Our analysis is strengthened by the inclusion of a wide range of variables known to influence the recovery process and by large samples of treated and untreated dependent and problem drinkers drawn from the same community. For individuals who were alcohol dependent at baseline, we hypothesized that treatment—as well as contacts and interventions by human service agencies, recovery-oriented social networks and AA participation—would be related to reduced alcohol consumption over 5 years. We also examined these relationships for the less severe problem drinking group. We expected that formal and informal resources and individual problem characteristics would also be related to a trajectory of lower consumption for these individuals over the 5 years.

Method

Baseline sample

The study was conducted in a northern California county with a population of approximately 900,000. It has a diverse population and mix of rural and urban areas, and it mirrors national patterns in the relationship of alcohol and drugs to other health and social problems (Weisner and Schmidt, 1995).

The study was designed to collect a representative sample (N = 1,598) of individuals experiencing a range of alcohol problems. Two sample procedures were used: In-person interviews were conducted in 1995 and 1996 with individuals entering the county's public and private chemical dependency programs (treatment sample) and with problem drinkers from the general county population (untreated sample). The treatment sample (n = 926) comprised consecutive admissions to the 10 public and private programs in the county that met the following inclusion criteria (Kaskutas et al., 1997a): (1) at least one new intake per week, (2) drugs other than alcohol were not the primary focus (e.g., methadone maintenance programs were not included) and (3) first-line treatment entry (i.e., programs limited to aftercare were excluded). Signed informed consent was obtained from both samples. Institutional review board approval was obtained from the University of California, San Francisco, and the Public Health Institute, Berkeley, CA.

Data collection for the treatment sample was conducted by trained interviewers who were independent of the treatment agencies. They administered structured in-person questionnaires to all participants by the end of their third day of residential treatment or third outpatient visit. Participation was independent of receiving agency services. The overall recruitment rate for individuals in all programs in the study was 80%. To ensure the samples reflected the true population attending treatment programs, statistical weights were created. These took into account differences in fieldwork duration (the length of time spent interviewing in each agency to represent equally across agencies the number of individuals who would have entered during the same given time period) and in sampling fraction within agencies (any differences in every "nth" client sampled). Weights were also adjusted for nonresponse by age, gender and ethnicity. For example, nonwhite women were overrepresented in one public program and were thus underweighted (0.39), and nonwhite men were underrepresented in one public program and were thus overweighted (3.00) (Humphreys and Weisner, 2000; Tam, 1997; Weisner et al., 2002).

The general population sample of dependent and problem drinkers (N = 672) was collected in the same county. Telephone interviews using random-digit-dialing methods were conducted with a probability sample of 13,394 adults. Individuals were recruited for an in-person interview if they met problem drinking criteria (described below) and had not received chemical dependency treatment during the previous 12 months. We refer to this general population sample who had not received chemical dependency treatment in the previous 12 months as the untreated sample. Of the overall untreated sample, 22% reported a treatment episode at some point earlier in their lifetime prior to the previous year (with a mean of 1.5 episodes).

The recruitment rate in the untreated sample was 70% of eligible respondents. This rate was calculated using a standard design for random-digit-dial telephone surveys (American Association for Public Opinion Research, 2000). It takes into account the percent of eligible unknowns who would have been problem drinkers and lost at the point of telephone screening, as well as refusals of the in-person interview. We did not find significant differences between those who agreed to the in-person interview in age, gender, ethnicity or problem severity characteristics. Moreover, prevalence rates and characteristics of problem drinkers in our untreated sample are similar to other household population studies in this county (Weisner et al., 1995; Weisner and Schmidt, 1995). This community sample of untreated dependent and problem drinkers was interviewed in person privately in respondents' homes by the same interviewers as the treatment sample, using a similar instrument.

Follow-up procedures

For both samples, 1-, 3- and 5-year follow-up interviews were conducted using Computer Assisted Telephone Interviewing (CATI). Baseline respondents were tracked every 3 months using postcard mailings and telephone check-ins. Respondents who could not be reached by telephone were referred to a fieldwork agency for further searching. Of individuals who were not found by telephone contacts, 7% were successfully located and interviewed in person at the 1-year follow-up, 8% at the 3-year follow-up and 5% at the 5-year follow-up. Follow-up response rates of the baseline

sample were 84% for Year 1, 82% for Year 3 and 79% for Year 5 (75%, 78% and 72%, respectively, for the treatment sample, and 93%, 91% and 88%, respectively, for the untreated general population sample).

