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Factors associated with alcohol consumption among medical cannabis patients with chronic pain

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Abstract

Introduction—Chronic pain is the most common reason for medical cannabis certification. Data regarding alcohol use and risky drinking among medical cannabis patients with pain is largely unknown. Therefore, we examined the prevalence and correlates of alcohol use and risky drinking in this population.

Methods—Participants completed surveys regarding demographics, pain-related variables, anxiety, cannabis use, and past six-month alcohol consumption. Alcohol use groups were defined using the AUDIT-C [i.e., non-drinkers, low-risk drinkers, and high-risk drinkers (≥4 for men and ≥3 for women)] and compared on demographic characteristics, pain measures, anxiety, and cannabis use.

Results—Overall, 42% (n=330/780) were non-drinkers, 32% (n=251/780) were low-risk drinkers, and 26% (n=199/780) were high-risk drinkers. Compared to non-drinkers, low- and high-risk drinkers were significantly younger whereas a larger proportion of low-risk drinkers reported being African-American compared to non- or high-risk drinkers. High-risk drinkers reported significantly lower pain severity/interference compared to the other groups; high-risk drinkers were also less likely to be on disability compared to other groups. A multinomial logistic

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Conflict of interest

Nothing to declare.

Contributions

The first, second, and last authors were responsible for study conceptualization and initial data analysis and were responsible for initial manuscript writing and data interpretation. All authors contributed to writing, editing and approved the article for submission.

regression showed that patients reporting lower pain severity and less disability had greater odds of being classified a high-risk drinker.

Conclusions—High-risk drinking appears common among medical cannabis patients. Future research should examine whether such use is concurrent or consecutive, and the relationship of such co-use patterns to consequences. Nevertheless, individuals treating patients reporting medical cannabis use for pain should consider alcohol consumption, with data needed regarding the efficacy of brief alcohol interventions among medical cannabis patients.

Keywords

medical; cannabis; risky drinking; marijuana; alcohol; AUDIT-C

Introduction

The landscape of cannabis use in the United States (US) has shifted dramatically over the past few decades. To date, 28 states and the District of Columbia have allowed legal access to *medical* cannabis (National Association of State Legislatures, 2016), all of which include pain, pain-related syndromes, or other "debilitating conditions" as qualifying reasons for which medical cannabis can be recommended. Additionally, far more patients seek medical cannabis for pain than for any other approved condition (Davis et al., 2016; Ilgen et al., 2013). Moreover, approximately 40% of medical cannabis patients also report drinking alcohol (Perron et al., 2015), which is not surprising given that both alcohol and cannabis have been reported as methods to self-medicate, or control, pain (Alford et al., 2016). Given the substantial body of evidence (Antai et al., 2014; Dubois et al., 2015; National Cancer Institute, 2015; Rehm, 2009; Schuckit, 2009) linking high-risk drinking (defined as ≥14 drinks per week and/or ≥five or more drinks on an occasion for men; ≥seven drinks per week and/or ≥four or more drinks on an occasion for women; National Institute on Alcohol Abuse and Alcoholism, 2005) with negative biopsychosocial outcomes, data characterizing medical cannabis patients who drink alcohol at potentially harmful levels are urgently needed to inform harm reduction approaches in this population.

To date, a paucity of studies have examined the prevalence and correlates of alcohol use and risky drinking among medical cannabis patients. For example, studies show that ~14% of medical cannabis patients screened positive for high-risk drinking on the Alcohol Use Disorders Identification Test (AUDIT ≥8) (Ilgen et al., 2013; Perron et al., 2015). However, these studies have not reported the prevalence of alcohol consumption based on more recently recommended AUDIT-C cut-offs, namely non-drinkers, low-risk drinkers (≤2 for women, ≤3 for men), and high-risk drinkers (≥3 for women, ≥4 for men), nor have they examined what factors might be associated with high-risk drinking among medical cannabis patients experiencing chronic pain.

