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Individual and Community Social Determinants of Health and Recovery from Alcohol Use Disorder Three Years Following Treatment

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Abstract

Prior research on recovery from alcohol use disorder (AUD) has often focused on individual-level factors that promote recovery. Given systemic health inequities it is also important to study community-level social determinants of health (SDOH) that may promote recovery from AUD. This study extended prior work examining individual profiles of recovery from AUD to assess how individual and community SDOH at the time of treatment entry were associated with recovery from AUD three years after treatment. Data were utilized from the COMBINE study (n = 664), a multisite randomized clinical trial evaluating pharmacological and behavioral treatments for AUD. Public community data sources associated with participants' study sites were used to measure community SDOH. Multilevel latent profile analyses with individual- and community-level variables as predictors of recovery profiles were estimated. Four profiles were identified based on participants' alcohol consumption and functioning. Individual SDOH variables, such as fewer years of education and lower income, and community SDOH, including lower rates of health insurance, lower income, and greater income inequality, were each associated with

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Declaration of Interest Statement
The authors declare no conflicts of interest.

Data Sharing Policy
The data that support the findings of this study are available from the National Institute on Alcohol Abuse and Alcoholism. These data were derived from the following resources available in the public domain: https://www.niaaa.nih.gov/research/niaaa-data-archive.

lower functioning profiles. The findings highlight the importance of community SDOH in AUD recovery and the value of including both individual and community SDOH variables in research on long-term recovery.

Keywords

alcohol use disorder; social determinants of health; recovery; community-level

Alcohol use disorder (AUD) is highly prevalent (World Health Organization 2018; Grant et al. 2015) and adversely affects numerous life domains (National Institute on Alcohol Abuse and Alcoholism 2021). Recovery from AUD is achievable (Tucker, Chandler, and Witkiewitz 2020) and encompasses a reduction of alcohol consumption and improvements in health, social functioning, well-being, and purpose in life (Best and Lubman 2012; Ashford et al. 2019; Kaskutas et al. 2014; Neale et al. 2016). Many factors influence an individual's recovery including social determinants of health (SDOH), defined as conditions in which individuals grow, live, and work, that affect their exposure to health-related concerns (Whitehead 1992; Solar and Irwin 2010; Roche et al. 2015). The Centers for Disease Control and Prevention's (CDC) SDOH model encompasses five domains including, Health Care Access/Quality, Education Access/Quality, Social and Community Context, Economic Stability, and Neighborhood and Built Environment (CDC 2020). These domains can be examined at multiple levels of influence, as incorporated in the social-ecological model of health behavior (Institute of Medicine 2003) wherein an individual at the center is surrounded by concentric circles of influence including family, friends, and social networks; organizations, communities, institutions, and culture; and government policies, laws, and regulations.

Prior studies have primarily focused on SDOH at the individual level (e.g., Currie and Morgan 2020) and found improvements in financial situation, employment, community involvement, social support, health, and well-being were associated with increased likelihood of recovery (Best, Vanderplasschen, and Nisic 2020; Laudet and White 2008; Tew 2012; Moos and Moos 2006). Prior research examining community-level SDOH found communities with lower socioeconomic status experience more consequences from alcohol consumption (Grittner et al. 2012; Roche et al. 2015), even though higher socioeconomic status communities consume more alcohol (Galea et al. 2007; Grittner et al. 2013; Kyu et al. 2015). Lower socioeconomic status communities also have higher densities of alcohol outlets, which is associated with greater alcohol consumption and harms (Campbell et al. 2009; Trangenstein et al. 2020).