Measures

The study measures annual volume of drinks consumed over four consecutive time periods during a 6-year period, as measured for the prior 12 months at baseline, and 1, 3 and 5 years later. Drinking volume for the year prior to each interview was measured by a sum of items included in a series of graduated frequency questions. Respondents were asked, "During the last 12 months, how often did you have twelve or more drinks of any kind of alcoholic beverage in a single day?" This question was asked for 8-11, 5-7, 3-4 and 1-2 drinks in a day as well. This measure has been the core measure in the National Alcohol Survey and used in treatment studies through the Community Epidemiology Laboratory (Hilton, 1987b; Kaskutas et al., 1997b; Midanik, 1994; Midanik and Clark, 1994, 1995; Room, 1982; Weisner and Schmidt, 1992, 1995).

Demographic characteristics included gender, age and ethnicity (white, black, Hispanic and other). Individuals met criteria for problem drinking by reporting at least two of the following during the 12 months prior to the baseline interview: (1) five or more drinks in a day at least once a month for men (three drinks in a day weekly for women), (2) one or more alcohol-related social consequences (from a list of eight) and (3) one or more alcohol dependence symptoms (from a list of nine). This measure is consistent with the predominant approach taken in research on alcohol epidemiology, and similar measures have been used in a wide variety of published studies (Institute of Medicine, 1990; Schmidt et al., 1998; Weisner and Schmidt, 1992; Wilsnack et al., 1991). Alcohol-related social consequences covered a range of ways that individuals with alcohol problems come to the attention of others in the community (Hilton, 1987a; Weisner, 1990; Weisner et al., 1995; Weisner and Schmidt, 1992). This was measured in the 12 months prior to each interview and included drinking-driving arrests, public drunkenness arrests, other alcohol-related criminal arrests, traffic accidents when drinking, other (nontraffic) alcohol-related accidents and/or confrontations about an alcohol-related health problem by a medical practitioner, serious alcohol-related family problems caused by respondents' drinking or confrontations about an alcohol-related job problem by a supervisor or employer. Dependence symptoms included assessment of nine criteria commonly used in clinical and general population research (American Psychiatric Association, 2000; Caetano and Weisner, 1995).

From the larger group of problem drinkers recruited for the study, we selected individuals who met criteria for alcohol dependence. We used a checklist of questions based on criteria from the Diagnostic Interview Schedule for Psychoactive Substance Dependence, DSM-IV (American Psychiatric Association, 2000) that has been used in other published studies (Caetano and Raspberry, 2000; Humphreys and Weisner, 2000; Weisner et al., 2001). The presence or absence of each symptom was asked for the previous 30 days, and individuals with three or more symptoms out of a total of seven were classified as dependent.

To assess drug, employment and psychiatric problem severity, an abbreviated form of the Addiction Severity Index (ASI) was used. The ASI is a valid and reliable instrument that assesses the severity of alcohol, drug, employment, medical, psychiatric, family/social relations and legal problems (McLellan et al., 1992). In each domain, questions measure the number, frequency and duration of problem symptoms in the patient's lifetime and in the past 30 days. The resulting score is a continuous measure from 0 (no problems) to 1.0 (high severity).

Contact with formal services included alcohol and drug treatment and other community agencies. The baseline sample, as described above, comprised treated and untreated individuals. At each follow-up interview, the 12 months' prior treatment attendance was assessed, with treatment defined as DUI, detoxification, inpatient and outpatient alcohol and drug treatment. We included baseline treatment status as the treatment variable for the baseline measure. Treatment reported at each following interview wave was measured as treatment. We also asked whether an individual had had contact with the medical system (through a medical visit, emergency room visit or overnight hospital stay), the legal system (through an arrest, parole, probation or time in jail), the welfare system (through Aid for Families with Dependent Children [AFDC], General Assistance, Food Stamps or Temporary Assistance for Needy Families [TANF] after that program began) and/or the mental health system (through inpatient or outpatient visits). Respondents were then asked a series of questions about those contacts. Service encounters were assessed as having had drinking addressed if the provider brought up the subject of drinking, referred the respondent to services and/or provided counseling related to drinking in the 12 months prior to the interview.

Informal influences on drinking behavior at each interview included an index of alcohol and drug-related social network size, which reflected the total number of friends and family members who were heavy or problematic drinkers or users of illicit drugs with whom the respondent reported regularly having contact. Respondents were also asked whether anyone from a list of family members had said anything about their drinking or suggested they cut down during the previous 12 months. In addition, respondents reported the number of Alcoholics Anonymous (AA) meetings they had attended in the 12 months prior to each interview.

