THE EUROPEAN SOCIETY OF MEDICINE
Medical Research Archives, Volume 13 Issue 2

RESEARCH ARTICLE

Prevalence and Risk Factors Among Patients with Alcohol Use Disorder During COVID-19: National Survey on Drug Use and Health Analysis

Onur Baser, MA, MS, PhD [1]; Yixuan Zeng, MS [2]; Isabel Eda Baser [3]

[1] Department of Economics, Bogazici University, Istanbul, Turkiye; Graduate School of Public Health, City University of New York, New York, NY, USA
[2] Department of Biostatistics, University of Michigan, Ann Arbor, MI, USA; Columbia Data Analytics, Ann Arbor, MI, USA
[3] Department of Psychology, Eugene Lang College, The New School, New York, NY, USA; Columbia Data Analytics, New York, NY, USA

OPEN ACCESS

PUBLISHED
28 February 2025

CITATION
Baser, O., Zeng, Y., et al., 2025. Prevalence and Risk Factors Among Patients with Alcohol Use Disorder During COVID-19: National Survey on Drug Use and Health Analysis. Medical Research Archives, [online] 13(2). https://doi.org/10.18103/mra.v13i2.6329

DOI
https://doi.org/10.18103/mra.v13i2.6329

ISSN
2375-1924

ABSTRACT

Background: Recent guidelines recommend improved treatments for alcohol use disorder (AUD), yet little is known about the factors associated with alcohol use treatment, especially during the COVID-19 pandemic, which has been linked to stronger alcoholic cravings.

Objective: This study examines the use of treatments among US adults with AUD and assesses the factors associated with their use.

Methods: We used 2021 National Survey on Drug Use and Health data for the study. Alcohol use disorder was identified using diagnostic criteria based on the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition*. Age, gender, race/ethnicity, education level, employment status, health insurance type, family income, residential area, receipt of mental health care, and illicit drug use disorder were compared descriptively between treated and untreated adults with AUD. Multinomial logistic regression modeling was applied to examine associations of these factors with different treatments and no treatments.

Results: The 2021 National Survey on Drug Use and Health files included 47,291 adults (55.8% female). The past-year prevalence of AUD among US adults was 11.4% in 2021. In 2021, 3.7% of adults with AUD received non-medication treatment, and 0.9% received medication treatment. Male adults receiving mental health care and those engaged in illicit drug use were more likely to receive treatment for AUD. Age and education level were also significant factors. Living in a non-metropolitan area was more likely associated with non-medication treatment. We found no evidence of treatment disparities by race/ethnicity, employment status, family income, or health insurance type.

Conclusions: Effective medication and non-medication-based treatments for AUD are consistently underutilized despite several recent guideline recommendations that encourage treatments.

Keywords: Alcohol use disorder, Risk factors, Treatment, Pandemic

Abbreviations

AOR adjusted odds ratio
AUD alcohol use disorder
CI confidence interval
DSM-5 *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition*
MAUD medications for treating alcohol use disorder
NSDUH National Survey on Drug Use and Health

Introduction

Alcohol use is a serious medical condition characterized by an impaired capacity to cease or control alcohol consumption despite negative social, occupational, or health consequences.[1,2] Problematic alcohol use has long been acknowledged as a medical condition. However, the term alcohol use disorder (AUD) was not defined until 2013 with the issuance of the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (DSM-5), which has been used to determine whether a person has AUD and, if present, its severity. The severity is based on the number of criteria a person meets based on their symptoms.[2]

Nearly 30 million adults in the United States 18 years and older are affected by AUD.[3] Among youth, an estimated 894,000 US adolescents 12 to 17 years of age had AUD in 2021.[4] The Centers for Disease Control and Prevention estimates that alcohol misuse, including AUD, costs the United States approximately $249 billion per year, including $28 billion in health care, $179 billion in lost workplace productivity, $13 billion in motor vehicle accidents, and $25 billion to law enforcement and for other criminal justice expenses.[5,6]

Further, AUD can have immediate negative effects on individuals' mental and physical health, such as vehicular accidents, homicide, suicide, and depression and/or anxiety. Over time, AUD can lead to the development of chronic diseases and other health problems, including high blood pressure, stroke, heart disease, liver disease, digestive disorders, and several types of cancer.[7,8]

Given AUD's cost and its negative short-term and long-term impact on individuals, many non-medication and medication-based treatments are now available. Non-medication treatments include cognitive-behavioral skills coping therapy, motivational enhancement therapy, and the 12-step Alcoholics Anonymous intervention.[9] For medication-based treatments, the US Food and Drug Administration has approved four evidence-based medications for treating AUD (MAUD) since 1949: acamprosate (Campral®, taken three times daily), disulfiram (Antabuse®, taken once daily), oral naltrexone (ReVia®, taken once daily), and extended-release injectable naltrexone (Vivitrol®, taken once monthly).[10,11] Evidence from epidemiological studies suggests that improving alcohol consumption outcomes (e.g., reduction in return to drinking or in the percentage of drinking days) with these effective medications, together with psychosocial interventions, would likely result in improved health outcomes.[12] However, medications are underutilized.[13,14] To improve effective medication use, the American Psychiatric Association released guidelines for the pharmacological treatment of patients with AUD in 2017.[15] Despite the recent developments related to increasing awareness of AUD with public health campaigns,[16] educational programs,[17] digital health innovations,[18] policy changes,[19] increased research fundings,[20] and community based initiatives,[21] little is known about the prevalence, disparities, and factors associated with using MAUD among adults with AUD in the United States. Isolation during COVID-19 restrictions exacerbated loneliness, financial stress, and lack of support, which are linked to more intense alcoholic cravings.[22,23] Therefore, we examined the use of MAUD in 2021 among US adults with AUD, assessing the factors associated with using MAUD and non-medication treatments.

