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FORMAL AND INFORMAL SUBSTANCE USE TREATMENT UTILIZATION AND ALCOHOL ABSTINENCE OVER SEVEN YEARS: IS THE RELATIONSHIP DIFFERENT FOR BLACKS AND WHITES?

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Abstract

Background—This study examines whether the effects of formal substance use treatment utilization and Alcoholics Anonymous (AA) on 30-day abstinence vary for black versus white Americans.

Methods—The current analysis utilizes data from a longitudinal sample of 1,013 black and white, dependent and problem drinkers across a 7-year period. Participants were identified through a probability survey in the general population and consecutive intakes in chemical dependency treatment programs in a California County. Generalized Estimating Equations assessing interactions between race and treatment utilization incorporated variables from four post-baseline interviews, controlling for baseline variables.

Results—Formal treatment utilization was associated with 30-day abstinence (OR:1.6, 95%CI: 1.3, 2.1), yet this relationship did not differ for blacks and whites. In contrast, there was a significant interaction between AA utilization, race and 30-day abstinence. While both whites and blacks who attended AA were more likely to report 30-day abstinence compared to their non-AA attending counterparts (white OR:4.0, 95%CI:3.2–5.1 vs. black OR:2.2, 95%CI:1.5–3.2), the relationship was stronger for whites. Among those who did not attend AA, blacks were more likely than whites to be abstinent. Post-hoc analyses suggest that these latter findings may be related to greater religiosity and “drier” social networks among black Americans.

Conclusions—While utilization of formal treatment may yield similar benefits for blacks and whites, AA utilization may be more important for maintaining abstinence among whites than

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Contributors

Lyndsay Avalos developed the aims for the study, conducted all statistical analysis, and wrote the methods, results and discussion section. Nina Mulia, conducted the literature search and wrote the first draft of the introduction section and parts of the discussion, and provided feedback and suggestions on the analyses. Both authors contributed to and have approved the final manuscript.

Conflict of Interest

Both authors declare that they have no conflicts of interest.

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blacks. Future research should investigate racial differences in social network drinking patterns and religious reinforcement of sobriety, and the role these may play in AA outcomes.

Keywords

racial/ethnic disparities; substance use treatment; treatment outcomes; Alcoholics Anonymous (AA)

1.0. INTRODUCTION

Research has highlighted striking racial/ethnic disparities in alcohol-related problems, morbidity, and mortality. African Americans and other minority groups have elevated rates of alcohol-related and cirrhosis mortality, in addition to greater risk for alcohol problems and slower remission of alcohol problems among those who drink (Caetano, 1997; Caetano and Kaskutas, 1996; Dawson et al., 2005; Herd, 1994; Montoya, 2001; Stinson et al., 1993; Yoon et al., 2001). To address such disparities, it is essential to understand factors influencing the development and persistence of drinking problems, and how these factors are distributed across racial/ethnic groups. One set of potentially important explanatory factors pertains to alcohol treatment services; specifically, treatment access, engagement, and outcomes. Because alcohol treatment has been widely shown to reduce alcohol problems (Institute of Medicine, 1990; Miller et al., 2001; Moos et al., 1990), and in particular to facilitate recovery (Dawson et al., 2006; Mojtabai, 2005; Vaillant, 2003; Weisner et al., 2003b), disparities related to alcoholism treatment could contribute to race differences in alcohol-related morbidity and mortality in the general population. Despite its relevance to the national effort to address racial disparities in health, disparities in alcohol treatment and particularly treatment outcomes is an understudied area.

Research on treatment disparities has focused mostly on treatment access and utilization, and has yielded mixed findings (Cohen et al., 2007; Keyes et al., 2008; Wells et al., 2001; Wu and Ringwalt, 2005). However, the confounding of race/ethnicity, problem severity and services utilization may obscure differences in treatment use (Schmidt et al., 2006; Schmidt et al., 2007). Studies further indicate that racial/ethnic minorities may have a less optimal experience of treatment compared to whites (Brower and Carey, 2003; Schmidt et al., 2006; Tonigan, 2003a) and that they may be less likely to complete alcoholism treatment (Bluthenthal et al., 2007). A large study of publicly funded treatment in Los Angeles County found that African Americans were less likely than whites to complete their alcohol treatment/recovery plans, and that this was due in part to differences in economic resources (Jacobson et al., 2007).

In light of what appear to be differences in treatment experiences and completion, it is somewhat surprising that racial/ethnic groups appear to have similar treatment outcomes. This was shown in several studies presented at an NIAAA symposium on treatment research and health disparities (e.g., see studies by (Brower and Carey, 2003; McKay et al., 2003; Morgenstern and Bux, 2003; Tonigan, 2003). Tonigan et al.'s (2003) analysis of Project Match data found that minorities did as well as, or better than, whites at 6- and 12-months post-treatment. Although drinks per drinking day were similar, black outpatient clients had more abstinent days than whites. This was notable given black clients' more intensive drinking patterns at baseline, and the fact that whites were more educated, showed greater efforts to change prior to treatment, and greater attendance at therapy. Similar results were also observed by McKay and colleagues (2003) in their randomized study of continuing care treatments for alcohol- and cocaine-dependent persons. Despite less education, more employment problems, more cocaine dependence, and greater cohabitation with alcohol- and drug-addicted persons, black clients alcohol showed outcomes similar to those of

whites. Other treatment studies have also reported comparable, if not better, effects for blacks relative to whites (Brower and Carey, 2003; Morgenstern and Bux, 2003; Rosenheck and Seibyl, 1998).

While the consistent pattern across these studies suggests a robust finding, some limitations should be noted. Most studies were based on small samples, some involved bivariate analyses only, and only two assessed interactions of race by treatment needed to test differential treatment effects across race. Moreover, the follow-up period was short, typically 12 months or less, and one study observed an attenuation of positive treatment effects among blacks after the 6-month follow-up, suggesting the need for longer-term studies (McKay et al., 2003). Finally, the more rigorous of these studies involved randomized clinical trials, the results of which may not generalize well to *disadvantaged* populations (2000). As Humphreys and Weisner (2000) point out, use of common exclusion criteria for clinical trials can yield study samples with lower problem severity than that of excluded persons. Moreover, these exclusion criteria disproportionately exempt minorities and persons of low socioeconomic position.