To take into account the large range in alcohol problem severity, we first selected from the overall sample those who were alcohol dependent (who met DSM-IV criteria). We conducted analyses on the alcohol-dependent and problem-drinking groups separately. Descriptive analyses used Pearson's chi-square test to assess differences between categorical variables and *t* tests to examine mean differences in continuous variables. As expected, the distribution of drinking volume was skewed with a small number of large values. A base-10 logarithmic transformation produced model residuals that more closely approximated the normal distribution. The log-transformed version of the outcome was therefore used in all subsequent multivariate models.

We used a mixed-effects linear model (also known as hierarchical or random-effects modeling) to estimate and test the effects of our covariates on the outcome of log-10 drinking volume measured at each interview. This approach can be thought of as a repeated measures analysis of variance with several advantages over the standard least-squares method. Variation from individual-to-individual can be explicitly incorporated, and the method allows the inclusion of time-dependent covariates, those that can change value from interview to interview. Another advantage is that all respondents do not have to be assessed at the same times, and if data from one data point are missing, the available data on that subject can still be included in the analysis. The estimates are statistically consistent in the presence of such missing data, and, finally, one is not restricted to a single form of the variance/covariance matrix (i.e., the correlations of the outcomes from interview to interview) but can use a form that more closely fits the observed data. The end result is a model that allows us to test whether the addition of the formal and informal influences significantly explains the course of drinking over time. It also allows us to test the effects of the individual variables on drinking volume, including the general shape of the curve over the 5 years.

Our final analysis is composed of three nested mixed-effects linear models of log drinking volume. The first model contains only the control covariates of year of interview: age, gender, ethnicity, social consequences, number of dependence symptoms, as well as ASI psychiatric, drug, employment, medical, employment and severity scores. The second model adds the measures of formal services, and the final model includes the informal influence measures. The models were estimated using maximum likelihood estimation via PROC MIXED in SAS Version 8.2. We note that these models were developed by first comparing model fit statistics for models that included the ASI alcohol composite versus models that replaced it with counts of alcohol-related social consequences and dependence symptoms. While final model estimates were similar, using the social consequence and dependence measures in place of the ASI score produced an improved model.

Two indices were used to assess the fit of the final models: Akaike's Information Criteria (AIC) and the Bayesian Information Criteria (BIC). They are similar, but the BIC penalizes more severely for the number of parameters. (The number of parameters not only reflects the number of variables—a single variable can require more than one parameter if it is categorical and represented by a dummy variable—but also the number of estimates required to fit random effects and the type of variance/covariance structure used). Because the three models are nested in the sense that each one contains the same covariates as the previous one plus other covariates, they can be tested against each other. This was done by comparing the change in -2 times the log likelihood between models (-2LL) against a chi-square distribution with the degrees of freedom equal to the change in the number of parameters.

Missing data are always a concern in longitudinal studies. In this case, the percent missing, while not trivial, compares well with other long-term studies. There are several approaches to analyzing data in the presence of missing data. Two reasonable options are to estimate model effects using maximum likelihood-based estimation or to use multiple imputation; we chose maximum likelihood estimations rather than imputation. This approach has several advantages: First, it allows the use of all data, regardless of how many interviews each subject had. Second, methods of multiple imputation for longitudinal data are not common, and there is little literature to provide advice on pitfalls. Third, multiple imputation requires one to assume the data are multivariate normally distributed for good estimation, and some of the variables of interest in our models made this assumption questionable. Following the approach outlined by Littell and colleagues (Littell et al., 2000), once the model for the mean structure was established, the next step was to select a model for the covariance structure. By fitting models under several covariance structures, and comparing the AIC and BIC indices along with the number of parameters, a one-step auto-regressive structure with random intercept term appeared to provide the most parsimonious fit.