However, with a few exceptions, prior research has not investigated SDOH at higher levels of influence (e.g., communities, government) on long-term recovery from AUD. For example, Buu et al. (2007) examined how individual and community variables influenced remission, defined by a lack of AUD symptoms, over 12 years among 206 white male fathers of 3- to 5-year-old sons with probable AUD (Zucker et al. 2000). Participants with greater AUD severity lived in or moved into more disadvantaged neighborhoods, and those in remission lived in neighborhoods indistinguishable from those without AUD. A large

cohort study (N = 52,499) of participants who completed community-based treatment for AUD (Peacock et al. 2018) examined individual and community variables and successful remission six months following treatment, defined as completing treatment and achieving participants' drinking goal (e.g., abstinence or no heavy drinking). Participants were less likely to achieve remission if they lived in areas with greater socioeconomic disadvantage, had housing problems, or a history of AUD treatment. While this study used a large sample recruited from many locations, only a single composite variable for community SDOH was included, and the follow-up duration was relatively brief.

Recent studies by Witkiewitz et al. (2019, 2020, 2021) examined long-term profiles of recovery based on consumption and functioning among participants in two large, multi-site, randomized clinical trials, Project Matching Alcoholism Treatment to Client Heterogeneity (Project MATCH Research Group 1997) and Combined Pharmacotherapies and the Behavioral Interventions for Alcohol Dependence (COMBINE; Anton et al. 2006; COMBINE Research Group 2003). Four profiles of recovery three years following alcohol treatment were identified and replicated across samples (Witkiewitz et al. 2019, 2020, 2021), characterized as: low functioning and frequent heavy drinking (profile 1), low functioning and infrequent heavy drinking (profile 2), high functioning and some heavy drinking (profile 3), and high functioning and infrequent drinking (profile 4). Individuals in profiles 3 and 4 displayed the greatest increases in functioning from baseline to three years following treatment regardless of their quantity and frequency of drinking. Individuals in profiles 1 and 2 had poor psychosocial functioning and quality of life and were more likely to endorse unemployment and dissatisfaction across multiple life domains (Witkiewitz et al. 2019). Individuals in profile 3 were more likely to be non-Hispanic and white compared to the other profiles (Witkiewitz et al. 2020), perhaps reflecting systemic advantages for white individuals in recovery. These studies and others (Kanny et al. 2018; Holzhauer, Cucciare, and Epstein 2019; Subbaraman and Witbrodt 2014; Anton et al. 2006) have shown that individual factors like sex, age, race, and ethnicity influence alcohol use, treatment, and recovery. There is also evidence from prior studies (e.g., Peacock et al. 2018) that community SDOH can impact recovery in addition to individual demographic and SDOH factors.

The present study extended our prior work using the COMBINE dataset (Witkiewitz et al. 2020) to assess how individual and community SDOH factors at treatment entry were associated with recovery from AUD three years after treatment. Based on available site-specific community SDOH indicators, we hypothesized that participants in communities with less favorable SDOH in the domains of Economic Stability and Health Care Access/Quality would have relatively poorer recovery outcomes. Specifically, participants in communities with lower average income of those employed, lower rates of health insurance, and higher inequality of wage distribution were predicted to have a higher likelihood of classification in the lower functioning profiles, over and above individual demographic and SDOH factors, including sex, age, race, ethnicity, treatment condition, income, and years of education.

Materials and Methods

Participants and Procedures

We utilized data from the COMBINE study (Anton et al. 2006) and de-identified public data sources. The COMBINE study was a multisite, randomized clinical trial examining pharmacological and behavioral treatments for AUD. Participants were recruited from 11 sites from 2001 to 2003. All participants met criteria for alcohol dependence based on the Diagnostic and Statistical Manual (4^{th} ed.; American Psychiatric Association 1994). Exclusion criteria included current other substance use disorder with the exceptions of nicotine and cannabis, a psychiatric disorder requiring medication, and individuals with unstable medical conditions or medication contraindications. All participants provided informed consent and procedures received oversight and approval by each site's institutional review board.

Participants were randomized to complete 16 weeks of treatment with active or placebo naltrexone (100 mg/day), active or placebo acamprosate (3,000 mg/day), and Medication Management or Medication Management with Combined Behavioral Intervention (Arciniega et al. 2003). Nine sites (n = 1,144) provided an opportunity for follow-up at three years post-treatment, and 694 participants completed the follow-up (60.7%; Zarkin et al. 2010; Zarkin et al. 2008). Only 664 completed all 3-year assessments and were included in the present analyses.

