



Published in final edited form as:

Subst Abus. 2021 ; 42(4): 487–492. doi:10.1080/08897077.2021.1901176.

Recent and active problematic substance use among primary care patients: Results from the alcohol, smoking, and substance involvement screening test in a multisite study

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Abstract

Background: Primary care settings provide salient opportunities for identifying patients with problematic substance use and addressing unmet treatment need. The aim of this study was to examine the extent and correlates of problematic substance use by substance-specific risk categories among primary care patients to inform screening/intervention efforts.

Methods: Data were analyzed from 2000 adult primary care patients aged 18years (56% female) across 5 clinics in the eastern U.S. Participants completed the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST). Prevalence and ASSIST-defined risk-level of tobacco use, alcohol use, and nonmedical/illicit drug use was examined. Multinomial logistic regression models analyzed the demographic correlates of substance use risk-levels.

Results: Among the total sample, the prevalence of any past 3-month use was 53.9% for alcohol, 42.0% for tobacco, 24.2% for any illicit/Rx drug, and 5.3% for opioids; the prevalence of ASSIST-defined moderate/high-risk use was 45.1% for tobacco, 29.0% for any illicit/Rx drug, 14.2% for alcohol, and 9.1% for opioids. Differences in the extent and risk-levels of substance use by sex, race/ethnicity, and age group were observed. Adjusted logistic regression showed that male sex, white race, not being married, and having less education were associated with increased odds

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Authors' contributions

William S. John and Li-Tzy Wu contributed the study design and analysis. William S. John conducted the literature review and drafted the manuscripts. He Zhu conducted data analyses under the supervision and guidance of Li-Tzy Wu. All authors contributed to revisions and interpretations of the findings that resulted in the final manuscript.

Disclosure statement

Li-Tzy Wu also has received research funding from Patient-Centered Outcomes Research Institute and Alkermes Inc. William John also has received research funding from Patient-Centered Outcomes Research Institute. The other authors have no conflicts of interest to disclose.

Supplemental data for this article is available online at <https://doi.org/10.1080/08897077.2021.1901176>.

of moderate/high-risk use scores for each substance category; older ages (versus ages 18–25years) were associated with increased odds of moderate/high-risk opioid use.

Conclusions: Intervention need for problematic substance use was prevalent in this sample. Providers should maintain awareness and screen for problematic substance use more consistently in identified high risk populations.

Keywords

Primary care; ASSIST; substance abuse; tobacco; alcohol; drugs; opioids

Introduction

Primary care settings provide salient opportunities for identifying patients with problematic substance use and addressing unmet treatment need.^{1–9} Trained primary care providers can also provide treatment using FDA-approved pharmacotherapies for tobacco, alcohol, and opioid use disorder. Moreover, research shows that patients report a greater willingness to enter addiction treatment in a primary care setting than a specialty drug treatment center.¹⁰ However, despite this potential, screening for problematic substance use rarely occurs in primary care settings due to various provider- or organizational-level barriers thereby resulting in a significant number of missed intervention opportunities.^{11–13}

To support efforts toward integrating screening and intervention for problematic substance use into primary care, it is important to provide information on the extent, patterns, and risk-levels of recent and active problematic substance use among primary care patients. The Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) is a valid and reliable screening instrument affording such information.^{14,15} The ASSIST measures the level of recent/active substance use and provides an indication of the level of intervention needed based on a substance use-risk score. This information has implications for not only identifying those in need of intervention for an active SUD but also those who may be at an earlier point prior to developing SUD where intervention is needed to prevent manifestation of more severe problems. Therefore, examining the extent of ASSIST substance use-risk scores among primary care patients across key demographic groups is important for informing clinical need and strategies to improve primary care-based screening and interventions. Most previous research examining the prevalence and correlates of substance use in primary care, however, does not incorporate subgroup analysis or information on sub-threshold SUD.^{16,17}

The goal of the present study was to address these gaps in the literature and assess the prevalence and correlates of ASSIST substance use scores by key demographic subgroups among a large sample of primary care patients, drawn from heterogeneous clinics in the United States. This sample was originally obtained for a study supported by the National Drug Abuse Treatment Clinical Trials Network: the Tobacco, Alcohol, Prescription Medication, and Other Substance Use Tool (CTN-0059: TAPS Tool).¹⁸ There is limited availability of other large-scale surveys of substance use specific to primary care settings, which highlight the value of this sample for informing primary care-based efforts at addressing substance misuse. Together, this information is important for not only providing

an indication of clinical need but also to reveal the subgroups of patients who may need increased surveillance to prevent problematic substance use and associated consequences.

