Following Problem Drinkers Over Eleven Years: Understanding Changes in Alcohol Consumption*

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ABSTRACT. Objective: Much of what we know about the course of alcohol consumption in problem and dependent drinkers comes from studies of in-treatment populations. Less is known about the natural course of alcohol consumption among such drinkers in the general population and what predicts how much they drink. **Method:** This study examined alcohol consumption over the course of 11 years in a randomly selected sample of 672 problem and dependent drinkers from a single, heterogeneous U.S. county. **Results:** Alcohol consumption declined and leveled off over time but did not decrease to the average general U.S. population level. Several indicators of ongoing problems with drinking are associated with high levels of drinking over time: having a heavy-drinking

network, receiving suggestions to do something about one's drinking, and going to treatment. Factors associated with less drinking include having contact with community agencies and going to Alcoholics Anonymous (AA). **Conclusions:** Results suggest that problem and dependent drinkers continue to drink at an elevated level over the course of years. Gatekeepers, family members, and policymakers should encourage and facilitate contact with social service agencies and with AA for problem drinkers. Suggestions from others to do something about one's drinking and seeking specialty care occur more often in those with more severe problems and do not appear to be linked to less drinking over time. (*J. Stud. Alcohol Drugs*, 71, 831-836, 2010)

MUCH OF WHAT WE KNOW about changes in drinking over time has come from studies of the most severe drinkers, those who are recruited in treatment programs and followed over time (Finney and Moos, 1981; Kaskutas et al., 2005; Polich et al., 1981; Project MATCH Research Group, 1998). Findings in the literature suggest that although treatment is effective and many recover (some without treatment; Dawson et al., 2005), a return to heavy drinking is the more likely outcome. These findings have prompted those in the field to recognize the relapsing nature of alcohol dependence and a need for a formal continuing-care model consistent with a chronic illness framework (McKay, 2009). Although this represents a sea change in how alcoholism is conceptualized, it does not speak to the much larger population of problem drinkers whose drinking problems may not require such a continuing-care model to generate and sustain remission from problematic drinking. The need for continuing care among problem drinkers has implications for screening, brief intervention, or referral to treatment protocols and health education campaigns.

This report explores the relevance of different types of continuing care among problem drinkers using a probability sample recruited from the community and followed for 11

years. We studied their drinking trajectory over time and the role of formal and informal services on that drinking trajectory. Because it is possible that reductions in drinking volume might represent a natural regression toward the population average, our models also explicitly include time as a covariate.

Most studies of problem drinkers have considered those whose drinking resulted in some form of a problem, such as an arrest or discipline at work, and who had expressed interest in getting help with their drinking. These samples tend to be of a higher severity than non-treatment seekers (e.g., Ilgen et al., 2008; Moos and Moos, 2006). The only longitudinal study that reported changes in alcohol consumption over time among problem drinkers who were not seeking help for their drinking sampled older individuals (ages 55-65 years) who had been to a health care facility in the past 3 years and included both nonproblem drinkers as well as problem drinkers (Schutte et al., 2003).

In this work, we first described the average level of alcohol consumption in our sample of problem drinkers over time and compared their drinking volume at the 11-year follow-up (conducted in 2005-2006) with general-population average consumption from the 2004-2005 National Alcohol Survey (NAS). This indexes the extent that the problem drinkers' consumption had moved toward the general population's mean consumption.

Second, we modeled average alcohol consumption over time for our problem-drinker sample, considering formal and informal influences at each interview as potential predictors of the drinking trajectory. Formal resources include specialty alcohol treatment as well as contact with social service and

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health system agencies. Informal influences address whether anyone had suggested the problem drinker get help for his or her drinking and the number of individuals seen regularly who are heavy drinkers or drug users. Prior work from the larger study from which our problem-drinker sample was drawn suggests complex effects, both positive and negative, for these factors. For example, in research using some of these same data, contact with legal, welfare, mental health, and medical agencies has been significantly associated with decreased consumption among problem drinkers through the 5-year follow-up (Weisner et al., 2003) and with continued effects at 7 years for just one type of contact (mental health system) (Ammon et al., 2008). The number of heavy drinkers and drug users in the social network and having a family member address the respondent's drinking were significantly associated with more drinking through 7 years (Ammon et al., 2008).