Measures

Individual-Level Variables—Individual-level variables included participants' age, sex, race, ethnicity, years of education, and income based on a self-report questionnaire at baseline, and participants' treatment condition. Sex included male or female. Race and ethnicity were defined with two mutually exclusive binary variables of those identifying as Black or not Black and those identifying as Hispanic or not Hispanic. Additionally, a binary poverty variable was created from the individual income data reflecting those who were below or above the poverty line (defined as <$15,000, which is near the Health and Human Services Poverty Guideline of $14,630 in 2001). Treatment conditions were coded as three binary variables of receiving naltrexone, acamprosate, and/or Combined Behavioral Intervention.

Community-Level Variables—Personal addresses were not available for participants, so community-level variables were determined based on the participants' study site at baseline.

Decennial Census.: The United States Census Bureau conducts a population census every 10 years, and statistics are developed from 5% public use samples by public use microdata areas (PUMAs), or mutually exclusive geographic areas within a state containing no less than 100,000 people each (United States Census Bureau 2021a; Ruggles et al. 2020). We used data from the year 2000, the closest time point to the baseline assessment, and identified the PUMAs corresponding with the study sites to calculate the Gini index of wages. The Gini is a frequently used measure of income inequality that determines how cumulative income is spread across a population; zero indicates the same income for

everyone and 1.0 indicates a single person receives all of the income (Kennedy, Kawachi, and Prothrow-Stith 1996; Moskowitz et al. 2008). We examined the Gini index of wages, or the inequality of wage distribution where larger values equate to greater inequality.

Current Population Survey.: The Current Population Survey is a monthly sample of labor statistics by the Bureau of Labor Statistics and the United States Census Bureau with an expanded set of variables on an annual basis called the Annual Social and Economic Supplement (Flood et al. 2020; United States Census Bureau 2021b). These data were delineated by metropolitan statistical areas (United States Census Bureau 2020). We used data from the 2001 Current Population Survey to determine the average income of those who were employed and the percent of those insured at each study site.

Profiles of Recovery

The indicators utilized to assess 3-year follow-up latent profiles of recovery included measures of alcohol consumption, physical and mental health, quality of life, employment, and other drug use. From the Form 90 (Miller 1996), we obtained summary alcohol use variables including percent drinking days (PDD), percent heavy drinking days (PHDD), and drinks per drinking day (DDD), and binary responses to cannabis use and other illicit drug use. A binary variable of any employment was obtained from the Economic Form 90 (Bray et al. 2007). Physical and mental health scores were based on the 12-item Short-Form Health Survey (SF-12; Ware, Kosinski, and Keller 1996). The World Health Organization Quality-of-Life Scale-BREF (WHOQOL-BREF; WHOQOL Group 1998) was used to obtain quality-of-life subscale scores in physical, psychological, social, and environmental domains (Kirouac et al. 2017). A more detailed description of these indicators is presented elsewhere (Witkiewitz et al. 2020).

Statistical Analysis Plan

Multilevel latent profile analysis (LPA) of the 3-year follow-up data was conducted using M*plus* 8.5 (Muthén and Muthén 2017) with robust maximum likelihood estimation, which allowed us to include all available data under the assumption that data were missing at random. Previous research found a four-profile LPA solution provided the best fit with individual-level data predicting individual-level profiles (Witkiewitz et al. 2020). Expanding on the prior study, the current study evaluated a four-profile multilevel LPA, adding community-level variables as predictors of individual-level profiles (see Supplementary Appendix for a comparison of alternative multilevel LPA models). Multilevel LPA is an exploratory person-centered technique that allows one to examine heterogeneous subpopulations (e.g., recovery profiles) within nested data (individuals nested within communities) (Mäkikangas et al. 2018; Henry and Muthén 2010). Specifically, multilevel LPA was used to assess hypothesized associations between individual (level 1) and community (level 2) variables and the probability of membership in the four profiles. Individual-level data included participants' sex, age, racial/ethnic identities, years of education, income below poverty level, and treatment condition. Community-level variables based on participants' study sites included average median income of those employed, Gini coefficient of wages, and percent enrolled in health insurance. We followed a multi-step procedure of first testing an empty multilevel model with only latent profiles, then we

compared models that varied in the inclusion of level 1 and level 2 predictors based on likelihood ratio tests to examine whether adding level 1 and then level 2 predictors improved the model fit (as defined by a deviance test using the likelihood ratio χ^2 difference test). These analyses allowed us to test whether adding level 2 (community-level) variables significantly improved model fit, above and beyond the level 1 (individual-level) variables.