Although we found no studies about correlates of *medical* cannabis use and alcohol consumption, studies of those who consume alcohol and *non-medical* (e.g., recreational) cannabis indicate that approximately two-thirds of the US general population who use cannabis at least monthly also reported usually (or always) using alcohol and cannabis at the same time (Subbaraman & Kerr, 2015). Although it is not always reported whether alcohol

and non-medical cannabis use is concurrent (i.e., use occurs at the same time) or consecutive (i.e., use does not occur at the same time), in general people who consume both substances are more likely to be younger, unemployed, single, drink more frequently and heavily, and report experiencing more alcohol-related social consequences and harms (e.g., problems related to relationships or occupation), compared to those who only consume alcohol (Subbaraman & Kerr, 2015). Moreover, although evidence suggests that concurrent use is associated with double to triple the odds of drunk driving compared to consecutive use, both types of polysubstance use patterns are associated with experiencing alcohol-related psychosocial consequences (Subbaraman & Kerr, 2015). Not only could co-occurring alcohol and cannabis use be associated with a variety of negative outcomes among medical cannabis patients, but when heavier amounts of alcohol are consumed, it may also predispose these patients to misuse or become dependent on cannabis or other substances (Pergolizzi et al., 2012). Thus, providing alcohol interventions (Sullivan et al., 2011; O'Donnell et al., 2014) to medical cannabis patients who engage in risky drinking could decrease these negative outcomes.

Current Study

Although data provide initial evidence suggesting that meaningful proportions of medical cannabis patients are drinking alcohol at risky levels (Ilgen et al., 2013; Perron et al., 2015), and given the possible negative outcomes associated with alcohol and *non-medical* cannabis use (Subbaraman & Kerr, 2015), additional data are needed to better characterize the problem of high-risk drinking among medical cannabis patients in order to inform future studies examining the utility of brief alcohol interventions in this population. Therefore, the primary aim of this study is to evaluate the prevalence of alcohol use (including low-risk and high-risk drinking) among medical cannabis patients with pain and to identify differences in demographic, pain experience variables, anxiety, and substance use, between non-drinkers, low-risk drinkers, and high-risk drinkers.

Method

Participants and Procedure

The current study presents cross-sectional, baseline data from a longitudinal cohort study of medical cannabis patients in Michigan who have obtained certification to use cannabis for moderate/severe pain. Patients presenting to two study sites (i.e., medical cannabis clinics) were approached by study staff between February, 2014 and June, 2015 and completed screening measures during a clinic visit (see Cranford et al., 2016). Inclusion criteria included seeking initial or renewal certification for medical cannabis as a treatment for pain, reporting pain of at least 5 out of 10 on a numeric rating scale (0–10; Farrar et al., 2001), and being 21 years of age or older. Exclusion criteria included being pregnant or reporting seeking medical cannabis for Alzheimer's disease or cancer. The study was approved by the University of Michigan Medical School Institutional Review Board and a Certificate of Confidentiality was obtained from the National Institute of Health.

Measures

Main Outcome Measure

Alcohol Use Disorders Identification Test-Consumption (AUDIT-C): The 3-item AUDIT-C measures alcohol consumption [frequency, quantity, and binge-drinking (defined as ≥6 drinks on any one occasion)] during the past six months (Bush et al., 1998). Cronbach's α in the present sample was 0.76. Consistent with prior work, AUDIT-C scores were summed and non-drinkers are classified when scores = 0; low-risk drinkers are classified by scores ≤2 for women, ≤3 for men and high-risk drinkers were classified by scores ≥3 for women and ≥4 for men (Bradley et al., 2007; Dawson et al., 2012).

Other Measures

Demographic Characteristics—Participants also provided data on their sex, race, age, employment status (i.e., full-time, part-time, self-employed, on disability, etc.), relationship status, and education level.

West Haven – Yale Multidimensional Pain Inventory (WHYMPI)—Two subscales from the WHYMPI were used to evaluate perceived level of pain severity and interference (Kerns, Turk, & Rudy, 1985). Pain severity was assessed using three items (i.e., "Level of pain at the present moment," "Severity of pain during the last week on average," "How much suffering do you experience as a result of your pain"). Pain interference was assessed using nine items (e.g., "…how much do pain problems interfere with day to day activities," "…how much has pain changed your ability to work"). Response options vary by item but are measured on a 7-point scale from "0 = No pain/No interference/Not at all severe" to "6 = Very intense pain/Extreme Interference/Extremely Severe." Average scores were calculated for each subscale; Cronbach's α was 0.92 for the Pain Severity subscale, and 0.75 for the Pain Interference subscale.