Results

Table 1 presents baseline demographic characteristics, problem severity, formal services and informal influences for dependent and problem drinkers. There were significantly more men (67% vs 62%, $p = .04$) and older individuals (mean age 39 vs 36 years, $p < .001$) in the dependent group than in the problem drinkers group. As expected, dependent individuals had higher levels of problem severity across most measures ($p < .001$ for number of social consequences and dependence symptoms, and also for psychiatric, medical, social, drug, legal and employment severity). Those who were dependent were also more likely

TABLE 1. Baseline characteristics of alcohol dependent and problem drinkers

	Alcohol dependent (n = 600)	Problem drinkers (n = 992)	p value
Demographic characteristics			
Ethnicity (%)			
White	54	65	<.001
Black	31	17	
Hispanic	6	10	
Other	9	8	
Education (%)			
<High school	24	15	<.001
High school graduate	46	46	
>High school	30	39	
Income (%)			
<$25,000	56	42	<.001
$25,000+	44	58	
Male (%)	67	62	.043
Age, mean (SD) years	39.00 (11.10)	35.80 (11.90)	<.001
Problem severity, mean (SD)			
Number of social consequences	1.54 (1.38)	0.32 (0.71)	<.001
Number of dependence symptoms	5.91 (2.32)	2.18 (2.11)	<.001
ASI psychiatric severity	0.41 (0.24)	0.22 (0.23)	<.001
ASI medical severity	0.30 (0.37)	0.19 (0.31)	<.001
ASI family problem severity	0.26 (0.29)	0.17 (0.25)	<.001
ASI drug severity	0.11 (0.13)	0.07 (0.11)	<.001
ASI legal severity	0.12 (0.19)	0.08 (0.16)	<.001
ASI employment severity	0.72 (0.34)	0.61 (0.35)	<.001
Formal services (%)			
Legal contact	37	20	<.001
Medical contact	75	78	.191
Welfare contact	20	15	.009
Mental health contact	37	24	<.001
Drinking addressed: Legal	13	6	<.001
Drinking addressed: Med/MH	31	6	<.001
Drinking addressed: Welfare	6	1	<.001
Drinking addressed: Work	18	6	<.001
Treatment history	80	44	<.001
Informal influences			
Drinking addressed: Family (%)	81	39	<.001
Size of heavy-drinking and drug-using social network, mean (SD)	2.28 (5.79)	2.63 (5.13)	.210
No. of days AA attendance past year, mean (SD)	25.80 (54.30)	14.60 (46.50)	<.001

to be in the treatment sample at baseline (80% vs 44%, $p <$ .001). Concerning formal services, there were no differences in contact with the medical system, but dependent individuals were more likely to have had contact with the legal ($p <$ .001), welfare ($p <$ .01) and mental health ($p <$ .001) systems. They were also more likely to have had their drinking addressed by the legal, medical/mental health and welfare systems and/or by a family member and/or someone at work ($p <$ .001 for each). Among the informal influences, those who were dependent at baseline had attended on average more AA meetings (26 vs 15, $p <$ .001), and more reported that family members had addressed their drinking (81% vs 39%, $p <$ .001). However, the size of their heavy-drinking and drug-using social networks did not differ from those of problem drinkers at the baseline interview.

Figure 1 displays the mean trajectory over time of log-10 drinking volume for both dependent and problem drinkers. At baseline, those who were dependent had higher mean levels of alcohol consumption than did problem drinkers. This translates on average into 17 drinks per week for the problem drinkers and 49 drinks for the dependent drinkers. Over time, both groups reduced their drinking, and dependent drinkers actually had a slightly lower mean log volume by the 5-year follow-up interview, although their mean volume on the original scale was still greater than that of the problem drinkers. This finding appears to be the result of having more of the dependent drinkers reporting zero consumption at the 5-year interview (19% vs 27%). The log transformation shifts the means of the two groups closer to each other (by down-weighting the extreme values) and the greater proportion of zero values further pulls the mean of the dependent group towards zero. The mean log-10 volume for all those reporting some drinking over the past year at Year 5 was greater for the dependent drinkers (2.47 vs 2.30).

Table 2 displays the model fit statistics for the base-10 log transformed measure of each year's volume of drinking in three nested models for the dependent and problem drinkers. As expected, in the first model the demographic and severity characteristics were significantly related to drinking over time. As shown by the change in the log-likelihood (-2LL), the addition of the formal services to the model in the second step added significantly to variance explained by the model in each sample ($p <$ .05 for dependent drinkers and $p <$ .001 for problem drinkers). The addition of informal influences also significantly improved the model fit ($p <$ .001 for each) but, as reflected by the greater change in the log-likelihood, does so to a much greater degree. Thus, whereas the formal influences were important in predicting alcohol consumption, the informal influences were more important. The effect of formal services might have been stronger if we had used a continuous measure of contacts. However, we note that the variables measuring formal services were very skewed, with many zeros in contrast to the social network ones. Respondents had fewer meetings with community agencies than AA meetings or influences from social networks.