Information about disparities in outcomes of *informal* treatment such as Alcoholics Anonymous (AA) is even more sparse, despite the fact that AA is by far the most widely used intervention for alcohol problems (Kaskutas et al., 1997b; Miller and McCrady, 1993; Weisner et al., 1995), with high utilization rates across racial/ethnic groups observed in national surveys (Mulia et al., 2011; Perron et al., 2009). In a rare study comparing the effects of AA participation on Hispanic and white treatment clients, Arroyo and colleagues (1998) found that AA participation was negatively correlated with total alcohol consumption and drinks per drinking day, but unrelated to abstinence (possibly reflecting the study sample's very heavy drinking at baseline). In addition, Hispanics and whites showed comparable outcomes despite Hispanics' lower attendance at AA (and at formal alcohol treatment) a finding that echoes a theme from research on specialty treatment reported above.

In summary, the extant literature on disparities in treatment outcomes is sparse but suggests that there are few racial differences in the effects of formal and informal treatment on alcohol-related outcomes. If anything, prior studies imply that minorities might benefit more from treatment, as they typically enter with greater problem severity and less favorable conditions. Perhaps the most important limitations of prior research, however, are the very short-term follow-up periods; the small samples of minorities; and the question of generalizability to minority problem drinkers beyond the confines of clinical trials. In the current study, we seek to address these limitations by drawing upon data from a community-based longitudinal study of treated and untreated problem drinkers followed over seven years. Comparing black and white problem drinkers, we investigate the effects of formal and informal treatment on abstinence, and specifically assess whether these effects are similar across the two racial groups.

2.0. Methods

2.1. Sample

The study was conducted in a Northern California county with a diverse population of approximately 900,000, a mix of rural and urban areas, and high generalizability to other parts of the U.S. (Greenfield and Weisner, 1995; Tam et al., 2000; Weisner and Schmidt, 1995a). Baseline interviews were conducted in 1995 and 1996 with individuals entering public and private chemical dependency treatment (CD) programs, and with dependent and problem drinkers in the general population who had not received treatment in the year prior to the baseline interview. The treatment sample (n=926; white: n= 537, black: n= 253,

Hispanic: n=60, other: n= 75, missing on race: n=1) included consecutive admissions to the ten 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 of treatment entry (i.e., programs limited to aftercare were excluded). The overall recruitment rate for the treatment sample was 80% (88% in the public programs, 77% in the private programs). The recruitment period differed between programs because of their intake flow, and these sampling logistics necessitated construction of weights (by gender and ethnicity) so that the sample properly represented its proportionate size and case mix among new treatment intakes. Weights ranged from .41 (for white females in one of the private programs) to 2.92 (for white males in one of the public detoxification programs) (Kaskutas et al., 1997a; Tam, 1997).

The general population sample of alcohol dependent and problem drinkers (n=672; white: n=476, black: n=54, Hispanic, n=85, other: n=52, missing on race: n=4) was recruited from a probability sample of 13,394 individuals age 18 or over using random-digit-dialing methods. Individuals were recruited for an in-person interview if they met or exceeded problem drinking criteria and had not received alcohol or drug treatment during the previous 12 months. The recruitment rate was 70%. To screen into the study, individuals had to meet at least two of the following *problem-drinking* criteria during the previous 12 months: a) drinking 5 or more drinks in a day at least once a month for men, and 3 or more drinks in a day at least weekly for women (Wilsnack et al., 1991); b) 1 or more alcohol-related social consequences (from a list of 8 including, for example, being arrested for drunk driving or having a traffic accident while drinking); and c) 1 or more alcohol dependence symptoms (from a list of 9) (Matzger et al., 2004; Matzger et al., 2005; Weisner and Matzger, 2002). This measure of problem drinking (Weisner, 1993) is consistent with the predominant approach taken in alcohol epidemiology research (Institute of Medicine, 1990; Schmidt et al., 1998; Weisner and Schmidt, 1995b; Wilsnack et al., 1991).

No differences were found between those who agreed to an in-person interview and those who did not after screening on age, sex, or problem severity characteristics, and prevalence rates as well as characteristics of problem drinkers were similar to those in studies using in-person interviews in the same county and in the U.S. National Alcohol Survey (Cherpitel, 1992 ; Tam et al., 1996; Weisner et al., 1995; Weisner and Schmidt, 1995a). The general population sample was interviewed in private locations, such as in respondents' homes, by interviewers who also conducted the interviews with respondents in the treatment sample, using a comparable instrument. Human Subjects approval was obtained from the Public Health Institute's Internal Review Board.

Post-baseline interviews were conducted for both samples 1, 3, 5, and 7 years later using Computer Assisted Telephone Interviewing (CATI) with questionnaires similar to the baseline instrument. Follow-up response rates for the 1, 3, 5, and 7-year post-baseline interviews were 84%, 82%, 79%, and 75%, respectively (88%, 83%, 81%, and 77% respectively for whites, 77%, 79%, 75%, and 72% respectively for blacks, 82%, 82%, 77%, 76% respectively for Hispanics, and 78%, 76%, 73%, 68% respectively for Other). Due to the small sample size of the Hispanic and other race/ethnicity categories, the current analysis includes only the white and black participants.

2.2. Measures

2.2.1. Demographic Characteristics—Baseline demographic variables used in the analysis are gender, age (25, 26–39, 40+) income (<\$25k, \$25k+), employment status (full/parttime employment vs. not employed), education (<high school, high school, more than high school) and marital status (married/living as married vs. single. Any AA utilization

prior to the baseline interview was also considered as a covariate. Finally, prior substance use treatment utilization was considered as a covariate in the analysis and included all participants in the treatment sample at baseline and any of the participants in the general population sample who had ever been to treatment.