Methods

Study sample

The TAPS tool study sample was composed of a convenience sample across multiple states of 2,000 adult primary care patients aged 18 or older. Methodological details of the parent study have been reported previously.¹⁹ Participants were recruited across five primary care clinics located in the eastern region of the United States from August 2014 to April 2015. The sites included a Federal Qualified Health Center in Baltimore, MD ($n = 589$), a public hospital-based clinic in New York, NY ($n = 534$), a university-based health center in Richmond, VA ($n = 211$), and two nonacademic community-based practices in Kannapolis, NC ($n = 287$ and $n = 379$). Patients were eligible for the study if they were 18 years or older, able to provide informed consent, able to comprehend spoken English, and physically able to complete the screening and assessment measures. Participants received \$20 for the completion of study assessments. This use of the TAPS Tool data for this analysis was approved by the Duke University Health System Institutional Review Board.

Measures

The ASSIST 3.0¹⁴ consists of eight questions regarding the use of tobacco, alcohol, cannabis, cocaine, amphetamine-type stimulants, inhalants, hallucinogens, or nonmedical use of sedatives, opioids, and other drugs. Questions were interviewer-administered for this study. Those who endorsed any use of a substance class in the first question were then asked subsequent questions for that substance class. Questions 2 through 5 referred to the past 3-month period (recent or active use) for each substance class and included questions on the frequency of use, cravings, problems associated with use, and failure to fulfill normal role expectations. Questions 6 and 7 assessed whether others have expressed concern ever or in the past 3-months over use of the substance and the inability to control or stop using. The eighth question inquired about injection drug use but was unscored. The substance-specific score was obtained by adding the item scaling weights on items 2 through 7.¹⁴ Substance-specific use scores (except for alcohol) were divided into low-risk use (0–3), moderate-risk use (4–26), and high-risk use (> 27). Alcohol use scores of 0–10 constituted low-risk use, 11–26 moderate-risk use, and > 27 high-risk use. Sociodemographic variables included self-reported age, sex, race/ethnicity, education, marital status, and employment status.

Data analysis

Descriptive statistics were used to examine prevalence of substance use (i.e., any use; past 3-month use) and ASSIST risk scores (i.e., low-risk and moderate/high-risk use) among the total sample and by key demographic groups (i.e., sex, race/ethnicity, and age). Moderate- and high-risk use were combined into one category based on the relatively low prevalence of high-risk use and to distinguish between patients who needed any intervention versus none based on World Health Organization recommendations.²⁰ Substance categories included tobacco, alcohol, any illicit/nonmedical drug, and a separate

category for opioids alone. Adjusted multinomial logistic regression models were used to estimate demographic correlates of substance use risk scores, using no substance use as the reference group. Models were controlled for sociodemographic characteristics as well as study site. Sensitivity analyses were performed by separating the drug category into licit (Rx) and illicit drug groups. All analyses were conducted with Stata 15.0.²¹

Results

Overall sample characteristics

Among the total sample ($n = 2,000$), the mean (SD) age was 46.0 (14.7) years and over half of the sample were females (56.2%) and Black/African-American (55.6%). A third of the sample was white (33.4%), 11.7% were Hispanic, and 6.6% were of other/unknown race.