Predictors of decreasing consumption for dependent and problem drinkers

Tests of the individual effects of measures in the models are summarized in Table 3. For both groups, consumption decreased over time, and the time-by-time interaction showed that the decrease leveled off ($p <$ .001 for all models).

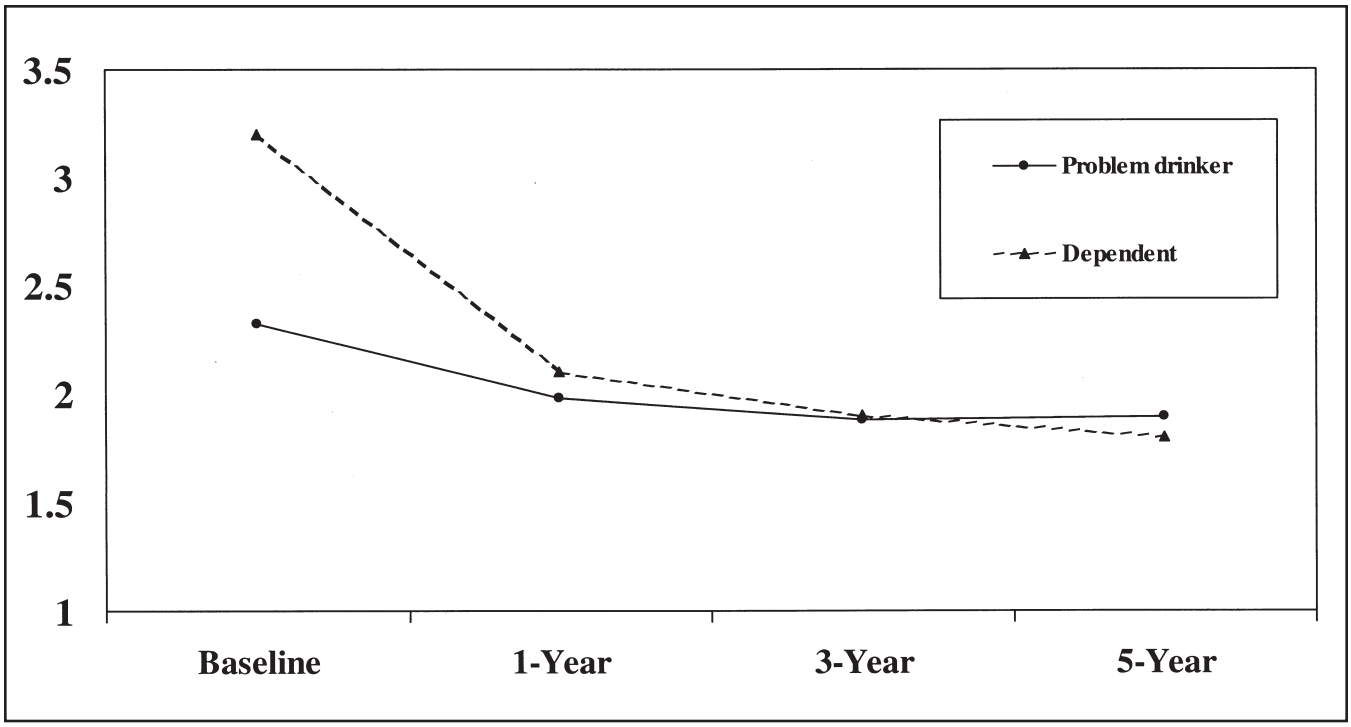

FIGURE 1. Mean log-10 volume for dependent and problem drinkers over 5 years

Individual characteristics. For both dependent and problem drinkers, women were more likely than men to decrease their drinking over time ($p = .001$ for dependent individuals and $p = .027$ for problem drinkers). Increasing age was predictive of increased drinking for problem drinkers ($p = .016$). Also among problem drinkers, blacks ($p < .001$) and others ($p = .024$) were more likely than whites to decrease their drinking; among the dependent drinkers, Hispanics were more likely than whites to decrease their drinking ($p = .014$), with blacks showing a decreasing, although not significant, trend. Among the severity measures, a higher number of dependence symptoms was a key predictor of increased log-volume for both dependent and problem drinkers ($p < .001$ for each). In addition, for problem drinkers, larger numbers of social consequences were related to higher consumption levels ($p = .04$). Also for problem drinkers, among the severity measures, a higher ASI employment score predicted lower volume ($p = .006$). For the dependent group, a higher ASI family problem score was predictive of decreasing drinking levels ($p = .025$), and a higher ASI drug score over time was related to increases in consumption ($p = .039$).