Methods

This study used data from the 2021 National Survey on Drug Use and Health (NSDUH). The data are nationally representative of adults aged 18 and older in the civilian noninstitutionalized US population and include sociodemographic characteristics, alcohol and illicit drug use, and receipt of mental health and any alcohol use treatment. The survey covers residents of households, people in noninstitutional group quarters, and civilians living on military bases. The survey, administered in English and Spanish, includes a computer-assisted interviewing questionnaire. Individuals experiencing homelessness, active military personnel, and residents of institutional group quarters such as jails, nursing homes, mental institutions, and long-term care hospitals are excluded from the survey.[24]

Alcohol use disorder was identified using DSM-5 diagnostic criteria. The NSDUH uses structural interviews to assess alcohol use behaviors and symptoms consistent with DSM-5 criteria. Participants are asked questions about their alcohol consumption patterns, experiences with alcohol-related problems, and symptoms indicative of AUD. The DSM-5 criteria for AUD include (1) impaired control (i.e., a persistent desire or unsuccessful efforts to cut down or control alcohol use); (2) social impairment (i.e., the use of alcohol results in failure to fulfill major role obligations at work, school or home; social or interpersonal problems caused or exacerbated by alcohol use); (3) risky use (i.e., alcohol is often taken in larger amounts or over a longer period than was intended); (4) physical dependence (i.e., tolerance, as defined by either needing more alcohol to achieve the desired effect or experiencing diminished effect with continued use of the same amount of alcohol, and withdrawal symptoms when alcohol use is discontinued or reduced); and (5) craving (i.e., a strong desire or urge to use alcohol). To meet the criteria for AUD diagnosis, individuals must experience at least two of these symptoms within a 12-month period. Respondents provided verbal informed consent, and NSDUH data collection was approved by the institutional review board at RTI International.

Since 2019, NSDUH has collected information about past-year receipt of alcohol use treatment services and reported whether medications such as oral/long-acting injectable formulations (e.g., acamprosate and disulfiram) were used to help reduce or stop alcohol use. However, due to methodological changes, particularly the addition of web-based interviewing, the 2021 data

are not comparable to data from previous years. Therefore, we used only 2021 data for our analysis. A full sample was available from all four quarters in 2021. Based on information from the household screenings, there were 13,270 interviews from adolescents aged 12 to 17 and 56,580 interviews from adults aged 18 or older.[10] Overall, 54.6% of interviews were completed via the web, and 45.4% were completed in person. Weighted response rates for household screening and for interviewing were 22.2% and 46.2%, respectively, for an overall response rate of 10.3% for people aged 12 or older. The weighted interview response rates were 38.4% for adolescents aged 12 to 17 and 47.0% for adults aged 18 or older.[24]

Our first goal was to assess the proportion of patients with AUD receiving MAUD during the first year of COVID-19. Using the data collected about MAUD, we presented the rates of both MAUD and non-medication treatment.

As a second goal, descriptive analysis was conducted. In particular, for three different cohorts—MAUD, Non-Medication, and No-Treatment—available socioeconomic, demographic and clinical characteristics were compared. Data on age, gender, race, education level, employment status, health insurance, family income, geographic residence, receipt of mental health care, and illicit drug use disorder were available. Some of the missing responses for variables such as family income were imputed with the procedures used in NSDUH. Numbers and percentages were provided for dichotomous and polychotomous variables. *P* values, assumed significant at .05, were calculated according to chi-square test for dichotomous variables. Nonparametric tests were applied if there was a deviation from asymptotical assumptions.

To assess the disparities associated with MAUD and nonmedical treatment, multinomial logistic regression was used. Multinomial logistic model allows for the prediction of probabilities of different possible outcomes of categorical distributed dependent variable given a set of independent variables. Specifically, our mutually exclusive dependent variables were (1) MAUD compared with no treatment, (2) non-medication treatment versus no treatment, and (3) MAUD versus nonmedical treatment. The independent variables were the set of socioeconomic, demographic, and clinical variables that were analyzed descriptively.

All statistical analyses were conducted using RStudio software version 2023.06.0+421 and accounted for NSDUH's complex design and sampling weights.

Results

Despite the American Psychiatric Association guidelines encouraging patients to use medications, the proportion of patients receiving MAUD was only 0.9%.

Among US adults in 2021, past-year prevalence of AUD was 11.4% (95% confidence interval [CI], 11.1%-11.7%) or 28.9 million people (95% CI, 28.2 million–29.7 million). Among adults with AUD, 4.6% (95%, CI, 4.1-5.1), or 1.3 million persons (95% CI, 1.2 million–1.5 million) reported receiving any alcohol use treatment in the past year, and 0.9% (95% CI, 0.7%-1.1%), or 258,336 persons (95% CI, 189,887-326,783) reported using MAUD (Table 1).

Table 1: Descriptive Characteristics of Individuals Reporting AUD in 2021 NSDUH (n=6078)

Characteristic	MAUD (%) (n = 258,336)	Non-medication, % (n = 1,077,504)	*P* Value	No Treatment, % (n= 27,618,496)	*P* Value
Age, y					
18-25	2.9	11.1	.191	17.6	<.01
26-34	8.9	30.8	.451	22.8	.625
35-49	29.7	37	.444	27.9	<.01
≥50	58.5	21.3	.133	31.8	.328
Sex					
Male	65.4	69.7	.259	56.4	.084
Female	34.6	30.5	.259	43.6	.084
Race/ethnicity					
White	81.2	52.5	.397	67.8	.874
Black	12.8	21.4	.651	11.8	.132
Hispanic	5.7	16.3	.467	17	.275
Other	0.3	10	.318	0.7	.666
Education					
<High school	11	8	.288	9.7	.1
High school	11.6	39.5	<.05	26.8	.168
Some college	43.7	37.8	1	31	.549
College graduate	33.7	14.9	.073	32.5	.766
Employment status					
Full-time	73.5	39	1	53.9	.145
Part-time	3.3	12.4	.254	13.3	.175
Unemployment	7.3	9.7	1	7.4	.224
Other	15.9	39	.451	25.4	<.05
Health insurance					
Private only	75.8	28.5	<.05	62.3	.526