2.2.2. Alcohol, Drug and Problem Measures—Baseline *DSM-IV alcohol dependence* was based on criteria from the Diagnostic Interview Schedule (DIS) for Psychoactive Substance Dependence. The DIS, which uses DSM-IV criteria (American Psychiatric Association, 2000), has been used in other published studies (Caetano and Raspberry, 2000; Matzger et al., 2004; Room et al., 2004; Weisner et al., 2001). Individuals with three or more symptoms (occurring in the previous 30 days) out of a total of seven were classified as dependent.

Drug, psychiatric, legal, medical, and social problem severity, were assessed at each interview using the *Addiction Severity Index* (ASI) (Kaskutas et al., 2003; Mertens and Weisner, 2000; Weisner et al., 2003b; Weisner et al., 2000). The ASI is a widely used instrument that assesses the severity of alcohol, drug, employment, medical, psychiatric, family/social, and legal problems (Mäkelä, 2004; McLellan et al., 1992). In each area, questions are asked that measure the number, frequency, and duration of problem symptoms in the past 30 days, providing a continuous measure from 0 (no problems) to 1.0 (high severity).

2.2.3. Substance Use Treatment Utilization

2.2.3.1. Formal Service Utilization: *Formal substance use treatment* attendance in the past 12 months (yes/no) was assessed at each follow-up interview. Participants were asked if they had been to a DUI program, a detox program, any other inpatient/residential alcohol or drug treatment program, or any other outpatient alcohol or drug treatment program, in the past 12 months. Baseline treatment status was not included in this variable.

2.2.3.2. Informal Service Utilization: Attendance at *Alcoholics Anonymous (AA) meetings* was assessed at each follow-up interview as whether the participants reported attending any AA meetings in the prior 12 months (yes/no). Baseline attendance was not included in this variable.

2.2.4. Outcome Measure—Thirty-day alcohol abstinence was ascertained from the ASI alcohol domain and dichotomized into abstinent in the past 30 days or not abstinent.

2.3. Analysis

Chi-square tests and t-tests were conducted for bivariate analysis. We conducted generalized estimating equation (GEE) logistic regression models for repeated measures interacting race by treatment to analyze whether the relationship between formal substance use treatment services and abstinence was different for white and black alcohol dependent drinkers, over seven years. GEE models estimate a single overall average group trajectory for the outcome variable and have the advantage of providing unbiased trajectory parameter estimates even when the variance structure is not correctly specified (Diggle et al., 1994; Neuhaus, 1992). This technique allows the inclusion of respondents even if they are missing one or more interviews, and baseline variables can be added for control. Time invariant covariates included in the model were gender, age, marital status, baseline education, baseline income, baseline employment status, baseline DSM-IV alcohol dependence, baseline ASI measures (alcohol, drug, psychiatric, medical, social and legal) and race. Additionally, substance use treatment utilization prior to or at baseline was included in the model assessing substance use treatment utilization. Similarly, AA utilization prior to baseline was included in the

model assessing AA utilization. The time-varying exposures of interest were either formal substance use treatment or whether the respondent attended AA. We additionally adjusted for time-varying ASI measures (drug, psychiatric, medical, social and legal). ASI alcohol severity over-time was not included in the models as it is highly correlated with 30-day alcohol abstinence. An exchangeable correlation structure and robust estimates of the variance were used. Stata v. 10 (Stata Corp., 2009) was used for all analyses.

2.3.1. Post-hoc Analysis—Post-hoc descriptive analyses were conducted to help understand our findings. Specifically, we assessed differences in religious beliefs and social support between blacks and whites who did not attend AA.

3.0. RESULTS

Several baseline differences emerged between blacks and whites. Blacks were more likely to have an income below \$25,000, to be unemployed, male, single, less educated, and older compared to whites (Table 1). They were also more likely than whites to be alcohol dependent at baseline, have attended formal substance use treatment at baseline or prior, have utilized AA prior to baseline, and to have higher severity scores in all domains except medical and social. At each follow-up there were a proportion of participants who utilized both formal treatment and AA. Among the participants who attended formal treatment, the proportion who also attended AA ranged from 65% at the 3-year follow-up to 77% at the 5-year follow-up. Among the participants who attended AA, the proportion who also attended treatment ranged from 37% at the 5-year follow-up to 46% at the 1-year follow-up.

3.1. Formal Treatment Utilization

In both the black and white subgroups, 30-day abstinence rates were highest for participants who utilized formal substance use treatment versus those who did not (Figure 1). Formal treatment utilization was significantly associated with 30-day abstinence over time. After adjusting for potential confounders, participants who went to treatment had higher odds of abstinence compared to participants who did not go to treatment (OR: 1.66, 95% CI: 1.3–2.1). Race was not significantly associated with 30-day abstinence in the adjusted model. There was no significant interaction between formal treatment utilization and race on 30-day abstinence over seven years (z-statistic on interaction term: -0.94 , p-value = 0.349).

3.2. AA Utilization

Black and white participants who utilized AA had higher 30-day abstinence rates in comparison to their non-AA utilizing counterparts (Figure 2). Among those who did not attend AA, rates of abstinence were consistently higher for blacks than whites. A significant interaction between race and AA utilization on 30-day abstinence over seven years emerged in the GEE model (Figure 3; z-statistic on interaction term: -2.81 , p-value = 0.005). Although AA utilization was significantly related to alcohol abstinence in both racial groups, the relationship was weaker for black participants compared to white participants (OR: 2.21, 95% CI: 1.5–3.2, vs. OR: 4.03, 95% CI: 3.20–5.07, respectively). However, results from the interaction model including all covariates showed that among those who attended AA there was not a significant racial difference in the odds of abstinence between black as compared to white participants (OR: 0.77, 95% CI: 0.54–1.09) (Figure 3). By contrast, among people who did *not* attend AA, black participants had over one and a third times the odds of abstinence compared to white participants (OR: 1.39, 95% CI: 1.01–1.93). When analyses were repeated to include any substance use treatment utilization at baseline or prior, similar patterns emerged.