TABLE 2. Model fit statistics for three nested models of log-10 alcohol volume measured at four timepoints for alcohol dependent and problem drinkers

Model	AIC	-2 LL	Change	Parameters	*p* value
Alcohol dependent					
Controls	4,279.6	4,239.6	–	20	
Formal added	4,278.4	4,222.4	17.2	28	.028
Informal added	4,131.7	4,069.7	152.8	31	<.001
Problem drinker					
Controls	7,755.5	7,715.5	–	20	–
Formal added	7,712.0	7,656.0	59.6	28	<.001
Informal added	7,557.4	7,495.4	160.6	31	<.001

Notes: Based on chi-squared distribution. Changes in degrees of freedom equal changes in the number of parameters from the previous step. LL = log likelihood.

Formal services. Among the formal influences, contacts with mental health providers predicted lowered consumption over the 5 years for both dependent and problem drinkers ($p = .059$ and $p < .001$, respectively). Contacts with the criminal justice system ($p = .033$) and medical ($p = .018$) and welfare ($p = .055$) organizations were also related to lower consumption among problem drinkers. Having drinking addressed by a medical or mental health provider was predictive of decreasing consumption for problem drinkers ($p = .041$). Treatment in the prior year was related to increased consumption among the problem drinking group ($p = .006$).

Informal influences. As expected, among the informal influences, the number of AA meetings was related to decreased consumption for dependent and problem drinkers ($p < .001$ for each). Moreover, the size of an individual's heavy-drinking and drug-using social network was related to increased consumption ($p = .006$ for dependent individuals and $p = .059$ for problem drinkers). Suggestions from family members to reduce drinking or go to treatment were related to increased consumption for both groups ($p < .001$ for each).

TABLE 3. Final model of log-10 alcohol volume measured at four timepoints for alcohol dependent and problem drinkers

	Alcohol dependent		Problem drinker	
Effect	Estimate	*p* value	Estimate	*p* value
Intercept	1.749		1.729	
Time: Linear	-0.179	**<.001**	-0.217	**<.001**
Time: Quadratic	0.028	**<.001**	0.033	**<.001**
Individual characteristics				
Age	-0.004	.136	0.005	**.016**
Female vs male	-0.204	**.001**	-0.105	**.027**
Black vs white	-0.105	.119	-0.320	**<.001**
Hispanic vs white	-0.289	**.014**	0.030	
Other vs White	-0.059		-0.197	**.024**
ASI psychiatric severity	0.047		-0.145	.113
Number of social consequences	0.002		0.047	**.040**
Number of dependence symptoms	0.264	**<.001**	0.260	**<.001**
ASI medical severity	-0.002		-0.073	.136
ASI family problem severity	-0.205	**.025**	-0.033	
ASI drug severity	0.473	**.039**	0.359	.083
ASI legal severity	0.081		0.110	
ASI employment severity	-0.056		-0.121	**.006**
Formal services				
Contact: Legal	-0.071		-0.103	**.033**
Contact: Medical	-0.030		-0.068	**.018**
Contact: Welfare	-0.011		-0.092	.055
Contact: Mental health	-0.089	.059	-0.156	**<.001**
Drinking addressed: Social welfare	0.048		-0.078	
Drinking addressed: Med/mental health	-0.032		-0.087	**.041**
Drinking addressed: Legal	-0.100		0.119	.108
Drinking addressed: Work	-0.032		0.017	
Treatment in prior year	-0.086	.081	0.114	**.006**
Informal influences				
Drinking addressed: Family	0.398	**<.001**	0.288	**<.001**
Alcohol- and drug-using network size	0.010	**.006**	0.005	.059
Days of AA attendance	-0.002	**<.001**	-0.003	**<.001**

Notes: Degrees of freedom = 1/2,258 for problem drinkers and 1/1,117 for dependent individuals. Only p values ≤.15 are shown; p values ≤.05 are bolded.

Discussion

We examined the trajectory of alcohol consumption over 5 years, using a model that included demographic and problem characteristics, formal services and informal influences. Our results suggest a trend of reduced drinking over time, both among individuals who began the study alcohol dependent and those who were less severe problem drinkers. Public opinion, greater health consciousness and increased awareness of behavioral health issues, such as drinking and smoking, in society at large may have influenced this overall positive outcome.