Associations between baseline individual (level 1) and community (level 2) variables and the latent profiles were examined using model-based multinomial logistic regression with level 1 and level 2 characteristics predicting odds of membership (odds ratios with 95% confidence intervals [CI]) in each of the latent profiles. In these models, all covariates were included as predictors of latent profile membership with one profile serving as the reference profile. Level 1 predictors were group mean centered, and level 2 predictors were grand mean centered (Enders and Tofighi 2007). We used a false discovery rate procedure (Benjamini and Hochberg 1995) to adjust the *p*-value for multiplicity, which in the current study was adjusted to $p<0.012$. We report odds ratios with 95% confidence intervals, as well as Cohen's d statistics, test statistics for each coefficient, and exact *p*-values for all covariate effects.

Results

Descriptive Analyses

Participants who provided 3-year follow-up data and had no missing covariate data ($n = 664$) were 30.0% female, 19.9% non-White (80.1% non-Hispanic White, 6.0% Hispanic, 9.6% Black, 0.8% American Indian or Alaska Native, 1.4% "other," 2.0% multi-racial, and 0.2% Asian or Pacific Islander), and had an average age of 45.02 years ($SD = 10.3$) at treatment initiation. Community-level variables by site and by Black racial and Hispanic ethnic groups are reported in Table 1.

Recovery Multilevel Latent Profile Analysis

The classification precision of the unadjusted 4-profile multilevel LPA model was excellent (entropy = 0.93) and matched previously identified profiles (Witkiewitz et al. 2020), including a "low functioning frequent heavy drinking" profile (profile 1; 14.1% of the sample); a "low functioning infrequent heavy drinking" profile (profile 2; 14.3% of the sample); a "high functioning heavy drinking" profile (profile 3; 19.4% of the sample); and a "high functioning infrequent non-heavy drinking" profile (profile 4; 52.1% of the sample). Individuals in profiles 3 and 4 (i.e., high functioning profiles) compared to profiles 1 and 2 (i.e., low functioning profiles) had above average physical health and average mental health, average to above average quality of life, low unemployment, and low cannabis and other drug use (Table 2). In contrast, those in the low functioning profiles had below average physical and mental health, below average quality of life, higher unemployment, and higher levels of cannabis and other drug use.

Predictors of Recovery Latent Profiles

Deviance statistics indicated a better fitting model with level 1 predictors, as compared to an empty model ($\Delta\chi^2(27) = 1347.80$; $p < .001$), and a better fitting model with the addition of

level 2 predictors, as compared to the model with level 1 predictors ($\Delta\chi^2(9) = 231.99$; $p < .001$).

Individual predictors.—Sex, age, poverty, and identifying as Black were each significantly associated with profile membership (see Table 3). For individual factors associated with profile 4 ("high functioning infrequent drinking") versus those classified into lower functioning profiles (profiles 1 and 2), younger age predicted expected classification in profile 4 versus profile 1 ("low functioning frequent heavy drinking"), and income above the poverty level predicted expected classification in profile 4 versus profile 2 ("low functioning infrequent heavy drinking"). When comparing those in profile 3 ("high functioning heavy drinking") versus those classified in lower functioning profiles, individuals with expected classification in profile 3 differed from profile 2 on sex, age, and poverty. Individuals who were older, female, and had income above the poverty level had higher odds of expected classification in profile 3 versus profile 2. Those with income above the poverty level had higher odds of expected classification in profile 2 versus profile 1. Being male, younger, and Black predicted higher probability of expected classification in profile 4 versus profile 3.