Prevalence of ASSIST-defined risk groups by sex, age, and race/ethnicity (Table 1)

The prevalence of any past 3-month use among the total sample ($n = 2,000$) was highest for alcohol (53.9%), followed by tobacco (42.0%), any illicit/Rx drug (24.2%), and opioids (5.3%). The prevalence of moderate/high-risk use ASSIST scores were highest for tobacco (45.1%), followed by drugs (29.0%), alcohol (14.2%), and opioids (9.1%). The prevalence of past 3-month drug use for licit (Rx) and illicit categories was 7.2% and 21.3%, respectively; the prevalence of moderate/high-risk use scores was 10.7% for licit (Rx) drug use and 25.9% for illicit drug use (Table S1).

A higher proportion of males than females had any past 3-month use or moderate/high-risk use scores for each substance category. A slightly higher proportion of whites than Blacks/African-Americans had moderate/high-risk use scores for tobacco and alcohol. However, a greater proportion of Blacks/African-Americans had moderate/high-risk use scores for drugs compared to whites (32.6% versus 23.9%). The prevalence of moderate/high-risk opioid use was also slightly lower among whites (7.3%) relative to Blacks/African-Americans (10.2%) or Hispanics (10.3%).

Adults aged 35–49 years had the highest prevalence of moderate/high-risk use scores for tobacco (48.1%) and opioids (11.4%). Past 3-month prevalence of alcohol use was highest among ages 18–25 (63.6%) and 26–34 (67.1%) years; however, more than twice as many adults aged 26–34 had moderate/high-risk use for alcohol than those aged 18–25 (16.9% versus 8.4%). Approximately one-third of adults aged 18–25 (32.9%) and 26–34 (33.9%) reported past 3-month illicit/Rx drug use compared to 19.3% of adults 50 and older; however, the prevalence of moderate/high-risk use scores for illicit/Rx drugs was similar across all ages.

Correlates of ASSIST-defined risk groups (Table 2)

Across all substance use categories, males (versus females) had increased odds of low-risk or moderate/high-risk use ASSIST scores (vs. no use). Ages 35–49 years (versus 18–25 years) were associated with increased odds of moderate/high-risk use of tobacco and opioids; ages 50+ years (versus 18–25 years) were associated with decreased odds of moderate/high-risk use of any drug but increased odds of moderate/high-risk opioid use.

Older ages were also associated with decreased odds of moderate/high risk use of any illicit drug (Table S2). Black/African-American and other race (versus white) were associated with decreased odds of low-risk or moderate/high-risk use scores for all substance categories. Having more education (versus less than high school) was associated with decreased odds of moderate/high-risk use of all substance categories. Having some college education or more was associated with increased odds of low-risk alcohol use. Having never married was associated with increased odds of moderate/high-risk use of all sub-stance categories. Furthermore, participants from the study site in Maryland (versus New York) had increased odds of low- or moderate/high-risk use of all substance categories.

Discussion

Results from this study of a large sample of primary care patients showed that recent/active problematic substance use was prevalent, which further supports the relevance of integrating screening and intervention for substance abuse into primary care. Our findings are in line with other studies suggesting the relatively high prevalence of problematic sub-stance use in primary care settings compared to the national average.^{16,17} This may be in part a reflection of the high prevalence of comorbid conditions (e.g., chronic pain, hypertension, diabetes) among patients with problematic substance use,²² for which primary care treatment is routinely sought. The present study, however, extended prior research to indicate the prevalence and correlates of recent/active problematic substance use that may be at a sub-threshold level of substance use disorder. Thus, these findings not only inform the need for interventions to address active problematic use but also the need for early intervention approaches to prevent the development of further problems.

A key feature of this study also extending prior research was the examination of ASSIST-defined risk scores among primary care patients by demographic subgroups. Particularly pronounced sex differences were found, with more than twice as many males than females having moderate/high-risk use of alcohol and illicit/Rx drugs. Also, primary care patients in this sample who were white, less educated, or not married were more likely to have moderate/high-risk use scores for tobacco, alcohol, illicit/Rx drugs, and opioids. It was found that older adults had increased odds of having moderate/high-risk use of opioids, which may reflect the relatively higher prevalence of chronic pain among older adults,²³ for which opioids may have been misused. These findings suggest that increased monitoring may be warranted among these patient subgroups to maximize the capacity of primary care-based prevention or early intervention efforts for substance misuse.