Community contacts and informal networks. Because people with alcohol problems interact with many community institutions, and because their drinking impacts relationships with families and friends, we particularly examined the role of community contacts, including specialty treatment and informal influences. We found that each type of community contact was related to a trajectory of lower consumption for problem drinkers, but only mental health was related for those who were dependent. As we hypothesized and consistent with prior research (e.g., Humphreys et al., 1997), we found that social influences were related to reduced drinking over time. The greatest impact came from having fewer heavy-drinking and drug-using social networks and more AA participation. Our 1-year follow-up also found these factors to be important (Weisner et al., 2003). On the other hand, interventions from family members were related to higher consumption over 5 years. This may be related to the subjects' lower level of drinking problems; they may not perceive themselves to have a problem and may consequently reject pressures from their families to reduce their drinking. Interventions by families to reduce drinking may therefore be a response to continued problematic drinking. This is consistent with the literature and our findings in this sample on treatment entry; at the 1-year and 3-year interviews family pressures were not predictors of entering treatment (Weisner and Matzger, 2002).

In examining the roles of community and informal influences in these samples, we found that community interventions are related to entering treatment over time (Weisner and Matzger, 2002), whereas informal influences predict reduction in drinking. This was true at 1 year (Weisner et al., 2003) and, in this study, at 5 years.

Treatment effects decay over time. We expected that attending treatment would be related to lower trajectories of consumption over the 5 years. However, although attending treatment was important for 1-year outcomes (Weisner et al., 2003), its effect diminished over the 5 years, becoming marginally important for dependent drinkers over time. Multiple treatment episodes were related to problem severity, and early treatments probably lost their effects over time. These findings suggest that other experiences may reinforce or erode the effects of treatment, and our results highlight the importance of including clinical interventions to develop recovery-oriented social networks to extend treatment benefits as part of treatment. At the same time, attending treatment was related to higher consumption for problem drinkers with DUI and other treatments. This result may be related to a confound between the dependent and independent variables, that the treatment was not a good fit with the individual's level of severity, or that the treatment experience was not consistent with the perception of severity that problem drinkers had of their drinking.

Dependence versus problem drinking. We found important differences between dependent and problem drinkers in the way problem characteristics and community contacts affected consumption over time. For both groups, informal influences played a larger role than formal services. However, for problem drinkers contacts with community agencies and interventions from medical and mental health

agencies were related to reduced consumption. The finding that the lower-severity problem-drinker group benefits from community interventions is important. This group is considered amenable to early interventions in nonspecialty settings (Fleming et al., 1997; Institute of Medicine, 1990; Samet et al., 2001), and our findings support that conclusion. Our study of 1-year outcomes found that this sample had many contacts with community agencies, and many of the contacts were missed opportunities to address drinking (Weisner and Matzger, 2003). These results are consistent with other research in pointing to the importance of prevention and policy initiatives targeted at problem drinkers, and they reinforce the importance of screening and interventions in these settings.

Community agency interventions were less associated with positive outcomes among those who were alcohol dependent. Although dependent individuals in this study had contact with many institutions, only contacts with mental health agencies were related to lower consumption. This suggests that, for the dependent group, interventions, such as being talked to about one's drinking or receiving suggestions to cut down, are not sufficient. This interpretation is supported by the finding that, within both groups, those at the more severe end of the continuum improved less. This was also true for those with related drug problems. For problem drinkers, co-occurring drug problems were marginally related to higher alcohol consumption over time, and for those who were dependent they were significantly related.

Higher levels of medical and employment problems among problem drinkers were also related to lower consumption over time. It is likely that these problems are what brought problem drinkers into contact with community institutions; the problems caused discomfort, and the individuals' alcohol severity was not so high that they could not benefit from more minimal interventions. Although several individual characteristics were related to reduced consumption, only ethnicity and gender were important for both dependent and problem drinkers. Over the 5-year observation period, women had a steeper trajectory of diminished drinking than men had. This observation has also been found in a few earlier clinical and community studies (Fillmore, 1987b; Kaskutas et al., 2003). However, most clinical and general population samples with long-term follow-ups have contained too few women to examine gender effects. It is critical for future research to examine the unique factors related to long-term recovery among women. Our findings also indicate the importance of examining ethnicity in long-term studies. Hispanics had a lower drinking trajectory than whites, as was true of blacks compared with whites for those who were alcohol dependent. Problem drinking blacks had a lower trajectory than whites. This has not been well studied in the longitudinal literature, but the findings are counter to what has been found in short-term follow-ups and in cross-sectional studies, in which blacks and Hispanics have not shown the same reductions as whites (Caetano, 1997; Caetano and Kaskutas, 1995). This finding could be the result of examining a cohort of problem users rather than a broader general population study. It could also be a result of higher levels of community contacts and treatment among ethnic minorities, which we found in our sample (not shown) as well as in national surveys (Weisner er al., 1995). Our future research with 7-year data points will examine interactions of ethnicity with formal and informal supports to better understand these relationships.