Community predictors.—As shown in Table 3, percent health insured, income, and income inequality were each significantly associated with profile membership. Lower income inequality predicted expected classification in profile 4 ("high functioning infrequent drinking") versus profile 1 ("low functioning frequent heavy drinking"), and higher income inequality predicted expected classification in profile 4 versus profile 2 ("low functioning infrequent heavy drinking"). Higher percent insured and lower income inequality predicted expected classification in profile 3 ("high functioning heavy drinking") versus profile 1, whereas higher income predicted expected classification in profile 3 versus profile 2. Higher percent insured, lower income, and lower income inequality predicted classification in profile 2 versus profile 1.

Discussion

The current study extended our prior work (Witkiewitz et al. 2020) by examining how individual- and community-level factors at the time of treatment admission were associated with long-term recovery from AUD three years following treatment. Multilevel LPA with individual (level 1) and community (level 2) variables supported hypotheses that community-level SDOH would be associated with recovery profiles, in addition to individual-level SDOH. Consistent with prior work, two high functioning profiles were identified that varied by drinking levels. Specifically, profile 4 included those with infrequent, non-heavy drinking and profile 3 included those with heavy drinking. Two low functioning profiles also were identified with profile 2 including those with infrequent, non-heavy drinking and profile 1 including those with frequent heavy drinking.

Consistent with study hypotheses, low functioning profiles (profiles 1 and 2) were both distinguished from recovery profiles (profiles 3 and 4) by individual-level factors, including sex, age, education, poverty, and race/ethnicity, and by community-level factors, including rates of health insurance, income, and income inequality. Individuals with expected

classification in profile 1 (“low functioning frequent heavy drinking”) had the lowest rates of community-level percent insured and the highest income inequality, compared to all other profiles. Individuals with expected classification in profile 2 (“low functioning infrequent heavy drinking”) were more likely to have individual income below the poverty level and the lowest community-level income as compared to other profiles. Individuals in profile 2 were particularly differentiated from profile 3 (“high functioning heavy drinking”) by being male and younger.

The two low functioning profiles (profiles 1 and 2) were also differentiated by community-level factors. Expected classification in profile 2 was associated with higher proportion insured, lower income, and lower income inequality. Community-level factors did not differentiate the two high functioning profiles (profile 3 and 4), although being male, younger age, and identifying as Black were associated with membership in profile 4 (“high functioning infrequent drinking”) as compared to profile 3.

These findings dovetail with prior research findings that community SDOH influence several aspects of alcohol use and consequences especially for those in disadvantaged communities (Bryden et al. 2013; Karriker-Jaffe, Roberts, and Bond 2013). They also extend those findings to include long-term recovery from AUD in a more diverse group of treatment-seeking participants than previously studied (Buu et al. 2007; Peacock et al. 2018). AUD research has long focused on the individual and direct social support (e.g., COMBINE Research Group 2003), but as these results and a growing number of studies have shown (e.g., Roche et al. 2015), community-level variables matter above and beyond individual factors. While it was not possible to directly investigate the interaction of race and ethnicity on community variables because of the limited number of study sites, community variables did predict membership in recovery profiles beyond individual racial or ethnic identity. While individual racial identity was significant (i.e., identifying as Black predicted profile membership), community SDOH in the domains of Economic Stability and Health Care Access and Quality were also significant factors and predicted more differences in profile membership than individual racial identity. Racial and ethnic identities are often used as proxies for systematic health inequities, and future research should expand this focus by evaluating the role of community SDOH in producing health inequities. Research on how historical and contemporary zoning practices and policies like redlining and divestment create barriers to an individual’s recovery would provide additional insight into recovery determinants than continued singular focus on individual processes (Lee et al. 2020; Trangenstein et al. 2020; Mehra, Boyd, and Ickovics 2017). Overall, community SDOH should be given more consideration in future studies of AUD recovery, especially in areas with greater health inequities.