Limitations

Findings should be interpreted within the context of the study's limitations. First, our findings should be considered within the context of changing national trends in substance use since the time data were collected for this analysis (i.e., 2014–2015). Nonetheless, information provided by this study are critical to informing primary care-based strategies when current national surveys of substance use are not specific to primary care settings. Second, substance use data were based on self-report, which may have been subject to recall or social desirability bias. Third, our results may have been subject to selection bias due

to potentially more frequent primary care use among patients with substance use problems. Fourth, while our sample was drawn from a diverse set of clinics across multiple states, findings may not be generalizable to all primary care settings or regions of the country. Finally, problematic substance use and the indication of intervention need were based on WHO-defined cut off scores for the ASSIST, which may not be necessarily congruent across all demographic subgroups.^{15,24} Thus, it is possible that some results related to substance use risk-level were biased toward underestimation.

Conclusions

This study showed that recent/active problematic substance use was present in a substantial proportion of a large sample of primary care patients. Demographic disparities in problematic substance use were also revealed in which moderate/high-risk use was more prevalent among males, whites, or those with less education or not married. This information serves to not only support the need for integrating screening and intervention for substance misuse into primary care, but may also inform strategies at improving the efficacy of such efforts.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

The authors thank the CTN-0059 study team and all study participants for their time and contributions.

Funding

This study was made possible by the U.S. National Institutes of Health [Grant nos. UG1DA040317, UG1DA013034, UG1DA013035, U10DA013727, and R01MD007658]. The secondary data analysis and preparation of this manuscript was supported primarily by the National Institute on Drug Abuse [Grant no. UG1DA040317]. The sponsoring agency had no further role in the study design and analysis, the writing of the report, or the decision to submit the paper for publication. National Institute on Minority Health and Health Disparities.

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Table 1. Prevalence of past 3-month substance use and level of risk based on the ASSIST scores by sex, race/ethnicity, and age group ($n = 2,000$).

	Sample size Total <i>N</i>	ASSIST score category			
		No use Row % (95% CI)	Low-risk use ^a Row % (95% CI)	Moderate/high-risk use ^b Row % (95% CI)	Past 3-month use Row % (95% CI)
Tobacco					
Overall	2,000	26.3 (24.4–28.3)	28.6 (26.7–30.7)	45.1 (42.9–47.2)	42.0 (39.9–44.2)
Sex					
Males	874	18.5 (16.1–21.2)	25.5 (22.7–28.5)	55.9 (52.6–59.2)	52.9 (49.5–56.2)
Females	1,124	32.4 (29.7–35.2)	31.1 (28.5–33.9)	36.5 (33.7–39.3)	33.5 (30.8–36.4)
Race/ethnicity					
White, non-Hispanic	577	21.1 (18.0–24.7)	30.7 (27.1–34.6)	48.2 (44.1–52.3)	42.8 (38.8–46.9)
Black/African American, non-Hispanic	1,058	26.0 (23.4–28.7)	27.0 (24.4–29.8)	47.0 (44.0–50.0)	44.1 (41.2–47.1)
Hispanic	233	30.9 (25.3–37.1)	30.9 (25.3–37.1)	38.2 (32.2–44.6)	37.8 (31.8–44.1)
Other/unknown	132	43.2 (35.0–51.7)	28.8 (21.8–37.0)	28.0 (21.1–36.2)	28.8 (21.8–37.0)
Age in years					
18–25	225	35.1 (29.2–41.6)	28.4 (22.9–34.7)	36.4 (30.4–42.9)	42.2 (36.0–48.8)
26–34	301	27.6 (22.8–32.9)	31.2 (26.3–36.7)	41.2 (35.8–46.8)	42.9 (37.4–48.5)
35–49	528	24.4 (21.0–28.3)	27.5 (23.8–31.4)	48.1 (43.9–52.4)	44.9 (40.7–49.2)
50+	946	24.8 (22.2–27.7)	28.5 (25.8–31.5)	46.6 (43.5–49.8)	40.1 (37.0–43.2)
Alcohol					
Overall	2,000	10.3 (9.1–11.8)	75.5 (73.6–77.3)	14.1 (12.7–15.7)	53.9 (51.7–56.1)
Sex					
Males	874	6.4 (5.0–8.2)	72.4 (69.4–75.3)	21.2 (18.6–24.0)	59.6 (56.3–62.8)
Females	1,124	13.4 (11.6–15.6)	77.8 (75.3–80.2)	8.7 (7.2–10.5)	49.4 (46.5–52.3)
Race/ethnicity					
White, non-Hispanic	577	5.9 (4.2–8.1)	79.5 (76.1–82.6)	14.6 (11.9–17.7)	58.2 (54.2–62.2)
Black, non-Hispanic	1,058	11.1 (9.3–13.1)	74.5 (71.8–77.0)	14.5 (12.5–16.7)	51.6 (48.6–54.6)
Hispanic	233	11.6 (8.1–16.3)	74.7 (68.7–79.8)	13.7 (9.9–18.7)	56.2 (49.8–62.4)
Other/unknown	132	22.0 (15.8–29.8)	67.4 (59.0–74.8)	10.6 (6.4–17.0)	49.2 (40.9–57.7)