3.3. Post-hoc Analyses

Post-hoc analyses were conducted in an attempt to better understand the differential abstinence rates among blacks and whites who did *not* attend AA. At the seven year follow-up, among those who did not attend any AA meetings in the past year, 70% of the blacks who were abstinent reported being religious (See Figure 4), as compared to 60% of the blacks who were not abstinent. Among those who did not attend any AA meetings, 32% of the whites who were abstinent were religious compared to 33% of the whites who were not abstinent. Similar results were found at the five year follow-up, the only other follow-up assessing religiosity (results not shown). Additionally, black participants who did not attend AA had fewer heavy or problem drinkers in their social networks at each of the time periods (Figure 5).

4.0. DISCUSSION

Despite the greater socioeconomic disadvantage and problem severity of blacks compared to whites at baseline, similar alcohol outcomes emerged in association with formal substance use treatment utilization over seven years. Our finding of comparable alcohol outcomes from a longitudinal, observational study is consistent with results from the few treatment-based, randomized control trials assessing racial disparities in treatment outcomes (Brower and Carey, 2003; McKay et al., 2003; Morgenstern and Bux, 2003; Tonigan, 2003). Importantly, however, the present study's assessment of these relationships over a seven-year period is longer than the typical 12-month timeframe employed in prior research. This suggests that these findings are robust over time.

One possible explanation for similar alcohol outcomes despite the less favorable prognostic factors among blacks concerns the mechanisms through which good alcohol outcomes are achieved from attendance at formal treatment utilization. These may be different for blacks and whites. In fact, Morgenstern and Bux (Morgenstern and Bux, 2003) found that while blacks had greater, increased affiliation with AA, whites attended more treatment sessions. In addition, McKay et al. (2003) suggest that while whites may recover through standard mechanisms such as increased self-efficacy and attendance at self-help groups, the most important factor in recovery for blacks might be their commitment to abstinence (*ibid*).

Our study addresses an alternative explanation put forth by Lowman and Le Fauve on the lack of significant racial differences noted in previous studies of treatment outcomes (Lowman and Le Fauve, 2003). They suggest that the similarity of treatment outcomes may be artifacts of the research process. As noted earlier, researchers have pointed out that while clinical trials have clear advantages in terms of rigorous evaluation of treatment effectiveness, they also have limitations. Specifically, the use of exclusionary criteria for defining participation in research trials may inadvertently restrict study samples to more highly motivated individuals, and thus participants in clinical trials may respond to alcoholism treatment in similar ways irregardless of their race/ethnicity (Taylor, 2003). The fact that our observational study identified relationships similar to those in randomized trials suggests that it might not be the sample selection process but rather the treatment and recovery process that accounts for comparable alcohol outcomes across race.

To our knowledge, this is the first study that has evaluated whether the relationship between AA utilization and alcohol outcomes differs for blacks and whites. We found that while AA utilization was beneficial for both blacks and whites, the magnitude of the effect appeared stronger (but not significantly) among white AA users. Differences in the effects of AA utilization could potentially reflect differential engagement in AA, or engagement with different AA activities affecting sobriety. In this sample at baseline, blacks were more likely to self-identify as an AA member or to have had a spiritual awakening through AA

(Kaskutas et al., 1999). By contrast, whites had attended more AA meetings than blacks, and were more likely to have a sponsor and to have read AA literature. Thus it may be that activities such as having a sponsor or attending more AA meetings are especially important mechanisms through which AA facilitates sobriety.

Related to this, a distinct feature of AA is the opportunity to change one's social networks to include more non-drinkers. Research has consistently demonstrated a significant relationship between sober social networks and alcohol outcomes (Bond et al., 2003; Delucchi and Kaskutas, 2010; Delucchi et al., 2004; Humphreys et al., 1999; Kaskutas et al., 2002; Matzger et al., 2004; Timko et al., 2005; Weisner et al., 2003a; Weisner et al., 2003b). Having an AA sponsor may be an important way in which sober people are introduced and begin to change their social network. Future research needs to be conducted to assess the mechanisms for which AA may impact sobriety and whether engagement in AA including having a sponsor to talk to when facing difficult times or whether other characteristics such as the number of meetings one attends help to explain the disparities that were identified in this study.

Notably, among those who did *not* attend AA, blacks had higher odds of being abstinent compared to whites. Our post-hoc analyses shed some light on these findings. We found that among those who did not attend AA, blacks had fewer heavy drinkers in their social networks over time compared to whites. As previously described, research has demonstrated a strong link between social networks and alcohol use (Bond et al., 2003; Delucchi and Kaskutas, 2010; Delucchi et al., 2004; Humphreys et al., 1999; Kaskutas et al., 2002; Matzger et al., 2004; Timko et al., 2005; Weisner et al., 2003a; Weisner et al., 2003b). The fewer heavy drinkers in the social networks of the black participants may in part be attributed to religiosity and the proscriptive attitudes regarding alcohol found in religious denominations with which many black persons are affiliated and whose services they frequently attend.

Affiliation with religions where drinking is prohibited (e.g., Baptist, Fundamentalist Protestant, Mormon) is related to less heavy drinking and/or abstinence, even in comparison to those denominations with more liberal views of alcohol use (e.g., Catholic, Jewish, Episcopalian, Presbyterian, and Lutheran) (Amoateng and Bahr, 1986; Clarke et al., 1990; Cochran et al., 1988). Further, having any religious beliefs has been linked to less alcohol use and abstinence (Bennett et al., 1999; Gorsuch, 1995; Greenfield et al., 2000; Miller, 1998). Interestingly, our post-hoc analyses indicate that among persons who did not attend AA, blacks were more likely than whites to report being religious. Further research needs to be conducted on the potential role of religiosity and social networks in relation to alcohol outcomes.