Generalized Anxiety Disorder – 7 (GAD-7)—The GAD-7 was used to measure general anxiety symptoms (e.g., "Not being able to stop or control worrying," "Feeling nervous, anxious, or on edge") consistent with the criteria set forth in the DSM-IV (Spitzer, Kroenke, Williams, & Lowe, 2006). Participants rated how much any of these symptoms had bothered them during the past two weeks from "0 = Not at all" to "3 = Nearly every day." Items were summed; a score of 10 or greater is considered clinically significant anxiety (Spitzer, Kroenke, Williams, & Lowe, 2006). Cronbach's alpha in the present sample was 0.91.

Cannabis Use—Recent cannabis consumption was assessed with one item: "In the past 6 months, how often have you used cannabis (weed, pot, grass, hash)?" with the following response scale: "0 = Never" to "4 = Daily or Almost Daily." This variable was dichotomized (Daily or almost daily versus all other responses) for analyses because the majority of participants (73%) reported daily consumption. The Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST; WHO ASSIST Working Group, 2002) was administered, which assesses frequency of cannabis use and five consequences (e.g., craving, social/occupational impairment) on a scale from "0 = Never" to "6 = Daily or Almost Daily." Responses from the ASSIST were summed, and categorized using established risk cutoff scores: Low= 0 to ≤3; Moderate= 4 to ≤26; Elevated ≥26.

Participants were also asked: “During the past month, on average, how much marijuana did you use per week (medical or non-medical)?” with the following response scale: “0 = None, did not use in the past month” to “5 = 1+ oz.”

Data Analysis

Descriptive statistics (i.e., frequencies and percentages) regarding demographics, pain severity and interference, anxiety, and cannabis use were calculated on those in the overall baseline sample who completed the AUDIT-C (n=780), and then calculated within each of three groups: non-drinkers, low-risk drinkers, and high-risk drinkers. Next, a series of chi-square tests and one-way analysis of variance (ANOVA) tests were conducted to examine the association of each variable with drinking groups. Each ANOVA was followed by a post-hoc test of mean pairwise comparisons to determine whether any group mean significantly differed, and each chi-square test was followed by a series of two-proportion z-tests to determine whether any group proportion significantly differed. Lastly, a multinomial logistic regression fitted with a generalized logit model was conducted to examine the associations of drinking group (non-drinker, low-risk drinker, high-risk drinker) with demographic characteristics, pain severity and interference, anxiety, and cannabis use. Generalized logits were used after it was determined that the proportional odds assumption did not hold in the adjusted model. The AIC fit statistic for the final adjusted model was 1606.90 (intercept +covariates), which represents a reduction of 50.9 from 1657.79 (intercept-only AIC). The final adjusted model explained 14% of the total variation in levels of risky drinking. Additionally, there was no evidence of confounding or collinearity in the final regression model. All analyses were conducted using SAS version 13.1.

Results

Participant Characteristics

A total of 2,569 patients were approached and 1,485 (58%) were screened for the study. Of those 1,485, a total of 801 (54%) met eligibility criteria, agreed to participate, and were included in the baseline cohort; 780 provided complete data on the AUDIT-C and thus comprise our sample (see Table 1). Participants were middle-aged (M_{age} = 45.5; SD=12.7), approximately one-half (52%) were male, and most were white (81%; 11% African-American, and 8% Other). Overall, 42% (n=330) were classified as non-drinkers, 32% (n=251) were low-risk drinkers, and 26% (n=199) were high-risk drinkers.

Factors Associated with Alcohol Consumption Groups

There were no differences between non-drinkers, low-risk drinkers, and high-risk drinkers in sex, anxiety scores, frequency or quantity of cannabis use, or cannabis use risk (see Table 1). However, compared to non-drinkers, low- and high-risk drinkers were significantly younger whereas a larger proportion of low-risk drinkers were African-American compared to non- or high-risk drinkers. High-risk drinkers were also less likely to be on disability compared to other groups. Additionally, there were no differences in mean scores of pain severity or pain interference between non-drinkers and low-risk drinkers, but high-risk drinkers reported significantly lower pain severity and interference compared to non-drinkers and low-risk drinkers.