There are several study limitations. First, the number of SDOH domains examined in the current analyses was limited by the available data, and future research should investigate a larger set of SDOH domains at the individual and community levels. It would be useful to measure other community supports, including availability of mutual help programs and other recovery support organizations. Second, interactions among individual and community SDOH could not be examined due to the limited number of study sites. Examining interactions between levels of influence may uncover nuances in recovery processes and

outcomes, such as how individual and community SDOH interact to promote resilience or contribute to vulnerability.

Additionally, although select individual- and community-level variables were evaluated, we did not examine other SDOH domains including more direct influences such as neighborhood characteristics. Examining the influences of neighborhood factors by using participant zip codes may reveal unique contributions such as neighborhood density and safety and education access and quality. Additionally, participants may have moved from baseline to three years and experienced different community influences, but only baseline study site was available for use in the present analyses. Future studies should also examine community SDOH from current addresses when possible. Finally, these data are from a pharmacological treatment study conducted 20 years ago and may not generalize to non-pharmacological treatments and contemporary samples.

Overall, this study found community-level SDOH factors, including income, rates of health insurance, and income inequality, were associated with long-term recovery from AUD, in addition to individual-level SDOH factors. Future research on AUD recovery should investigate a greater range of individual and community SDOH variables per the CDC categories and explore interactions across the various levels of influence.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Community Level Variables by Site and Racial and Ethnic Identification.

Sites	% witd Healtd Insurance	Income among Employed	Income Inequality (Gini)
Site 1 (n=65)	91.0%	$44595	0.44
Site 2 (n=43)	91.0%	$44595	0.41
Site 3 (n=86)	78.2%	$28071	0.43
Site 4 (n=72)	89.9%	$39316	0.40
Site 5 (n=88)	91.9%	$33935	0.40
Site 6 (n=73)	92.8%	$35060	0.46
Site 7 (n=96)	84.6%	$41566	0.42
Site 8 (n=95)	89.8%	$37768	0.42
Site 9 (n=46)	90.2%	$43519	0.40
Race/Ethnicity	% with Health Insurance	Income among Employed	Income Inequality (Gini)
	Mean (SD)	Mean (SD)	Mean (SD)
Non-Black (n=600)	88.2% (4.8%)	$37733 ($5442)	0.42 (0.02)
Black (n=64)	90.0% (0.2%)	$38676.75 ($2955)	0.42 (0.02)
Non-Hispanic (n=624)	88.8% (4.2%)	$38276 ($4940)	0.42 (0.02)
Hispanic (n=40)	82.1% (6.0%)	$31207 ($5431)	0.43 (0.01)

Note. Income inequality was defined by the Gini coefficient of wages, which measures the dispersion of an area's cumulative income across the population, where larger values equate to greater wage inequality. SD = Standard Deviation.

Table 2.

Latent Profile Indicator Means (Standard Errors) and Proportions by Latent Profiles.

	Profile 1: Low Functioning, Frequent Heavy Drinking	**Profile 2: Low Functioning, Infrequent Heavy Drinking**	**Profile 3: High Functioning, Heavy Drinking**	**Profile 4: High Functioning, Infrequent Drinking**
	Mean (SE)	**Mean (SE)**	**Mean (SE)**	**Mean (SE)**
% drinking days	92.21 (2.14)	13.60 (2.37)	67.17 (2.92)	5.49 (0.83)
Drinks per drinking day	10.84 (0.93)	7.95 (0.81)	6.92 (0.48)	2.22 (0.32)
% heavy drinking days	87.79 (1.88)	10.19 (1.97)	27.48 (1.50)	2.00 (0.39)
Physical Health (SF12)	49.73 (1.01)	42.08 (1.70)	52.07 (0.97)	52.91 (0.49)
Mental Health (SF12)	43.49 (2.11)	36.52 (2.23)	48.32 (1.38)	52.33 (0.51)
Physical QoL	27.09 (0.82)	21.84 (0.73)	29.11 (0.31)	30.48 (0.14)
Psychological QoL	21.36 (0.70)	17.44 (0.72)	22.95 (0.22)	24.83 (0.17)
Social QoL	10.08 (0.37)	8.51 (0.40)	10.97 (0.17)	11.85 (0.12)
Environmental QoL	30.50 (0.99)	24.67 (1.04)	32.48 (0.36)	33.35 (0.47)
	Proportion	Proportion	Proportion	Proportion
Employed	0.824	0.581	0.791	0.833
Cannabis Use	0.193	0.157	0.101	0.097
Other Drug Use	0.023	0.054	0.032	0.006