We conducted a final post-hoc analysis to assess whether our findings might be explained by greater utilization of formal substance use treatment by blacks (versus whites) who did not attend AA. Among non-AA users, whites were more likely than blacks to have attended formal substance use treatment at each time point, with the difference in proportions attending formal treatment ranging from two to 26 percentage points over the seven years. At the 7-year follow-up, 34% of the whites who did not attend AA went to formal treatment, as compared to 8% of their black counterparts. These findings counter the hypothesis that part of the noted effect for black non-AA goers was due to formal substance use treatment attendance.

4.1. Limitations

There are several limitations to the study related to attrition of the most severe cases and generalizeability, which have been detailed in prior papers using this sample (Delucchi et

al., 2004; Kaskutas et al., 2005; Matzger and Weisner, in press; Weisner et al., 2003a). Concerning attrition, although the study had high follow-up rates, attrition was higher for those whose problems were more severe and thus may produce some bias in our findings. This is a constraint with the use of any longitudinal data. Regarding generalizability, the county chosen was selected on the basis of diversity in its population characteristics and mix of rural and urban areas (Greenfield and Weisner, 1995; Weisner and Schmidt, 1992).

Additionally, we do not have data on formal treatment, AA attendance, and alcohol abstinence during years 2, 4, and 6 of this 7-year longitudinal study. It is possible that events and behaviors in the years for which we do not have data were associated with behavior years 3, 5 or 7, potentially resulting in an overestimation of the associations.

We recognize that it is difficult, even in longitudinal studies, to determine causality. Due to the 12-month recall for both the formal substance use treatment utilization and AA utilization and 30-day abstinence, we are only able to look at associations between the two at each interview.

Finally, we were unable to assess treatment engagement, intensity or completion- factors that may impact alcohol outcomes. As noted earlier, however, black treatment users have been shown to have lower attendance and lower treatment completion than whites (Bluthenthal et al., 2007; Niv et al., 2009; Tonigan, 2003), and we have no reason to suspect that the findings would be different in this sample. That research has failed to demonstrate racial/ethnic disparities in alcohol treatment outcomes is all the more remarkable (Brower and Carey, 2003). Nevertheless, future research assessing these longitudinal relationships should consider the role of engagement, intensity and completion of treatment.

Despite these limitations, our findings address the call for more research aimed at reducing health disparities in the outcomes of minorities who have alcohol disorders (Lowman and Le Fauve, 2003), by examining a sample of baseline dependent and problem drinkers over a seven-year period. Our results add to the scant research conducted on health disparities in alcohol use treatment outcomes and suggest future research paths for understanding the mechanisms underlying the similarities and differences in alcohol use outcomes as highlighted by different modalities of substance use treatment. In particular, further investigation of religiosity and social network drinking patterns may help to explain black-white differences in abstinence among persons who do not attend AA, and, possibly, comparable treatment outcomes despite greater problem severity and socioeconomic hardship among black dependent and problem drinkers.

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References

American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. American Psychiatric Association; Washington, D.C: 2000. Text Revision [DSM-IV-TR]

- Amoateng AY, Bahr SJ. Religion, family, and adolescent drug use. *Sociol Perspect*. 1986; 29:53–76.
- Arroyo JA, Westerberg VS, Tonigan JS. Comparison of treatment utilization and outcome for Hispanics and non-Hispanic whites. *J Stud Alcohol*. 1998; 59:286–291. [PubMed: 9598709]
- Bennett, ME.; Sanchez, F.; Miller, WR. *Studying Spirituality and Alcohol*. Bethesda, MD: 1999 Feb 1. Critical Review of the State of the Knowledge on Spirituality and Substance Use; p. 10
- Bluthenthal RN, Jacobson JO, Robinson PL. Are racial disparities in alcohol treatment completion associated with racial differences in treatment modality entry? Comparison of outpatient treatment and residential treatment in Los Angeles County, 1998 to 2000. *Alcohol Clin Exp Res*. 2007; 31:1920–1926. [PubMed: 17908265]
- Bond J, Kaskutas LA, Weisner C. The persistent influence of social networks and Alcoholics Anonymous on abstinence. *J Stud Alcohol*. 2003; 64:579–588. [PubMed: 12921201]
- Brower KJ, Carey T. Racially related health disparities and alcoholism treatment outcomes. *Alcohol Clin Exp Res*. 2003; 27:1365–1367. [PubMed: 12966341]
- Caetano R. Prevalence, incidence and stability of drinking problems among whites, blacks and Hispanics: 1984–1992. *J Stud Alcohol*. 1997; 58:565–572. [PubMed: 9391915]
- Caetano R, Kaskutas LA. Changes in drinking problems among whites, blacks and Hispanics: 1984–1992. *Subst Use Misuse*. 1996; 31:1547–1571. [PubMed: 8908707]
- Caetano R, Raspberry K. Drinking and DSM-IV alcohol and drug dependence among white and Mexican American DUI offenders. *J Stud Alcohol*. 2000; 61:420–426. [PubMed: 10807213]
- Cherpitel CJ. Drinking patterns and problems: a comparison of ER patients in an HMO and in the general population. *Alcohol Clin Exp Res*. 1992; 16:1104–1109. [PubMed: 1471765]
- Clarke L, Beeghley L, Cochran JK. Religiosity, social class, and alcohol use: an application of reference group theory. *Sociol Perspect*. 1990; 33:201–218.
- Cochran JK, Beeghley L, Bock EW. Religiosity and alcohol behavior: an exploration of reference group theory. *Sociol Forum*. 1988; 3:256–279.
- Cohen E, Feinn R, Arias A, Kranzler HR. Alcohol treatment utilization: findings from the National Epidemiologic Survey on Alcohol and Related Conditions. *Drug Alcohol Depend*. 2007; 86:214–221. [PubMed: 16919401]
- Dawson DA, Grant BF, Stinson FS, Chou PS. Estimating the effect of help-seeking on achieving recovery from alcohol dependence. *Addiction*. 2006; 101:824–834. [PubMed: 16696626]
- Dawson DA, Grant BF, Stinson FS, Chou PS, Huang B, Ruan WJ. Recovery from DSM-IV alcohol dependence: United States, 2001–2002. *Addiction*. 2005; 100:281–292. [PubMed: 15733237]
- Delucchi K, Kaskutas LA. Following problem drinkers over eleven years: understanding changes in alcohol consumption. *J Stud Alcohol Drugs*. 2010; 71:831–836. [PubMed: 20946739]
- Delucchi KL, Matzger H, Weisner C. Dependent and problem drinking over 5 years: a latent class growth analysis. *Drug Alcohol Depend*. 2004; 74:235–244. [PubMed: 15194201]
- Diggle, PJ.; Liang, KY.; Zeger, SL. *Analysis of longitudinal data*. Oxford University Press; Oxford, UK: 1994.
- Gorsuch RL. Religious aspects of substance abuse and recovery. *J Soc Issues*. 1995; 51:65–83.
- Greenfield TK, Midanik LT, Rogers JD. A ten-year national trend study of alcohol consumption 1984–1995: is the period of declining drinking over? *Am J Public Health*. 2000; 90:47–52. [PubMed: 10630136]
- Greenfield TK, Weisner C. Drinking problems and self-reported criminal behavior, arrests and convictions: 1990 U.S. alcohol and 1989 county surveys. *Addiction*. 1995; 90:361–373. [PubMed: 7735021]
- Herd D. Predicting drinking problems among black and white men: results from a national survey. *J Stud Alcohol*. 1994; 55:61–71. [PubMed: 8189728]
- Humphreys K, Mankowski ES, Moos RH, Finney JW. Do enhanced friendship networks and active coping mediate the effect of self-help groups on substance abuse? *Ann Behav Med*. 1999; 21:54–60. [PubMed: 18425655]
- Humphreys K, Weisner C. Use of exclusion criteria in selecting research subjects and its effect on the generalizability of alcohol treatment outcome studies. *Am J Psychiatry*. 2000; 157:588–594. [PubMed: 10739418]