Characteristic	MAUD (%) (n = 258,336)	Non-medication, % (n = 1,077,504)	*P* Value	No Treatment, % (n= 27,618,496)	*P* Value
Medicaid	17.5	46.9	.398	15.3	<.01
Other	0.7	9.4	.204	10.8	.25
Uninsured	6	15.4	.737	11.6	.584
Family income, $					
<20,000	30.9	30	.931	16.6	<.05
20,000-49,999	11.8	39	.393	29.1	.687
≥50,000-74,999	22.1	14.2	.748	15.4	.884
75,000	35.2	17	.847	38.9	.134
Metropolitan statistical area					
Large metro	51	49.5	.399	55.6	1
Small metro	45	27.1	.694	30.9	.629
Nonmetro	4	23.6	.752	13.5	.444
Receipt of mental health care					
No	20.1	30.3	.497	27.5	<.001
Yes	79.9	68.6	.497	69.5	<.001
Illicit drug use disorder					
No	81.4	46.6	.794	79.2	<.01
Yes	18.6	53.6	.794	20.8	<.01

MAUD, Medications for treating alcohol use disorder.

Table 1 reports descriptive characteristics of each cohort. The majority of the MAUD cohort was over 50 years old (58.5%), male (65.4%), white (81.2%), a high school graduate (77.4%), employed full-time (73.5%); had private health insurance (75.8%); lived in large metropolitan area (51%); and had received mental health care (79.9%). Compared with the MAUD group, responders who preferred non-medication treatment were more likely to have a high school education (39.5% vs. 11.6%, $p<.05$) and less likely to have private health insurance (28.5% vs. 75.8%, $p<.05$). Responders with no AUD treatment, compared to the MAUD cohort, were more likely to be between 18-25 years old (17.6% vs. 2.9%, $p<.01$) and have illicit drug use disorder (20.8% vs. 18.6%, $p<.01$), less likely to have Medicaid insurance (15.3% vs. 17.5%, $p<0.01$)) and receipt of mental health care (69.5% vs. 79.9%, $p<.01$). Unadjusted odds ratios are presented in Table 2.

Table 2: Odds Ratios for Unadjusted Results

Characteristic	Unadjusted OR (95% CI)		
	MAUD vs No Alcohol Use Treatment	Nonmedication Alcohol Use Treatment vs No Alcohol Use Treatment	MAUD vs Nonmedication Alcohol Use Treatment
Age, y (Reference: Age 18-25)			
26-34	2.1 (0.7-5.9)	1.6 (1.1-2.3)	0.8 (0.3-2.3)
35-49	4.2 (1.7-10.5)	2.0 (1.4-2.9)	0.5 (0.2-1.3)
≥50	3.7 (1.3-10.4)	1.1 (0.7-1.8)	0.3 (0.1-1.1)
Sex (Reference: Male)			
Female	0.6 (0.3-1.0)	0.9 (0.7-1.1)	1.5 (0.8-2.9)
Race/ethnicity (Reference: White)			
Black	1.7 (0.8-3.8)	1.5 (1.0-2.3)	0.9 (0.4-2.1)
Hispanic	0.5 (0.2-1.5)	1.0 (0.7-1.5)	2.4 (0.7-8.5)
Other	0.7 (0.2-2.2)	1.5 (1.0-2.3)	2.3 (0.7-8.0)
Education (Reference: <High school)			
High school	0.3 (0.1-0.9)	1.0 (0.6-1.6)	3.4 (1.0-11.2)
Some college	0.6 (0.2-1.4)	0.9 (0.5-1.4)	1.5 (0.6-4.1)
College graduate	0.5 (0.2-1.1)	0.4 (0.2-0.7)	0.9 (0.3-2.6)
Employment status (Reference: Full-time)			
Part-time	0.6 (0.2-1.9)	1.2 (0.8-1.8)	2.2 (0.6-7.8)
Unemployment	2.3 (0.9-5.7)	2.3 (1.5-3.6)	1.0 (0.4-2.8)
Other	2.1 (1.1-4.1)	1.7 (1.3-2.4)	0.9 (0.4-1.8)
Health insurance (Reference: Private only)			
Private only	1 [Reference]	1 [Reference]	1 [Reference]
Medicaid	2.2 (1.1-4.2)	4.0 (2.9-5.4)	1.8 (0.9-3.6)
Other	0.3 (0.0-2.3)	1.8 (1.1-3.0)	5.8 (0.7-45.5)
Uninsured	0.8 (0.3-2.2)	1.5 (1.0-2.4)	1.9 (0.6-5.9)
Family income, $ (Reference <$20,000)			
20,000-49,999	0.5 (0.2-1.1)	0.7 (0.5-1.0)	1.3 (0.6-3.1)
50,000-74,999	0.7 (0.3-1.6)	0.6 (0.4-0.9)	0.8 (0.3-2.2)

Characteristic	Unadjusted OR (95% CI)		
	MAUD vs No Alcohol Use Treatment	Nonmedication Alcohol Use Treatment vs No Alcohol Use Treatment	MAUD vs Nonmedication Alcohol Use Treatment
≥75,000	0.4 (0.2-0.9)	0.4 (0.3-0.6)	0.9 (0.4-2.1)
Metropolitan statistical area (Reference: Large metro)			
Small metro	0.9 (0.5-1.7)	1.2 (0.9-1.7)	1.3 (0.6-2.8)
Nonmetro	1.3 (0.6-2.9)	1.9 (1.3-2.7)	1.3 (0.6-3.1)
Receipt of mental health care (Reference: No mental health care)			
Yes	9.2 (4.4-19.2)	6.5 (4.7-8.9)	0.7 (0.3-1.6)
Illicit drug use disorder (Reference: No illicit drug use disorder)			
Yes	2.5 (1.4-4.4)	2.8 (2.1-3.7)	1.2 (0.6-2.3)