Method

Sample

The problem-drinker sample ($N = 672$) was recruited using random digit dialing to identify problem drinkers in a northern California county (population 900,000). The county was selected because of its mix of urban and rural areas and has been the site of the Community Epidemiology Laboratory for 3 decades (Weisner and Schmidt, 1995). A total of 13,394 adults 18 years of age and older were screened for problem drinking, which was based on meeting at least two of the following three criteria in the past year: (a) at least one alcohol-related social consequence (from a list of eight), (b) at least one symptom of alcohol dependence (from a list of nine), and (c) at least five drinks in a single day at least once a month (men) or at least three drinks in a single day weekly (women). Although no standardized definition of problem drinking is used in the alcohol literature (Ferrence et al., 1980; Hilton, 1991), our problem-drinking measure follows the predominant approach taken in research on alcohol epidemiology (Clark and Hilton, 1991; Institute of Medicine, 1990; Schmidt, 1992; Weisner and Schmidt, 1993; Weisner et al., 1995; Wilsnack et al., 1991). Once a problem drinker was identified by phone screen, in-person interviews were conducted.

Respondents were re-interviewed at 1, 3, 5, 7, 9, and 11 years after baseline. The response rate at 11 years was 81% (response rate excludes the 37 deceased participants). Those lost to follow-up were more likely to be male, to have lower socioeconomic status (i.e., less educated, lower income, and uninsured), and to have had more severe alcohol problems (i.e., more likely to have been dependent and to have reported more dependence symptoms and alcohol-related consequences) at study entry. However, there were no differences in follow-up associated with ethnicity or age. Importantly,

TABLE 1. Estimates and p values for final model of log-10 alcohol volume measured at seven time points in general-population sample of problem drinkers

Variable	Estimate	p
Intercept	2.024	<.001
Time: linear	-0.086	<.001
Time: quadratic	0.005	<.001
Individual characteristics		
Age	0.002	.368
No. of missed follow-ups	-0.008	.615
Female	-0.207	.001
Unmarried vs. married	0.004	.929
Ethnicity ^a		
Black vs. White	-0.2231	.0060
Hispanic vs. White	-0.1729	.0091
Other vs. White	-0.1564	.0546
Income	0.016	.105
Family history	0.007	.895
Family History $\times$ Female Gender	0.073	.403
Severity		
Not alcohol dependent vs. alcohol dependent (baseline)	0.190	.003
ASI alcohol problem severity (baseline)	1.877	<.001
ASI drug problem severity (baseline)	-1.247	.006
No. of social consequences over time	0.276	<.001
Formal influences		
Specialty treatment over time	0.111	.013
No. of contacts with medical, mental health, criminal justice, welfare over time	-0.069	<.001
Informal influences		
No. of AA meetings over time	-0.007	<.001
No. of suggestions to get help over time	0.071	.052
No. of heavy drinkers and drug users in network over time	0.013	<.001

Note: **Bold** indicates statistical significance. ASI = Addiction Severity Index; AA = Alcoholics Anonymous. ^aTotal effect for ethnicity: Effect = -.172, $p < .001$.

tantly, the number of missed follow-up interviews was not a significant predictor of the dependent variable, indicating a lack of bias in our results (Table 1).

For comparison with general-population average alcohol consumption, we drew on the 2005 NAS conducted in 2005 and 2006 ($N = 6,919$). The 2005 NAS is a representative probability sample of the U.S. general population age 18 years and older, drawn via random digit dialing and conducted by telephone, with a cooperation rate of 56%. The NAS oversampled African Americans, Hispanics, and low-population states, but data were weighted to the general population so that oversampling did not bias the results, taking into account age, sex, ethnic group, and geographic area (Kerr et al., 2009; Mulia et al., 2008).

Measures

We captured demographics at study entry: gender, ethnicity, and age. At baseline and each follow-up, we asked about education, income, and whether the respondent had insurance. Problem severity was assessed at each interview and included the following: all seven domains of the Addiction Severity Index (McLellan et al., 1992); dependence diagnosis

sis, met by endorsing at least three questions based on criteria from the Diagnostic Interview Schedule for Psychoactive Substance Dependence, DSM-IV (American Psychiatric Association, 2000); alcohol-related social consequences; and family history, based on whether at least one of the parents or grandparents had a problem with alcohol.