Limitations. Limitations of the study include its generalizability, reliance on self report and attrition of more severe cases.

In regard to generalizability, the study examines a single U.S. county that was selected on the basis of diversity in its population characteristics and mix of rural and urban areas. Its similarity to other U.S. areas with respect to alcohol and drug problems and treatment policy has been examined for over 15 years through the Community Epidemiology Laboratory (CEL) and as the U.S. site in the World Health Organization's Study of Community Response to Alcohol (Greenfield and Weisner, 1995; Kaskutas et al., 1997b; Roizen, 1981; Schmidt et al., 1998; Weisner and Schmidt, 1992, 1995). We have addressed issues of generalizability by paying close attention to measures, treatment system characteristics and the relationship between substance use and problems in the study county, and by conducting comparisons with the National Alcohol Survey, the National Drug and Alcohol Treatment Utilization Survey (NDATUS)/Uniform Facility Data Survey (UFDS) and the National Household Survey on Drug Abuse (Greenfield and Weisner, 1995; Schmidt and Weisner, 1993; Substance Abuse and Mental Health Services Administration, 1997; Weisner et al., 1995; Weisner and Schmidt, 2001).

The study relies on self-report of drinking. However, we used robust questions and well-established interview techniques developed through the National Alcohol Survey and clinical studies. Recent articles, moreover, find that self-report data on alcohol use can be accurate (Chermack et al., 1998; Midanik, 1988) and sometimes biased towards overreporting among those in treatment (Babor et al., 2000). We also conducted follow-up interviews separate from any program or institution with which respondents had contact, thus avoiding differential bias between groups.

Finally, although the study compares well with others in its follow-up rates over time, attrition was higher for those whose problems were more severe. We have addressed differences in follow-up characteristics in our analysis, but attrition may produce some bias in our findings of overall improvement. Because individuals were sampled at their entry to treatment or when they met problem-drinking status in the community survey, their drinking was potentially at its highest point, and a reduced drinking trajectory could

at least partly be attributed to regression to the mean. Measuring psychiatric severity at baseline may have also included alcohol- and drug abuse-stimulated symptomatology, and this may also influence regression to the mean or reduce its predictability. At the same time, however, we observed a wide range in ASI psychiatric severity scores at baseline from a mean range of 0.22 to 0.41, well below the maximum possible of 1.0; so we believe that if it has a predictive effect, it is not very strong—particularly once we account for other covariates. Furthermore, the follow-up interviews and tracing contacts by the study may have acted as an intervention, resulting in lowered drinking. However, as Booth and colleagues discuss (Booth et al., 2001), this does not account for fluctuations found over 5 years, which showed several different trajectories of drinking over time, or the lowered trajectories by some population groups, particularly gender and ethnicity, not related to severity at baseline. An important agenda of future waves of this study will be to help understand whether there is continued lower drinking, or whether problems do fluctuate or become more severe over time.

Our approach was to study a confined geographic area to control for environmental issues that might impact treatment entry and recovery, and we included a probability sample from the general population and consecutive intakes from representative public and private programs. It is the first in a series attempting to understand the 5-year course of alcohol, drug and other life outcomes among this representative sample of treated and untreated individuals with alcohol and drug disorders. Our multiple data points allow us to use new analytical techniques for examining trajectories.

Implications. Our findings point to the importance of what goes on outside specialty treatment. They underline the critical nature of developing mechanisms for identifying "at risk" drinkers in the course of contacts with health and social service systems and in increasing referrals to treatment for those with severe problems. The results argue for clinical interventions that extend the benefits of treatment, including a focus on the development of recovery-oriented social networks. They also reinforce short-term findings of the critical role played by social networks in the general population, and the importance of finding ways to assist families to intervene more successfully in a family member's alcohol problems. Changing behavior of dependent versus problem drinkers will likely involve different interventions. Overall, it is clear that many factors make a difference in individual drinking trajectories, which suggests the importance of a multifaceted approach to raising awareness in society and community institutions.

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