Adjusted and unadjusted odds ratios estimated using logistic regression are presented in Tables 3 and 4, respectively. Controlling for the other factors, we found no disparities between medication treatment and no treatment in terms of race, educational level, employment status, health insurance, and location. Males (adjusted odds ratio [AOR], 2.8; 95% CI, 1.5-5.4), those over 35 years old (AOR, 6.1; 95% CI, 2.3-16.4 for age 35-49; AOR, 5.0; 95% CI, 1.6-15.4 for age ≥50), those receiving mental health care (AOR: 11.9; 95% CI, 5.5-25.7), and those engaged in illicit drug use (AOR: 2.5; 95% CI, 1.3-4.8) were more likely to use MAUD.

Table 3. Adjusted Odds Ratios from Logistic Regression

Characteristic	AOR (95% CI)		
	MAUD vs No Alcohol Use Treatment	Non-medication Alcohol Use Treatment vs No Alcohol Use Treatment	MAUD vs Non-medication Alcohol Use Treatment
Age, y (Reference: Age 18-25)			
26-34	2.6 (0.9-7.7)	1.9 (1.3-2.9)	1.0 (0.3-3.7)
35-49	6.1 (2.3-16.4)	2.8 (1.9-4.2)	0.7 (0.2-2.3)
≥50	5.0 (1.6-15.4)	1.6 (0.9-2.9)	0.4 (0.1-1.8)
Sex (Reference: Male)			
Female	0.4 (0.2 - 0.7)	0.6 (0.4 - 0.8)	1.2 (0.6 - 2.5)
Race/ethnicity (Reference: White)			
Black	1.7 (0.7-4.2)	1.3 (0.8-2.1)	0.8 (0.3-2.6)
Hispanic	0.7 (0.3-2.2)	1.0 (0.7-1.6)	1.7 (0.4-6.5)
Other	0.7 (0.2-2.5)	1.5 (1.0-2.4)	1.8 (0.5-7.5)
Education (Reference: <High school)			
High school	0.4 (0.1 - 1.2)	1.3 (0.8 - 2.2)	4.3 (1.1 - 16.6)
Some college	1.0 (0.3 - 2.7)	1.2 (0.7 - 2.1)	1.7 (0.5 - 5.8)
College graduate	0.6 (0.2 - 2.0)	0.6 (0.3 - 1.1)	1.1 (0.2 - 4.8)
Employment status (Reference: Full-time)			
Part-time	0.5 (0.1 - 1.9)	0.8 (0.5 - 1.3)	1.9 (0.4 - 8.4)
Unemployment	2.1 (0.7 - 6.1)	1.1 (0.7 - 1.8)	0.5 (0.1 - 1.9)
Other	1.5 (0.6 - 3.5)	0.9 (0.6 - 1.4)	0.6 (0.2 - 1.7)
Health insurance (Reference: Private only)			
Medicaid	0.9 (0.4 - 2.2)	2.4 (1.6 - 3.6)	2.4 (0.9 - 6.5)
Other	0.2 (0.0 - 1.4)	1.5 (0.9 - 2.6)	5.3 (0.6 - 50.3)
Uninsured	0.7 (0.2 - 2.3)	1.4 (0.9 - 2.4)	2.4 (0.6 - 9.3)
Family income, $ (Reference: <$20,000)			
20,000-49,999	0.6 (0.3-1.5)	1.0 (0.7-1.4)	1.1 (0.4-3.3)
50,000-74,999	0.9 (0.3-2.6)	1.0 (0.6-1.8)	0.9 (0.3-3.5)
≥75,000	0.5 (0.2-1.3)	0.9 (0.6-1.4)	1.7 (0.5-5.5)
Metropolitan statistical area (Reference: Large metro)			
Small metro	1.2 (0.6 - 2.3)	1.2 (0.9 - 1.7)	1.3 (0.6 - 2.9)
Nonmetro	1.6 (0.7 - 3.6)	1.6 (1.1 - 2.4)	1.2 (0.4 - 3.2)
Receipt of mental health care (Reference: No mental health care)			
Yes	11.9 (5.5-25.7)	8.1 (5.8 - 11.3)	0.8 (0.3 - 1.9)
Illicit drug use disorder (Reference: No illicit drug use disorder)			
Yes	2.5 (1.3 - 4.8)	2.2 (1.6 - 2.9)	0.8 (0.4 - 1.8)