Contact with formal services at each interview included specialty alcohol or drug treatment, medical visits, mental health visits, and interfacing with the legal system or the welfare system. We assessed whether, at those contacts, anyone brought up their drinking. Informal resources included attending Alcoholics Anonymous (AA) meetings; the number of heavy drinkers and drug users in the social network; and whether their drinking had been brought up (and/or treatment suggested) by a relative, close friend, boss, co-worker, or acquaintance. The "graduated frequencies" series of questions (Clark and Hilton, 1991) was used to calculate total alcohol volume. The graduated frequencies series also was used in the NAS.

Analysis

A multilevel, mixed-effects model to predict alcohol consumption over time, controlling for demographic characteristics, problem severity, and formal and informal influences, was estimated and tested to model log-10 yearly drinking volume. Models were estimated using maximum likelihood estimation via PROC MIXED in SAS Version 9.2 (SAS Institute Inc., Cary, NC). All available data were included in

the analysis. To facilitate comparisons with other published studies, disaggregated mean alcohol consumption over time is shown, by gender, for the sample overall. Average alcohol volume in our community sample of problem drinkers was compared with that of the U.S. general population at about the same time (based on the NAS).

Results

Sample characteristics

The sample is heterogeneous with respect to gender (39% female) and ethnicity (29% non-White). When recruited at baseline, the average age was 35 years (18-86 years), and 40% were married. Almost half of the sample had more than a high school education, most (86%) were insured, and two thirds reported salaries in excess of U.S. \$25,000 when recruited between 1995 and 1996. Half of the individuals in the sample had a positive family history of alcohol problems, but only 20% met DSM-IV criteria for alcohol dependence at baseline. A similar proportion (22%) reported prior specialty treatment for alcohol problems before the 12 months preceding the baseline interview.

The Addiction Severity Index alcohol composite scores at study entry were relatively modest in our community sample of problem drinkers. As a point of comparison, in a treatment sample recruited at the same time and in the same county, Addiction Severity Index-based alcohol problem severity was about twice as high, psychiatric problems were two and

FIGURE 1. Alcohol consumption in mean number of drinks per month, per assessment, by gender. The mean monthly volume for the U.S. general population for Years 10-11 (from the National Alcohol Survey 2004-2005) was 23.9 drinks for men and 9.6 drinks for women.

a half times higher, social problem severity was three times higher, and those seeking treatment reported twice as many symptoms of DSM-IV alcohol dependence (Kaskutas et al., 1999).

Alcohol consumption over time

The mean number of drinks per month declined over time, with the largest drop in volume occurring between the baseline and 1-year follow-up interview (Figure 1). Among men, volume declined by 28% between the first two interviews, and by Year 11 dropped by another 23%. For women, the decrease between baseline and Year 1 was even greater (40%), but there was less subsequent reduction in the mean number of drinks per month by Year 11 (17%). Thus for both genders, it does appear to be the case that drinking was at its peak when the problem drinkers in the community were screened for problem-drinker status. At no assessment did the rate of abstinence exceed 10%.

The average number of drinks per month in the 2004-2005 NAS was 23.9 drinks among men (48% of the sample; $M_{age} = 45$) and 9.6 drinks among women (52% of the sample; $M_{age} = 46$). Average monthly consumption among the problem-drinking sample at Year 11 was 62.1 drinks for men and 31.0 drinks for women (Figure 1). Thus, although drinking had reduced considerably among men and women in the community sample of problem drinkers, it remained 160% higher and 223% higher than the mean number of drinks for men and women, respectively, in the U.S. general population.

We noted that about one third of the U.S. general population were abstainers. If we removed the abstainers from both the NAS and the community samples, average consumption for men and women was, respectively, 104% and 125% greater among the problem-drinker sample recruited from the community than among a representative sample of U.S. adults. Taken together, given the slowing of reductions in alcohol consumption over time, it does not appear that there is strong evidence that these problem drinkers will, over time, consume alcohol approaching the average level.

Predictors of alcohol consumption over time

The results from our final model of alcohol volume over time indicate that consumption decreased (coefficient for linear time is negative and significant) but the rate of decline slowed (coefficient for quadratic time is positive and significant). Three of the individual characteristics significantly predicted volume, with women and non-Whites drinking less and those with higher income drinking more over time. A positive family history, a variable equally distributed in our sample, did not emerge as significant. However, all of the severity variables were predictive, although not all in the same direction. For example, those who were *not* dependent

at baseline drank significantly more over time than those who had met DSM-IV dependence criteria at baseline. Addiction Severity Index alcohol problem severity at baseline was positively associated with alcohol volume over time, whereas Addiction Severity Index drug problem severity was negatively related to alcohol consumption. Experiencing more social consequences as a result of drinking over time was significantly associated with more drinking.