- Institute of Medicine. Broadening the Base of Treatment for Alcohol Problems. National Academy Press; Washington, D.C.: 1990.
- Jacobson JO, Robinson PL, Bluthenthal RN. Racial disparities in completion rates from publicly funded alcohol treatment: economic resources explain more than demographics and addiction severity. *Health Serv Res.* 2007; 42:773–794. [PubMed: 17362217]
- Kaskutas LA, Ammon LN, Delucchi K, Room R, Bond J, Weisner C. Alcoholics Anonymous careers: patterns of AA involvement five years after treatment entry. *Alcohol Clin Exp Res.* 2005; 29:1983–1990. [PubMed: 16340455]
- Kaskutas LA, Bond J, Humphreys K. Social networks as mediators of the effect of Alcoholics Anonymous. *Addiction.* 2002; 97:891–900. [PubMed: 12133128]
- Kaskutas, LA.; Russell, G.; Dinis, M. Technical Report on the Alcohol Treatment Utilization Study in Public and Private Sectors. Alcohol Research Group; Berkeley, CA: 1997a.
- Kaskutas LA, Turk N, Bond J, Weisner C. The role of religion, spirituality and Alcoholics Anonymous in sustained sobriety. *Alcohol Treat Q.* 2003; 21:1–16.
- Kaskutas LA, Weisner C, Caetano R. Predictors of help seeking among a longitudinal sample of the general population, 1984–1992. *J Stud Alcohol.* 1997b; 58:155–161. [PubMed: 9065893]
- Kaskutas LA, Weisner C, Lee M, Humphreys K. Alcoholics Anonymous affiliation at treatment intake among white and black Americans. *J Stud Alcohol.* 1999; 60:810–816. [PubMed: 10606493]
- Keyes KM, Hatzenbuehler ML, Alberti P, Narrow WE, Grant BF, Hasin DS. Service utilization difference for axis I psychiatric and substance use disorders between white and black adults. *Psychiatr Serv.* 2008; 59:893–901. [PubMed: 18678687]
- Lowman C, Le Fauve CE. Health disparities and the relationship between race, ethnicity, and substance abuse treatment outcomes. *Alcohol Clin Exp Res.* 2003; 27:1324–1326. [PubMed: 12966330]
- Mäkelä K. Studies of the reliability and validity of the Addiction Severity Index. *Addiction.* 2004; 99:398–410. [PubMed: 15049734]
- Matzger H, Delucchi K, Weisner C, Ammon LN. Does marital status predict long-term drinking? Five-year observations of dependent and problem drinkers. *J Stud Alcohol.* 2004a; 65:255–265. [PubMed: 15151358]
- Matzger H, Kaskutas LA, Weisner C. Reasons for drinking less and their relationship to sustained remission from problem drinking. *Addiction.* 2005; 100:1637–1646. [PubMed: 16277625]
- Matzger H, Weisner C. Nonmedical use of prescription drugs among a longitudinal sample of dependent and problem drinkers. *Drug Alcohol Depend.* 2007; 86:22–29. [PubMed: 16769180]
- McKay JR, Lynch KG, Pettinati HM, Shepard DS. An examination of potential sex and race effects in a study of continuing care for alcohol- and cocaine-dependent patients. *Alcohol Clin Exp Res.* 2003; 27:1321–1323. [PubMed: 12966329]
- McLellan AT, Kushner H, Metzger D, Peters R, Smith I, Grissom G, Pettinati H, Argeriou M. The Fifth Edition of the Addiction Severity Index. *J Subst Abuse Treat.* 1992; 9:199–213. [PubMed: 1334156]
- Mertens J, Weisner C. Predictors of substance abuse treatment retention among women and men in an HMO. *Alcohol Clin Exp Res.* 2000; 24:1525–1533. [PubMed: 11045861]
- Miller WR. Researching the spiritual dimensions of alcohol and other drug problems. *Addiction.* 1998; 93:979–990. [PubMed: 9744129]
- Miller, WR.; McCrady, BS. The importance of research on Alcoholics Anonymous. In: McCrady, BS.; Miller, WR., editors. *Research on Alcoholics Anonymous Opportunities and Alternatives*. Rutgers Center of Alcohol Studies; New Brunswick, NJ: 1993. p. 3–11.
- Miller WR, Walters ST, Bennett ME. How effective is alcoholism treatment? *J Stud Alcohol.* 2001; 62:211–220. [PubMed: 11327187]
- Mojtabai R. Use of specialty substance abuse and mental health services in adults with substance use disorders in the community. *Drug Alcohol Depend.* 2005; 78:345–354. [PubMed: 15893166]
- Montoya ID. Untangling the web: disparities in alcohol abuse and alcoholism. *Frontlines: Linking Alcohol Services Research and Practice.* 2001 Jun 2.