Table 4: Odds Ratios for Unadjusted Results

Characteristic	Unadjusted OR (95% CI)		
	MAUD vs No Alcohol Use Treatment	Nonmedication Alcohol Use Treatment vs No Alcohol Use Treatment	MAUD vs Nonmedication Alcohol Use Treatment
Age, y (Reference: Age 18-25)			
26-34	2.1 (0.7-5.9)	1.6 (1.1-2.3)	0.8 (0.3-2.3)
35-49	4.2 (1.7-10.5)	2.0 (1.4-2.9)	0.5 (0.2-1.3)
≥50	3.7 (1.3-10.4)	1.1 (0.7-1.8)	0.3 (0.1-1.1)
Sex (Reference: Male)			
Female	0.6 (0.3-1.0)	0.9 (0.7-1.1)	1.5 (0.8-2.9)
Race/ethnicity (Reference: White)			
Black	1.7 (0.8-3.8)	1.5 (1.0-2.3)	0.9 (0.4-2.1)
Hispanic	0.5 (0.2-1.5)	1.0 (0.7-1.5)	2.4 (0.7-8.5)
Other	0.7 (0.2-2.2)	1.5 (1.0-2.3)	2.3 (0.7-8.0)
Education (Reference: <High school)			
Some college	0.6 (0.2-1.4)	0.9 (0.5-1.4)	1.5 (0.6-4.1)
College graduate	0.5 (0.2-1.1)	0.4 (0.2-0.7)	0.9 (0.3-2.6)
Employment status (Reference: Full-time)			
Part-time	0.6 (0.2-1.9)	1.2 (0.8-1.8)	2.2 (0.6-7.8)
Unemployment	2.3 (0.9-5.7)	2.3 (1.5-3.6)	1.0 (0.4-2.8)
Other	2.1 (1.1-4.1)	1.7 (1.3-2.4)	0.9 (0.4-1.8)
Health insurance (Reference: Private only)			
Medicaid	2.2 (1.1-4.2)	4.0 (2.9-5.4)	1.8 (0.9-3.6)
Other	0.3 (0.0-2.3)	1.8 (1.1-3.0)	5.8 (0.7-45.5)
Uninsured	0.8 (0.3-2.2)	1.5 (1.0-2.4)	1.9 (0.6-5.9)
Family income, $ (Reference: <$20,000)			
20,000-49,999	0.5 (0.2-1.1)	0.7 (0.5-1.0)	1.3 (0.6-3.1)
50,000-74,999	0.7 (0.3-1.6)	0.6 (0.4-0.9)	0.8 (0.3-2.2)
≥75,000	0.4 (0.2-0.9)	0.4 (0.3-0.6)	0.9 (0.4-2.1)
Metropolitan statistical area (Reference: Large metro)			
Small metro	0.9 (0.5-1.7)	1.2 (0.9-1.7)	1.3 (0.6-2.8)
Nonmetro	1.3 (0.6-2.9)	1.9 (1.3-2.7)	1.3 (0.6-3.1)
Receipt of mental health care (Reference: No mental health care)			
Yes	9.2 (4.4-19.2)	6.5 (4.7-8.9)	0.7 (0.3-1.6)
Illicit drug use disorder (Reference: No illicit drug use disorder)			
Yes	2.5 (1.4-4.4)	2.8 (2.1-3.7)	1.2 (0.6-2.3)

Adults residing in non-metropolitan areas (AOR, 1.66; 95% CI, 1.11-2.5), males (AOR, 1.8; 95% CI, 1.3-2.4), those between 26-49 years old (AOR, 1.9; 95% CI, 1.3-2.9 for ages 26-34 and AOR, 2.8; 95% CI, 1.9-4.2 for ages 26-34), those receiving mental health care treatment (AOR, 8.1; 95% CI, 5.8-11.3), and those involved in illicit drug use (AOR, 2.2; 95% CI, 1.6-2.9) were more likely to have non-medication treatment compared with those receiving no treatment.

Adults with less than a high school education (AOR, 0.2; 95% CI, 0.1-0.9) or college degree (AOR, 0.3; 95% CI, 0.1-0.9) were more likely to receive MAUD rather than non-medication treatment compared with high school graduates.

Discussion

The prevalence of AUD among US adults has been increasing. AUD was associated with a 40% lower probability of having an optimal quality of life, adverse health outcomes, and on average 140,000 deaths per year.[25,26] The healthcare and social cost of AUD is nearly $300 billion.[5,6]

Prominent organizations such as the American Psychiatric Association, the National Institute on Alcohol Abuse and Alcoholism, the Veterans Administration, and the Substance Abuse and Mental Health Services Administration recommend increased use of MAUD.[27] Naltrexone, an opioid receptor antagonist that reduces the rewarding effects of alcohol, reduces the risk of relapse and decrease heavy drinking days.[28] Acamprosate, which modulates glutamate neurotransmission to reduce withdrawal symptoms and cravings, is effective in maintaining abstinence particularly when combined with psychosocial support.[29] Disulfiram inhibits aldehyde dehydrogenase, leading to unpleasant effects when alcohol is consumed.[30] Topiramate, an anticonvulsant that influences GABA and glutamate neurotransmission, reduces drinking frequency and increases abstinent days.[31] Gabapentin modulates GABA neurotransmission and reduces alcohol consumption, especially among individuals with high anxiety levels or sleep disturbances. [32] Further, several studies have shown the cost-effectiveness of these medications.[33] Nevertheless, our estimates show that the use of MAUD is extremely low.

Surveys of adults with AUD show that the reasons not to seek treatment include "lack of problem awareness" (55.3%) and "stigma or shame" (28.6%), followed by "encounter barriers" (22.8%) and "cope alone" (20.9%). Peer pressure and denial were also identified as reasons why adults with AUD do not seek treatment.[34] These can explain why our results indicate that college graduates are less likely to receive treatment than high school graduates.

Consistent with previous research, we found that women were less likely to seek treatment than men. Women often face greater social stigma and shame associated with alcohol use than men.[35] In particular, mothers may have significant childcare responsibilities that make it challenging to attend treatment programs. They may lack affordable childcare or fear losing custody of their children if their substance use is disclosed.[36] Women with AUD are more likely to have concurrent mental health disorders such as depression and anxiety.[37] These conditions may complicate the treatment process and make it harder for women to seek and adhere to treatment. Women are also more likely to face economic barriers, such as lower income and lack of health insurance, which can impede their ability to afford treatment for AUD.[38] Many women with AUD have histories of trauma and domestic violence; thus, fear of partners, lack of safe environments, and trauma-related symptoms can hinder their ability to seek treatment.[39] Since women have different barriers to treatment than men, they may be less likely to seek treatment in a dedicated alcohol facility and more likely to seek treatment with a general practitioner or psychiatrist for depression or fatigue.[40]

Studies indicate that older adults have a significant prevalence of AUD, often associated with longer duration of alcohol use.[41] This demographic may therefore be more likely to seek and receive pharmacotherapy for AUD. Older adults typically have more frequent interactions with health care providers, which increases their opportunity to discuss AUD treatment options and receive prescriptions for medications.[42] They are also more aware of the impact of AUD on their health and well-being, leading to a greater willingness to engage in treatment, including use of medications.[43] Research from treatment settings also indicate that older adults are frequently prescribed medications for AUD, reflecting clinical guidelines and treatment protocols that prioritize pharmacotherapy for this population.[44] Our results were consistent with these findings.