Multinomial Correlates of Alcohol Consumption Groups

Medical cannabis patients who reported lower pain severity and less disability had greater odds of being classified as a high-risk drinker compared to non-drinkers and low-risk drinkers (Table 2). Age, sex, education, anxiety, cannabis use, and cannabis risk group were not significant predictors in the models.

Discussion

This study describes the prevalence and correlates of alcohol consumption (no drinking, low-risk drinking and high-risk drinking) among a sample of patients who report using medical cannabis for pain. Approximately 58% of the sample reported consuming alcohol in the past six months, and 26% reported high-risk drinking, which is similar to rates among patients in primary care or emergency departments (~25%; Cherpitel, 2008; Bradley et al., 2007), and chronic pain patients on long-term opioid therapy (24%; Larance et al., 2016). Additionally, this estimate is similar to the prevalence of risky drinking in the general population (23%; Cherpitel, 2015). Compared to other medical cannabis patients, however, the rates found in this study exceeded those found in prior work (e.g., 13%; Ilgen et al., 2013; 14% in Perron et al., 2015), likely reflecting differences in measures used to classify high-risk drinking (e.g., AUDIT-C vs. full AUDIT), the use of sex-specific cut-offs to define high-risk drinking (i.e., no sex specific cut-offs in prior studies), and sample composition (i.e., prior studies comprised of patients with low pain severity and who used medical cannabis to treat non-pain conditions). Regardless, the finding that approximately one-quarter of medical cannabis patients with pain reported high-risk drinking underscores the public health significance of studying risky drinking in this population.

Importantly, a key marker of high-risk drinking appears to be pain interference and severity, with severity being particularly robust at differentiating alcohol consumption groups. Our findings, however, differed from a study of chronic pain patients on long-term opioid therapy (Larance et al., 2016). Specifically, we found that high-risk drinkers reported *less* pain interference/severity whereas Larance et al. (2016) found that risky drinkers reported *more* pain interference/severity. One possible explanation is that the patients in Larance et al. (2016) may have developed opioid-induced hyperalgesia (i.e., an increase in sensitivity to pain), contributing to higher perception of pain severity and interference. Alternatively, it may be that high-risk drinkers who obtain medical cannabis for pain, have less pain interference/severity to begin with, or consume alcohol in an attempt to reduce pain (Alford et al., 2016). Given the cross-sectional nature of these data, the temporal ordering of high-risk drinking and pain cannot be ascertained; thus, these hypotheses are speculative and warrant further investigation.

These inconsistencies notwithstanding, we also found similarities between our sample and those comprising individuals who consume alcohol and *non-medical* cannabis. For example, we found that 58% of medical cannabis patients also reported consuming any alcohol; whereas, Subbaraman and Kerr (2015) found that two-thirds of people who consumed non-medical cannabis at least monthly reported also consuming alcohol, suggesting that alcohol use is common among people who use cannabis, regardless of whether such use is for medical or non-medical reasons. Therefore, such behaviors may be appropriate to address

through brief interventions in order to prevent injury and negative health/social consequences (Subbaraman & Kerr, 2015; Dubois et al., 2015) and the positive, but modest, effects of implementing brief alcohol interventions in medical settings (Sullivan et al., 2011; O'Donnell et al., 2014) support the need to test such approaches in this population.

These findings should be considered in light of several methodological limitations. The sample was comprised of medical cannabis patients from clinics in the Midwestern US, which limits generalizability to other geographical areas. Further, replication is needed given the sampling methodology and refusal rate. Notably, we excluded patients who reported seeking/using medical cannabis for conditions other than pain and those who reported only minimal pain, thus restricting the generalizability of our findings to moderate/severe chronic pain patients. However, 75–90% of medical cannabis patients in this region in the US report using cannabis for chronic pain (Davis et al., 2016; Ilgen et al., 2013) highlighting the importance of studying this large group of medical cannabis patients. Additionally, we did not assess whether alcohol and medical cannabis use occurred concurrently or consecutively. However, given that approximately three-quarters of the sample reported daily cannabis use, and that prior studies have shown the prevalence of consecutive use is twice as high than concurrent use (Subbaraman & Kerr, 2015), it is quite likely that alcohol and cannabis use often co-occurs among medical cannabis patients. However, this hypothesis awaits future research using event level data to ascertain whether such use patterns are more problematic when substance use is concurrent versus consecutive. Lastly, as with all self-report data our sample could have been influenced by social-desirability and retrospective recall biases; however, the assurance of confidentiality may have partially mitigated this concern.