Note. SE = Standard Error; SF12 = Short Form Health Survey; QoL = Quality of Life, as measured by the World Health Organization Quality of Life scale.

Table 3.

Results of Multilevel Latent Profile Analysis Models.

	Profile 4 vs. Profile 1 (reference)			**Profile 4 vs. Profile 2 (reference)**			**Profile 3 vs. Profile 1 (reference)**			**Profile 3 vs. Profile 2 (reference)**			**Profile 2 vs. Profile 1 (reference)**			**Profile 4 vs. Profile 3 (reference)**		
	OR (95% CI)			OR (95% CI)			OR (95% CI)			OR (95% CI)			OR (95% CI)			OR (95% CI)		
Level 1 Predictors	d	*t*	*p*	d	*t*	*p*	d	*t*	*p*	d	*t*	*p*	d	*t*	*p*	d	*t*	*p*
Sex (male = 1)	1.04 (0.61, 1.79)			0.96 (0.57, 1.60)			0.48 (0.24, 0.97)			0.45 (0.27, 0.74)			1.09 (0.56, 2.13)			2.13 (1.46, 3.11)		
	0.02	0.14	0.89	−0.02	−0.17	0.87	−0.40	−2.06	0.04	−0.44	−3.17	0.002	0.05	0.24	0.81	0.42	3.93	<0.001
Age	0.98 (0.97, 0.99)			0.99 (0.97, 1.03)			1.02 (0.99, 1.04)			1.03 (1.01, 1.06)			0.98 (0.95, 1.02)			0.97 (0.94, 0.99)		
	−0.01	−2.73	0.01	0.00	−0.13	0.90	0.01	1.11	0.27	0.02	2.63	0.01	−0.01	−1.07	0.29	−0.02	−2.54	0.01
Years of education	1.10 (0.98. 1.23)			1.12 (0.98, 1.29)			1.19 (1.04, 1.36)			1.22 (1.04, 1.44)			0.98 (0.80, 1.20)			0.92 (0.84, 1.01)		
	0.05	1.65	0.10	0.06	1.71	0.09	0.10	2.50	0.01	0.11	2.43	0.02	−0.01	−0.20	0.84	−0.05	−1.71	0.09
Poverty (= 1)	0.85 (0.52, 1.38)			0.19 (0.12, 0.33)			0.90 (0.45, 1.81)			0.22 (0.10, 0.46)			4.36 (3.11, 6.11)			0.89 (0.48, 1.67)		
	−0.09	−0.66	0.51	−0.90	−6.19	<0.001	−0.03	−0.16	0.87	−0.84	−4.05	<0.001	0.81	8.57	<0.001	−0.06	−0.35	0.72
Black (= 1)	2.56 (1.04, 6.29)			1.75 (0.56, 5.43)			0.53 (0.31, 0.89)			0.44 (0.23, 0.85)			1.47 (0.76, 2.81)			3.95 (1.80, 8.66)		
	0.52	2.05	0.04	0.31	0.96	0.34	−0.24	−1.88	0.06	−0.45	−2.46	0.01	0.21	1.15	0.25	0.76	3.43	0.001
Hispanic (= 1)	2.00 (0.88,4.52)			1.75 (0.65, 4.73)			2.48 (0.61, 10.08)			2.26 (0.56, 9.13)			1.14 (0.33, 3.89)			0.78 (0.36, 1.66)		
	0.38	1.66	0.10	0.31	1.11	0.27	0.52	1.33	0.18	0.45	1.14	0.25	0.07	0.21	0.84	−0.14	−0.65	0.51
Acamprosate (= 1)	1.32 (1.05, 1.66)			1.52 (1.01, 2.30)			1.52 (1.16, 1.99)			1.75 (1.06, 2.87)			0.87 (0.55, 1.37)			0.87 (0.63, 1.20)		
	0.15	2.35	0.02	0.23	2.00	0.05	0.23	2.96	0.003	0.31	2.21	0.03	−0.08	−0.61	0.54	−0.08	−0.84	0.40
Naltrexone (= 1)	0.89 (0.62, 1.28)			0.64 (0.39, 1.06)			0.79 (0.45, 1.38)			0.57 (0.27, 1.20)			1.40 (0.77, 2.53)			1.12 (0.63, 1.99)		
	−0.06	−0.62	0.54	−0.25	−1.74	0.08	−0.13	−0.84	0.40	−0.31	−1.48	0.14	0.18	1.11	0.27	0.06	0.40	0.69
CBI (=1)	0.78 (0.45, 1.35)			1.15 (0.60, 2.20)			1.09 (0.54, 2.17)			1.56 (0.84, 2.90)			0.68 (0.29, 1.62)			0.73 (0.37, 1.44)		
	−0.14	−0.89	0.38	0.07	0.41	0.69	0.03	0.18	0.86	0.25	1.41	0.16	−0.21	−0.87	0.39	−0.17	−0.90	0.37
	OR (95% CI)			OR (95% CI)			OR (95% CI)			OR (95% CI)			OR (95% CI)			OR (95% CI)		
Level 2 Predictors	d	*t*	*p*	d	*t*	*p*	d	*t*	*p*	d	*t*	*p*	d	*t*	*p*	d	*t*	*p*
% with Health Insurance	1.06 (1.01, 1.11)			0.95 (0.91, 1.00)			1.11 (1.06, 1.15)			0.99 (0.96, 1.04)			1.11 (1.08, 1.14)			0.96 (0.90, 1.02)		
	0.03	2.36	0.02	−0.03	−1.91	0.06	0.06	5.01	<0.001	0.00	−0.19	0.85	0.06	8.73	<0.001	−0.02	−1.26	0.21