Research showed that racial and ethnic minorities are less likely to access treatment for AUD compared to non-Hispanic Whites. [45] This disparity is influenced by factors such as socioeconomic status, lack of health insurance and geographic barriers. For example, in the veteran population, African American female patients with AUD were less likely to receive effective medication than white female patients with AUD.[46] Even when minorities access treatment, the quality of care they receive can be lower than that received by non-Hispanic whites, reflected in shorter duration of treatment, fewer sessions, and less access to evidence-based therapies.[47] Treatment programs often lack cultural competence, which can lead to lower engagement and poorer outcomes.[48] Economic challenges such as poverty, unemployment, and lack of transportation disproportionately affect minority groups, making it more difficult to seek and sustain treatment for AUD.[49] Since our model controlled for education, income, residential location, and previous illicit drug use, which are factors also associated with race, evidence of disparity in treatments according to racial and ethnic differences was mitigated in our models.

Consistent with previous research, our results revealed that a history of receiving mental health care are more likely to use MAUD. [14,50,51] This trend can be attributed to several factors, including increased awareness of treatment options,[51] established relationship with healthcare providers,[52] and better integration of care for concurrent mental health conditions. [1,50]

Our results indicated that individuals with a history of illicit drug use disorder were more likely to use medication for AUD. Since these individuals have more severe or complex cases of AUD, this may necessitate the use of pharmacotherapy as part of a comprehensive treatment strategy.[53] Healthcare providers treating individuals with concurrent substance use disorders are more likely to adopt a comprehensive approach, including the use of medications to manage both AUD and illicit drug use disorders.[54] Providers who treat patients with history of illicit drug use disorders often more knowledgeable about and comfortable with prescribing medications for substance use disorders including AUD.[14] These patients may be also more motivated to seek comprehensive treatment options, including medications for AUD, to prevent relapse and manage their overall substance use disorder.[55]

Limitations

The data in this study were derived from a survey that might be prone to recall and social desirability biases. Recall bias occurs when participants in the study do not accurately remember a past event or experience when reporting an event. It is more likely to occur when the event happened a long time ago or when the participants have poor memory. Participants' age, disease status, education, socioeconomic status, pre-existing beliefs, and importance of the event being recalled are factors affecting recall bias. To the extent that the participants' response on medication use is subject to recall bias, our results would underestimate the medication use for adults with AUD. The NSDUH, however, was tested for validity and reliability and has recent agreements of greater than 80% on most variables.[56,57] Stigma or shame among adults with AUD might result in social desirability bias in the answers. This bias occurs when there is a tendency of survey respondents to answer questions in a manner that will be viewed favorably by others. This might cause an underestimation of AUD and medication use since social desirability bias typically takes the form of underreporting "bad" or undesirable behavior. To the extent that these biases affect the answers, our results for AUD estimates would be underestimated. Many people who are affected by AUD, including homeless and incarcerated populations are excluded from NSDUH. In the survey year, the United States had the sixth highest incarceration rate in the world (531 people per

100,000) and a homelessness rate of 171 persons per 100,000. Assuming that these people are more likely not to receive treatment if they have AUD, our estimates of the likelihood of treatment would have an upward bias.[58]

Conclusion

Our research reveals that the observed use of MAUD is quite low. Age, gender, education level, and severity of disease are associated with AUD treatment. Policies such as reducing barriers to access by promoting coverage for these medications, educating patients and providers about the effectiveness of available treatment options for AUD, and encouraging employee assistance programs to support employees with AUD more effectively during their treatment can help increase the utilization and the effectiveness of pharmacotherapy for AUD.

Declarations

ETHICS AND CONSENT: This study was based on publicly available NSDUH data. NSDUH data collection was approved by the institutional review board at RTI International.

CONSENT FOR PUBLICATION: All the authors have approved this manuscript for publication.

DATA AVAILABILITY: This study was based on publicly available material from the U.S. Department of Health & Human Services, Substance Abuse and Mental Health Services Administration [https://www.samhsa.gov/data/report/2021-nsduh-detailed-tables]

CONFLICT OF INTERESTS: The authors declare no competing interests.

FUNDING: This study received no external funding.

AUTHOR CONTRIBUTIONS: O.B. provided the supervision, conceptualization, methodology, validation, and visualization of the research and participated in the writing process from the original draft preparation to the reviewing and editing of the manuscript. Y.Z. participated in the investigation of the data, methodology, software, validation, analysis, and data curation. I.E.B. participated in project management, investigation of the literature review and the writing process from the original draft preparation to the reviewing and editing of the manuscript.

ACKNOWLEDGEMENTS: The authors thank Amy Endrizal for assistance in editing the manuscript.