- Moos, RH.; Finney, JW.; Cronkite, RC. Alcoholism Treatment: Context, Process, and Outcome. Oxford University Press; New York: 1990.
- Morgenstern J, Bux DA Jr. Examining the effects of sex and ethnicity on substance abuse treatment and mediational pathways. *Alcohol Clin Exp Res*. 2003; 27:1330–1332. [PubMed: 12966332]
- Mulia N, Schmidt L, Tam T. Racial/Ethnic Disparities in Recommended Care for At-risk Drinking and Alcohol Use Disorders. *Proceedings of the From Disparities Research to Disparities Interventions: Lessons Learned and Opportunities for the Future of Behavioral Health Services*. 2011:E1022.
- Neuhaus JM. Statistical methods for longitudinal and clustered designs with binary responses. *Stat Methods Med Res*. 1992; 1:249–273. [PubMed: 1341660]
- Niv N, Pham R, Hser YI. Racial and ethnic differences in substance abuse service needs, utilization, and outcomes in California. *Psychiatr Serv*. 2009; 60:1350–1356. [PubMed: 19797375]
- Perron BE, Mowbray OP, Glass JE, Delva J, Vaughn MG, Howard MO. Differences in service utilization and barriers among blacks, Hispanics, and whites with drug use disorders. *Subst Abuse Treat Prev Policy*. 2009; 4 online journal.
- Room R, Matzger H, Weisner C. Sources of informal pressure on problematic drinkers to cut down or seek treatment. *J Subst Use*. 2004; 9:280–295.
- Rosenheck R, Seibyl CL. Participation and outcome in a residential treatment and work therapy program for addictive disorders: the effects of race. *Am J Psychiatry*. 1998; 155:1029–1034. [PubMed: 9699689]
- Schmidt L, Greenfield TK, Mulia N. Unequal treatment: racial and ethnic disparities in alcoholism treatment services. *Alcohol Res Health*. 2006; 29:49–54. [PubMed: 16767854]
- Schmidt L, Weisner C, Wiley JA. Substance abuse and the course of welfare dependency. *Am J Public Health*. 1998; 88:1616–1622. [PubMed: 9807526]
- Schmidt LA, Ye Y, Greenfield TK, Bond J. Ethnic disparities in clinical severity and services for alcohol problems: results from the National Alcohol Survey. *Alcohol Clin Exp Res*. 2007; 31:48–56. [PubMed: 17207101]
- Stata Corp. Stata Statistical Software: Release 11.0. Stata Corporation; College Station, TX: 2009.
- Stinson FS, Dufour MC, Steffens RA, DeBaakey SF. Alcohol-related mortality in the United States, 1979–1989. *Alcohol Health Res World*. 1993; 17:251–260.
- Tam, TW. Technical report on the Alcohol Treatment Utilization Study in Public and Private Sectors: Within and Across Sector Weights. Alcohol Research Group; Berkeley, CA: 1997.
- Tam TW, Schmidt L, Weisner C. Patterns in the institutional encounters of problem drinkers in a community human services network. *Addiction*. 1996; 91:657–669. [PubMed: 8935251]
- Tam TW, Weisner C, Mertens J. Demographic characteristics, life context, and patterns of substance use among alcohol dependent treatment clients in a Health Maintenance Organization. *Alcohol Clin Exp Res*. 2000; 24:1803–1810. [PubMed: 11141039]
- Taylor RE. Pharmacological and cultural consideration in alcohol treatment clinical trials: issues in clinical research related to race and ethnicity. *Alcohol Clin Exp Res*. 2003; 27:1345–1348. [PubMed: 12966336]
- Timko C, Finney JW, Moos RH. The 8-year course of alcohol abuse: gender differences in social context and coping. *Alcohol Clin Exp Res*. 2005; 29:612–621. [PubMed: 15834227]
- Tonigan JS. Project Match treatment participation and outcome by self-reported ethnicity. *Alcohol Clin Exp Res*. 2003; 27:1340–1344. [PubMed: 12966335]
- Vaillant GE. A 60-year follow-up of alcoholic men. *Addiction*. 2003; 98:1043–1051. [PubMed: 12873238]
- Weisner C. Toward an alcohol treatment entry model: a comparison of problem drinkers in the general population and in treatment. *Alcohol Clin Exp Res*. 1993; 17:746–752. [PubMed: 8214407]
- Weisner C, Delucchi K, Matzger H, Schmidt L. The role of community services and informal support on five-year drinking trajectories of alcohol dependent and problem drinkers. *J Stud Alcohol*. 2003a; 64:862–873. [PubMed: 14743951]
- Weisner C, Greenfield TK, Room R. Trends in the treatment of alcohol problems in the U.S. general population, 1979 through 1990. *Am J Public Health*. 1995; 85:55–60. [PubMed: 7832262]