Because people who use cannabis and alcohol have the potential for experiencing synergistic negative outcomes (i.e., psychosocial consequences/harms, drunk driving), perhaps especially when medical cannabis and alcohol use occurs concurrently and in sufficiently large doses, individuals who treat patients who report using medical cannabis should assess for risky drinking. Moreover, the findings that high-risk drinking is related to less pain severity and less disability, despite similar levels of medical cannabis use, suggest that these patients may either be drinking to reduce pain severity or that they have less pain in general. Regardless, screening for high-risk drinking, and potentially providing brief interventions if detected, may be useful as a harm reduction approach for patients using medical cannabis for chronic pain. Although brief alcohol interventions may reduce consumption in some of these patients, such reductions may not address the underlying motivations for those who drink for additional pain relief. Given that the experience of pain is associated with heavy drinking lapses following alcohol interventions (Staiger et al.,2013; Witkiewitz et al., 2015a, 2015b), those who report using alcohol for this purpose may benefit from additional intervention for pain management (e.g., cognitive behavioral therapy for chronic pain; acceptance and commitment therapy) (Wetherell et al. 2011), in order to increase their ability to cope with pain without relying on supplemental alcohol use as an acute analgesic. Therefore, future research could examine an optimal sequence of alcohol and pain interventions, or integration of these interventions, for those medical cannabis patients most at risk for problems associated high-risk alcohol use.

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Highlights

- Alcohol use among medical cannabis patients is largely unknown.
- Most medical cannabis patients seek treatment for chronic pain.
- Among chronic pain patients using medical cannabis, 26% were high-risk drinkers
- Those with less pain severity/disability had greater odds of being a high-risk drinker.
- Providers should assess alcohol consumption among patients using medical cannabis.
- Future studies should examine the efficacy of alcohol interventions in this population.

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Table 1

Characteristics of medical cannabis patients based on alcohol consumption groups: non-drinkers, low-risk drinkers and high-risk drinkers (AUDIT 3-item sum ≥4 for men and ≥3 for women).

	Overall Sample (*n* =780)[a] *n* (%) / *M* (SD)	**Non-drinkers** (*n* = 330) *n* (%) / *M* (SD)	**Low-risk Drinkers** (*n* = 251) *n* (%) / *M* (SD)	**High Risk Drinkers** (*n* = 199) *n* (%) / *M* (SD)	**Statistic; *p*-Value**
Age	45.5 (12.7)	47.3 (12.1)§	44.5 (12.7) †	43.6 (13.3) †	F=6.22 **
Female sex	375 (48%)	169 (51%)	124 (49%)	82 (41%)	χ^2 =5.24
Race					χ^2 =20.31 ***
Caucasian	630 (81%)	273 (83%)§	184 (73%) †	173 (87%)§	
African-American	85 (11%)	26 (8%)§	44 (17%) †	15 (7%)§	
Other	65 (8%)	31 (9%)	23 (9%)	11 (6%)	
Employment status					χ^2 =34.31 ***
Employed	314 (40%)	102 (31%)§	105 (42%) †	107 (54%)^	
On disability	249 (32%)	131 (40%)§	81 (32%)§	37 (19%) †	
Other	217 (28%)	97 (29%)	65 (26%)	55 (28%)	
High school education or less	265 (34%)	128 (39%)§	72 (29%) †	65 (33%)	χ^2 = 7.48 *
Pain Severity	4.0 (1.0)	4.2 (1.0)§	4.0 (1.0)§	3.6 (1.1) †	F=17.62 ***
Pain Interference	3.7 (1.4)	3.9 (1.3) §	3.7 (1.3) §	3.3 (1.3) †	F=14.26 ***
Anxiety symptoms	5.7 (5.4)	5.6 (5.5)	5.8 (5.2)	5.7 (5.6)	F=0.09
Daily cannabis use	573 (73%)	252 (76%)	175 (70%)	146 (73%)	χ^2 =3.23
ASSIST Cannabis Risk Level					χ^2 =6.86
Low	70 (9%)	27 (8%)	28 (11%)	15 (8%)	
Moderate	691 (89%)	297 (91%)	218 (87%)	176 (89%)	
Elevated	12 (2%)	2 (0.5%)	4 (2%)	6 (3%)	
Quantity of cannabis use per week					χ^2 =10.00
1.0 oz. or more	112 (15%)	53 (17%)	37 (15%)	22 (11%)	
0.50–0.99 oz.	121 (16%)	61 (19%)	29 (12%)	31 (16%)	
0.125–0.49 oz.	328 (43%)	134 (42%)	108 (44%)	86 (45%)	
Less than 0.125 oz.	194 (26%)	70 (22%)	70 (29%)	54 (28%)	