References

1. Watkins KE, Ober AJ, Lamp K, et al. Collaborative care for opioid and alcohol use disorders in primary care: the SUMMIT randomized clinical trial. *JAMA Intern Med*. 2017;177(10):1480-1488.
2. National Institute on Alcohol Abuse and Alcoholism. Understanding alcohol use disorder. Accessed July 31, 2023. https://www.niaaa.nih.gov/publications/brochures-and-fact-sheets/understanding-alcohol-use-disorder
3. National Survey on Drug Use and Health. Alcohol use disorder in past year: Among people aged 12 or older. SAMHSA, Center for Behavioral Health Statistics and Quality,. Accessed July 31, 2023.
4. National Institute on Alcohol Abuse and Alcoholism. Alcohol use disorder (AUD) in the United States: Age groups and demographic characteristics. Accessed July 31, 2023. https://www.niaaa.nih.gov/alcohols-effects-health/alcohol-topics/alcohol-facts-and-statistics/alcohol-use-disorder-aud-united-states-age-groups-and-demographic-characteristics#:~:text=According%20to%20the%202021%20NSDUH,AUD%20in%20the%20past%20year.&text=1%2C2-,This%20includes%3A,2.2%25%20in%20this%20age%20group)&text=596%2C000%20girls%20ages%2012%20to,4.7%25%20in%20this%20age%20group)
5. Sacks JJ, Gonzales KR, Bouchery EE, Tomedi LE, Brewer RD. 2010 national and state costs of excessive alcohol consumption. *Am J Prevent Med*. 2015;49(5):e73-e79.
6. US Centers for Disease Control and Prevention. Excessive alcohol use continues to be drain on American economy. Accessed July 31, 2023. https://www.cdc.gov/media/releases/2015/p1015-excessive-alcohol.html
7. Committee on Substance Abuse, Committee on Children with Disabilities. Fetal alcohol syndrome and alcohol-related neurodevelopmental disorders. *Pediatrics*. 2000;106(2):358-361.
8. Rehm J, Baliunas D, Borges GL, et al. The relation between different dimensions of alcohol consumption and burden of disease: An overview. *Addiction*. 2010;105(5):817-843.
9. American Psychological Association. Understanding alcohol use disorders and their treatment. Accessed July 31, 2023. https://www.apa.org/topics/substance-use-abuse-addiction/alcohol-disorders#:~:text=Drinking%20problems%20also%20have%20a,memory%20loss%2C%20depression%20or%20anxiety.
10. Kranzler HR, Soyka M. Diagnosis and pharmacotherapy of alcohol use disorder: A review. *JAMA*. 2018;320(8):815-824.
11. Mattson ME, Lynch S. Medication prescribing and behavioral treatment for substance use disorders in physician office settings. Accessed July 31, 2023. https://www.samhsa.gov/data/sites/default/files/report_1976/ShortReport-1976.html
12. Agency for Healthcare Research and Quality. Pharmacotherapy for adults with alcohol use disorder in outpatient settings. Accessed July 31, 2023. https://effectivehealthcare.ahrq.gov/products/alcohol-misuse-drug-therapy/policymaker
13. Mark TL, Kranzler HR, Song X. Understanding us addiction physicians' low rate of naltrexone prescription. *Drug Alcohol Depend*. 2003;71(3):219-228.
14. Harris AH, Ellerbe L, Reeder RN, et al. Pharmacotherapy for alcohol dependence: Perceived treatment barriers and action strategies among veterans health administration service providers. *Psychol Serv*. 2013;10(4):410.
15. Reus VI, Fochtmann LJ, Bukstein O, et al. The American Psychiatric Association practice guideline for the pharmacological treatment of patients with alcohol use disorder. *Am J Psychiatr*. 2018;175(1):86-90.
16. Knopf A. SAMHSA awards $18.9 million for services to youth and families. *Alcoholism & Drug Abuse Weekly*. 2023;35(29):6-7.
17. Helle AC, Sher KJ, Masters J, Washington K, Hawley KM. A mixed-method evaluation of the adoption and implementation of the college alcohol intervention matrix among prevention experts: A study protocol. *Implement Sci Comm*. 2021;2:1-8.
18. Torous J, Myrick KJ, Rauseo-Ricupero N, Firth J. Digital mental health and COVID-19: Using technology today to accelerate the curve on access and quality tomorrow. *JMIR Mental Health*. 2020;7(3):e18848.
19. Volkow ND, Poznyak V, Saxena S, Gerra G, Network UWIIS. Drug use disorders: Impact of a public health rather than a criminal justice approach. *World Psychiatry*. 2017;16(2):213.
20. Villani J, Ganoza L, Sims BE, et al. Substance use prevention research funded by the NIH. *Drug Alcohol Depend*. 2020;206:107724.
21. Grucza RA, Sher KJ, Kerr WC, et al. Trends in adult alcohol use and binge drinking in the early 21st-century United States: A meta-analysis of 6 national survey series. *Alcoholism Clin Exp Res*. 2018;42(10):1939-1950.
22. Pollard MS, Tucker JS, Green HD. Changes in adult alcohol use and consequences during the COVID-19 pandemic in the US. *JAMA Netw Open*. 2020;3(9):e2022942-e2022942.
23. Rodriguez LM, Litt DM, Stewart SH. Covid-19 psychological and financial stress and their links to drinking: A dyadic analysis in romantic couples. *Psychol Addict Behav*. 2021;35(4):377.
24. Substance Abuse and Mental Health Services Administration. National Survey on Drug Use and Health. Accessed July 21, 2023.
25. Lu J, Yang Y, Cui J, et al. Alcohol use disorder and its association with quality of life and mortality in Chinese male adults: A population-based cohort study. *BMC Public Health*. 2022;22(1):1-11.
26. National Institute on Alcohol Abuse and Alcoholism. Alcohol-related emergencies and deaths in the United States. Accessed July 31, 2023. https://www.niaaa.nih.gov/alcohols-effects-health/alcohol-topics/alcohol-facts-and-statistics/alcohol-related-emergencies-and-deaths-united-states#:~:text=It%20is%20estimated%20that%20more,physical%20inactivity%2C%20and%20illegal%20drugs.