- Weisner C, Matzger H. A prospective study of the factors influencing entry to alcohol and drug treatment. *J Behav Health Serv Res*. 2002; 29:126–137. [PubMed: 12032970]
- Weisner C, Matzger H, Kaskutas LA. How important is treatment? One-year outcomes of treated and untreated alcohol-dependent individuals. *Addiction*. 2003b; 98:901–911. [PubMed: 12814496]
- Weisner C, McLellan AT, Hunkeler E. Addiction Severity Index data from general membership and treatment samples of HMO members: one case of norming the ASI. *J Subst Abuse Treat*. 2000; 19:103–109. [PubMed: 10963921]
- Weisner C, Mertens J, Parthasarathy S, Moore C. Integrating primary medical care with addiction treatment: a randomized controlled trial. *JAMA*. 2001; 286:1715–1723. [PubMed: 11594896]
- Weisner C, Schmidt L. Gender disparities in treatment for alcohol problems. *JAMA*. 1992; 268:1872–1876. [PubMed: 1328695]
- Weisner C, Schmidt L. The Community Epidemiology Laboratory: studying alcohol problems in community- and agency-based populations. *Addiction*. 1995a; 90:329–342. [PubMed: 7735018]
- Weisner C, Schmidt LA. Expanding the frame of health services research in the drug abuse field. *Health Serv Res*. 1995b; 30:707–727. [PubMed: 8537228]
- Wells K, Klap R, Koike A, Sherbourne C. Ethnic disparities in unmet need for alcoholism, drug abuse, and mental health care. *Am J Psychiatry*. 2001; 158:2027–2032. [PubMed: 11729020]
- Wilsnack SC, Klassen AD, Schur BE, Wilsnack RW. Predicting onset and chronicity of women's problem drinking: a five-year longitudinal analysis. *Am J Public Health*. 1991; 81:305–318. [PubMed: 1994739]
- Wu LT, Ringwalt C. Use of substance abuse services by young uninsured American adults. *Psychiatr Serv*. 2005; 56:946–953. [PubMed: 16088011]
- Yoon, YH.; Yi, Hy; Grant, BF.; Dufour, MC. Liver Cirrhosis Mortality in the United States, 1970–98. National Institute on Alcohol Abuse and Alcoholism, Division of Biometry and Epidemiology, Alcohol Epidemiologic Data System; Rockville, MD: 2001. Surveillance Report #57.

Figure 1.
30-day abstinence rates by race and formal treatment utilization at each follow-up.

Figure 2.
30-day abstinence by race and AA utilization at each follow-up.

Figure 3.
Probability of 30-day abstinence by race and AA attendance.

Figure 4. Percent of participants who reported 30-day abstinence by religious belief and race among those who did not attend any AA meetings at year 7.

Figure 5.
Number of people in participant's social network who are heavy or problem drinkers by race over time.

Table 1

Baseline Demographic Characteristics, Problem Severity, and Alcohol Consumption by Race

	White n = 1013 Wtd. N (%)	Black n = 307 Wtd. N (%)	p-value
Income			
<\$25k	350 (37)	271 (79)	<0.001
\$25k+	604 (63)	72 (21)	
Age			
25	168 (17)	25 (7)	<0.001
26–39	421 (43)	185 (52)	
40+	383 (39)	144 (41)	
Marital Status			
Married/living with partner	367 (38)	81 (23)	<0.001
Single	606 (62)	271 (77)	
Employment Status			
Full/part time	553 (58)	84 (24)	<0.001
Not employed	400 (42)	263 (76)	
Education			
Did not graduate high school	122 (13)	109 (31)	<0.001
High school graduate	437 (45)	169 (48)	
Some college +	414 (43)	74 (21)	
Gender			
Male	581 (60)	241 (68)	0.005
Female	392 (40)	113 (32)	
DSM-IV Alcohol Dependence Status			
Dependent	355 (37)	195 (56)	<0.001
Not Dependent	617 (64)	156 (44)	
Formal Treatment Utilization at Baseline or Prior			
Yes	427 (44)	236 (68)	<0.001
No	544 (56)	110 (32)	
AA Utilization Prior to Baseline			
Yes	558 (58)	275 (79)	<0.001
No	402 (42)	72 (21)	
ASI Score (Mean)			
Alcohol	0.29	0.34	0.015
Drug	0.07	0.15	<0.001
Medical	0.22	0.26	0.151
Social	0.20	0.22	0.174
Employment	0.61	0.81	<0.001
Legal	0.08	0.14	<0.001
Psychiatric	0.27	0.37	<0.001
Alcohol Volume (Mean)	1284.14	1737.53	<0.001

Table 2
Longitudinal Models For Formal Treatment Utilization Predicting 30-Day Abstinence

	Bivariate		Model 1 [*]		Model 2 ^{**}		Model 3 ^{***}	
	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
Formal Treatment Utilization	1.51	1.2, 1.8	1.60	1.3, 1.9	1.66	1.34, 2.06	1.79	1.40, 2.29
Black vs. White	NA	NA	1.90	1.5, 2.4	1.08	0.82, 1.44	1.14	0.84, 1.56
Formal Treatment * Race Interaction Term	-	-	-	-	-	-	0.81	0.51, 1.26

^{*} Model 1 - includes only race in the model (ref: white)

^{**} Model 2 - adjusting for gender, age, marital status, baseline educational status, baseline income, baseline employment status, baseline DSM-IV alcohol dependence, baseline or prior formal treatment utilization, baseline ASI measures (alcohol, drug, psychiatric, medical, social and legal), time-varying ASI measures (drug, psychiatric, medical, social and legal)

^{***} Model 3 - includes the interaction term and all confounders in Model 2

Table 3

Longitudinal Models For AA Utilization Predicting 30-Day Abstinence

	Bivariate		Model 1 *		Model 2 **		Model 3 ***	
	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
AA Utilization	3.13	2.7, 3.7	3.10	2.6, 3.7	3.29	2.70, 4.02	4.03	3.2, 5.07
Black vs. White			1.77	1.4, 2.2	1.11	0.85, 1.46	1.39	1.01, 1.93
AA * Race Interaction Term	-	-	-	-	-	-	0.55	0.36, 0.83

* Model 1 - includes only race in the model (ref: white)

** Model 2 - adjusting for gender, age, marital status, baseline educational status, baseline income, baseline employment status, baseline DSM-IV alcohol dependence, AA utilization prior to baseline, baseline ASI measures (alcohol, drug, psychiatric, medical, social and legal), time-varying ASI measures (drug, psychiatric, medical, social and legal)

*** Model 3 - includes the interaction term and all confounders in Model 2