	Profile 4 vs. Profile 1 (reference)			Profile 4 vs. Profile 2 (reference)			Profile 3 vs. Profile 1 (reference)			Profile 3 vs. Profile 2 (reference)			Profile 2 vs. Profile 1 (reference)			Profile 4 vs. Profile 3 (reference)		
Income among Employed	0.96 (0.92, 0.99)			1.06 (1.003, 1.13)			0.96 (0.92, 1.01)			1.07 (1.02, 1.12)			0.90 (0.87, 0.93)			0.99 (0.93, 1.06)		
	−0.02	−1.99	0.05	0.03	2.06	0.04	−0.02	−1.66	0.10	0.04	2.91	0.004	−0.06	−5.91	<0.001	0.00	−0.23	0.82
Income Inequality (Gini)	0.82 (0.75, 0.89)			1.14 (1.04, 1.26)			0.78 (0.72, 0.85)			1.10 (0.99, 1.21)			0.72 (0.66, 0.78)			1.04 (0.93, 1.17)		
	−0.11	−4.74	<0.001	0.07	2.77	0.01	−0.14	−5.66	<0.001	0.05	1.82	0.07	−0.19	−8.12	<0.001	0.02	0.76	0.45

Note: OR (95% CI) = Odds Ratio (95% Confidence Interval), d = Cohen's d, *t* = test statistic, *p* = observed *p*-value. Tests of statistical significance were adjusted for multiple comparisons using a Benjamini-Hochberg false discovery rate criterion of $p < 0.012$. Profile 1: "low functioning frequent heavy drinking" profile (14.1% of the sample); Profile 2: "low functioning infrequent heavy drinking" profile (14.3% of the sample); Profile 3: "high functioning heavy drinking" profile (19.4% of the sample); Profile 4: "high functioning infrequent non-heavy drinking" profile (52.1% of the sample).

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