27. Substance Abuse and Mental Health Services Administration. Medications for substance use disorders. Accessed July 31, 2023. https://www.samhsa.gov/medications-substance-use-disorders
28. Jonas DE, Amick HR, Feltner C, et al. Pharmacotherapy for adults with alcohol use disorders in outpatient settings: A systematic review and meta-analysis. *JAMA*. 2014;311(18):1889-1900.
29. Rösner S, Hackl-Herrwerth A, Leucht S, Lehert P, Vecchi S, Soyka M. Acamprosate for alcohol dependence. *Cochrane Database Syst Rev*. 2010;(9)
30. Fuller RK, Gordis E. Does disulfiram have a role in alcoholism treatment today? *Addiction (Abingdon, England)*. 2004;99(1):21-24.
31. Johnson BA, Rosenthal N, Capece JA, et al. Topiramate for treating alcohol dependence: A randomized controlled trial. *JAMA*. 2007;298(14):1641-1651.
32. Mason BJ, Quello S, Goodell V, Shadan F, Kyle M, Begovic A. Gabapentin treatment for alcohol dependence: A randomized clinical trial. *JAMA Intern Med*. 2014;174(1):70-77.
33. Hartung DM, McCarty D, Fu R, Wiest K, Chalk M, Gastfriend DR. Extended-release naltrexone for alcohol and opioid dependence: A meta-analysis of healthcare utilization studies. *J Subst Abuse Treat*. 2014;47(2):113-121.
34. Probst C, Manthey J, Martinez A, Rehm J. Alcohol use disorder severity and reported reasons not to seek treatment: A cross-sectional study in european primary care practices. *Subst Abuse Treat Prev Policy*. 2015;10(1):1-10.
35. Green CA, Polen MR, Lynch FL, Dickinson DM, Bennett MD. Gender differences in outcomes in an hmo—based substance abuse treatment program. *J Addict Dis*. 2004;23(2):47-70.
36. Marsh JC, Cao D, D'Aunno T. Gender differences in the impact of comprehensive services in substance abuse treatment. *J Subst Abuse Treat*. 2004;27(4):289-300.
37. Brady KT, Randall CL. Gender differences in substance use disorders. *Psychiatr Clin North Am*. 1999;22(2):241-252.
38. Timko C, Moos BS, Moos RH. Gender differences in 16-year trends in assault-and police-related problems due to drinking. *Addict Behav*. 2009;34(9):744-750.
39. Covington SS. Women and addiction: A trauma-informed approach. *J Psychoact Drugs*. 2008;40(sup5):377-385.
40. Gilbert PA, Pro G, Zemore SE, Mulia N, Brown G. Gender differences in use of alcohol treatment services and reasons for nonuse in a national sample. *Alcoholism Clin Exp Res* 2019;43(4):722-731.
41. McGovern J, Sarabia S. Substance abuse among older adults: Context, assessment, and treatment. *New Directions in Treatment, Education, and Outreach for Mental Health and Addiction*. 2018:111-124.
42. Blazer DG, Wu L-T. The epidemiology of substance use and disorders among middle aged and elderly community adults: National survey on drug use and health. *Am J Geriatr Psychiatry* 2009;17(3):237-245.
43. Han BH, Moore AA, Sherman S, Keyes KM, Palamar JJ. Demographic trends of binge alcohol use and alcohol use disorders among older adults in the United States, 2005–2014. *Drug Alcohol Depend*. 2017;170:198-207.
44. Oslin DW, Pettinati H, Volpicelli JR. Alcoholism treatment adherence: Older age predicts better adherence and drinking outcomes. *Am J Geriatr Psychiatr* 2002;10(6):740-747.
45. Schmidt LA, Ye Y, Greenfield TK, Bond J. Ethnic disparities in clinical severity and services for alcohol problems: Results from the National Alcohol Survey. *Alcoholism Clin Exp Res* 2007;31(1):48-56.
46. Yusuf Ransome DCC, Courtney D. Cogburn, and David R. Williams. Racial disparities in the association between alcohol use disorders and health in black and white women. National Library of Medicine. Accessed July 31, 2023. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6045433/
47. Wells K, Klap R, Koike A, Sherbourne C. Ethnic disparities in unmet need for alcoholism, drug abuse, and mental health care. *Am J Psychiatr*. 2001;158(12):2027-2032.
48. Guerrero E, Andrews CM. Cultural competence in outpatient substance abuse treatment: Measurement and relationship to wait time and retention. *Drug Alcohol Depend*. 2011;119(1-2):e13-e22.
49. Weisner C, Schmidt L. Alcohol and drug problems among diverse health and social service populations. *Am J Public Health*. 1993;83(6):824-829.
50. Priester MA, Browne T, Iachini A, Clone S, DeHart D, Seay KD. Treatment access barriers and disparities among individuals with co-occurring mental health and substance use disorders: An integrative literature review. *J Subst Abuse Treat*. 2016;61:47-59.
51. Blanco C, Iza M, Rodríguez-Fernández JM, Baca-García E, Wang S, Olfson M. Probability and predictors of treatment-seeking for substance use disorders in the us. *Drug Alcohol Depend*. 2015;149:136-144.
52. Harris AH, Kivlahan DR, Bowe T, Humphreys KN. Pharmacotherapy of alcohol use disorders in the veterans health administration. *Psychiatr Serv*. 2010;61(4):392-398.
53. Stinson FS, Grant BF, Dawson DA, Ruan WJ, Huang B, Saha T. Comorbidity between dsm-iv alcohol and specific drug use disorders in the United States: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Drug Alcohol Depend*. 2005;80(1):105-116.
54. McLellan AT, Lewis DC, O'Brien CP, Kleber HD. Drug dependence, a chronic medical illness: Implications for treatment, insurance, and outcomes evaluation. *JAMA*. 2000;284(13):1689-1695.
55. Kelly TM, Daley DC, Douaihy AB. Treatment of substance abusing patients with comorbid psychiatric disorders. *Addict Behav*. 2012;37(1):11-24.
56. Joseph Gfroerer JE, and James Chromy. *Redesiging an ongoing national household survey: Methodological issues*. Substance Abuse and Mental Health Services Administration; 2002.
57. Chromy JR FM, Gfoerer J. *Reliability of key measures in the national survey on drug use and mental health*. Substance Abuse and Mental Health Services Administration; 2010.

58. Powers RA, Severson R. Bureau of Justice Statistics. *The Encyclopedia of Research Methods in Criminology and Criminal Justice*. 2021;2:780-782.