Note. Within each row, group proportions or means with different superscripts (§ or †) are statistically different from one another.

* $p < .05$;

** $p < .01$;

*** $p < .001$

[a] Of N=801 enrolled, 21 persons were excluded because they provided no answers to the AUDIT questions concerning alcohol use.

Table 2

Multinomial logistic regression comparing alcohol consumption groups (non-drinkers, low-risk drinkers and high-risk drinkers) on demographic characteristics, psychiatric factors, cannabis use, and pain-related variables.

	Generalized Logit Model			
	High-Risk Drinkers v. Non-drinkers OR (95% CI)	**Low-risk Drinkers v. Non-drinkers OR (95% CI)**	***Statistic p*-Value (type-3)**	**High-risk Drinkers v. Low-risk Drinkers OR (95% CI)[a]**
Age	0.99 (0.97, 1.00)	0.99 (0.97, 1.00)	Wald χ^2: 3.74 p=0.15	1.00 (0.98, 1.02)
Female sex	0.71 (0.48, 1.05)	0.94 (0.66, 1.33)	Wald χ^2: 3.07 p=0.21	0.76 (0.51, 1.14)
Race			Wald χ^2: 18.78 p=0.0009	
Black	0.91 (0.44, 1.88)	2.57 (1.48, 4.46) ***		0.36 (0.18, 0.69)
All others	0.52 (0.24, 1.09)	0.95 (0.53, 1.71)		0.39 (0.22, 0.68)
Caucasian	(referent)	(referent)		(referent)
Employment status			Wald χ^2: 11.98 p=0.017	
On disability	0.41 (0.25, 0.69) ***	0.76 (0.49, 1.19)		0.54 (0.32, 0.93) **
Others	0.69 (0.43, 1.10)	0.73 (0.46, 1.15)		0.94 (0.58, 1.54)
Employed	(referent)	(referent)		(referent)
High school education or less	0.88 (0.59, 1.32)	0.66 (0.46, 0.96)	Wald χ^2: 4.74 p=0.09	1.33 (0.87, 2.05)
Pain Severity	0.63 (0.52, 0.77) ***	0.86 (0.71, 1.03)	Wald χ^2: 20.5 P<0.0001	0.74 (0.60, 0.90) ***
Anxiety symptoms	1.03 (0.99, 1.06)	1.01 (0.98, 1.05)	Wald χ^2: 1.86 p=0.39	1.01 (0.97, 1.05)
Daily cannabis use	0.64 (0.39, 1.05)	0.76 (0.48, 1.21)	Wald χ^2: 3.23 p=0.20	0.84 (0.51, 1.39)
ASSIST Cannabis Risk Level			Wald χ^2: 7.34 p=0.12	
Elevated	11.7 (1.75, 77.9)	2.74 (0.41, 18.4)		4.26 (0.83, 21.7)
Moderate	1.31 (0.59, 2.90)	0.93 (0.47, 1.84)		1.41 (0.64, 3.10)
Low	(referent)	(referent)		(referent)

*** p≤0.005;

** p≤0.05; Fit statistics: AIC (intercept only): 1657.79. AIC (intercept + covariates): 1606.90. R^2 =0.137

[a] These AORs were estimated via post-hoc analysis, by refitting the multiple variable logistic with low-risk drinking as referent; the chi-square, R^2, and AIC estimates are the same as in the original model with non-drinkers as referent.