All of the time-varying formal and informal influences in our model also emerged as significant predictors of alcohol consumption, although not always in the direction one might expect. Receiving alcohol specialty treatment was associated with more drinking, whereas the number of contacts across the medical, mental health, criminal justice, and welfare systems was related to less drinking. Attendance at AA meetings was associated with less drinking, but suggestions to get help for one's drinking predicted more consumption. Finally, the number of heavy drinkers and drug users in the social network was predictive of higher alcohol volume over time.

Discussion

The goal of this analysis was to understand the trajectories of alcohol consumption over a decade among a community sample of problem drinkers who had not been seeking treatment when recruited into the study. The most interesting finding is the observed decline in consumption. Drinking decreased over time, but comparisons with NAS data did not suggest that their drinking had regressed to the general-population level. Although it is not known if their consumption will continue to decline over time, the graph of their drinking and the significant quadratic coefficient in the model predicting volume suggest that their drinking is just as likely to be flattening out. This is of public health relevance, because it means that problem drinkers continue to drink at higher levels than the general public, which would bring with it higher levels of physical and other sequelae associated with problem drinking.

One explanation for the decline is that those who continued to drink the most are the ones who dropped out. However, when we examine the mean consumption levels by the number of assessments provided, those who provided only two assessments had mean levels greater than those with more or fewer interviews. A second possibility is that they cycle up and down in their overall level year to year, and, therefore, only those on the "up" side of the cycle were selected into the study because of the selection criteria. But if that were the case, we should be seeing cycling up and down, which we do not. Additionally, as we have shown in other work, overall problem drinking is fairly steady, but one is more likely to stop problem drinking than to relapse (Delucchi and Weisner, 2010). Finally, it may be that, when we recontacted them, they felt pressured to say they were

drinking less because somehow they were embarrassed to admit doing so. But that would mean only the heavier drinkers (among this problem-drinking sample) were underreporting, and that seems unlikely.

Results suggest that the needs of individuals were well met by contact with community agencies and with AA. This is encouraging, as it would mean that resources widely available in the community are effective forms of continuing care. It may well be that the influences are bi-directional; that is, individuals go to AA or to community agencies because they need help, and they continue to go because they have found them to be helpful.

Conversely, our study found that contact with other types of formal and informal resources were indicators of more, rather than less, drinking over time. Specifically, suggestions to get help for one's drinking, seeking specialty substance-use disorders treatment, and the number of heavy drinkers in the social network all predicted increased consumption. These variables are working in a direction opposite that found for AA and community agencies that do not specialize in alcohol and drug treatment. Some of these findings make intuitive sense, whereas others present a confusing picture, especially for formal influences. Part of the reason that contact with noncommunity agencies is associated with less drinking but that seeking specialty alcohol treatment is associated with more drinking over time may be found in studies of treatment samples that have found there is high recidivism to heavy drinking (Project MATCH Research Group, 1997). In post hoc analyses, we found that those who attended treatment or who were told to cut back at Year 11 reported more dependence symptoms at baseline. Thus, it should not be surprising that reporting treatment would be associated with more drinking over the same 12-month period. This is consistent with treatment seeking as a response to ongoing, more severe alcohol-related problems that are the result of continued heavy drinking, whereas contact with community agencies is a signal of problems not pertaining to one's drinking that are being attended to now that one's drinking has been successfully reduced.

We also found that problem-drinking non-Whites tended to drink less than problem-drinking Whites. We do not know of other studies that have found this, and thus this is an important area for replication.

In summary, this study makes three important contributions to the literature. First, drinking declines over time among problem drinkers but not to the same level of average consumption as among the general population. Second, several indicators of ongoing problems with one's drinking are associated with increased drinking over time. These are having a heavy-drinking network, receiving suggestions to do something about one's drinking, and going to treatment. Third, we also found indicators of success that are associated with less drinking. These are having contact with community agencies and going to AA.

These results indicate that particular types of ongoing care are especially positive influences on decreased consumption over time for problem drinkers. Gatekeepers, family members, and policymakers should encourage and facilitate contact with social service agencies and with AA for problem drinkers. Suggestions to do something about one's drinking do not appear to be linked to less drinking over time.

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