	Sample size Total N	ASSIST score category			
		No use Row % (95% CI)	Low-risk use ^d Row % (95% CI)	Moderate/high-risk use ^e Row % (95% CI)	Past 3-month use Row % (95% CI)
Age in years					
18–25	225	8.9 (5.8–13.3)	82.7 (77.2–87.1)	8.4 (5.5–12.8)	63.6 (57.1–69.6)
26–34	301	5.3 (3.3–8.5)	77.7 (72.7–82.1)	16.9 (13.1–21.6)	67.1 (61.6–72.2)
35–49	528	9.7 (7.4–12.5)	76.3 (72.5–79.8)	14.0 (11.3–17.2)	57.8 (53.5–61.9)
50+	946	12.7 (10.7–15.0)	72.6 (69.7–75.4)	14.7 (12.6–17.1)	45.2 (42.1–48.4)
Drugs ^c					
Overall	2,000	33.5 (31.4–35.5)	37.6 (35.5–39.7)	28.9 (27.0–31.0)	24.2 (22.4–26.1)
Sex					
Males	874	20.0 (17.5–22.8)	39.5 (36.3–42.8)	40.5 (37.3–43.8)	33.5 (30.5–36.7)
Females	1,124	44.0 (41.1–46.9)	36.1 (33.4–39.0)	19.9 (17.7–22.4)	16.9 (14.8–19.2)
Race/ethnicity					
White, non-Hispanic	577	31.7 (28.1–35.6)	44.4 (40.4–48.4)	23.9 (20.6–27.6)	21.5 (18.3–25.0)
Black, non-Hispanic	1,058	30.9 (28.2–33.8)	36.5 (33.6–39.4)	32.6 (29.9–35.5)	25.4 (22.9–28.1)
Hispanic	233	40.3 (34.3–46.7)	30.5 (24.9–36.7)	29.2 (23.7–35.3)	26.6 (21.3–32.6)
Other/unknown	132	49.2 (40.9–57.7)	29.5 (22.4–37.8)	21.2 (15.1–28.9)	22.0 (15.8–29.8)
Age in years					
18–25	225	35.1 (29.2–41.6)	36.0 (30.0–42.5)	28.9 (23.4–35.1)	32.9 (27.1–39.3)
26–34	301	31.2 (26.3–36.7)	37.2 (31.9–42.8)	31.6 (26.6–37.0)	33.9 (28.8–39.4)
35–49	528	32.2 (28.4–36.3)	39.6 (35.5–43.8)	28.2 (24.5–32.2)	23.7 (20.2–27.5)
50+	946	34.5 (31.5–37.5)	37.0 (34.0–40.1)	28.5 (25.8–31.5)	19.3 (17.0–22.0)
Opioids ^{de}					
Overall	2,000	79.7 (77.8–81.4)	11.3 (9.9–12.7)	9.0 (7.9–10.4)	5.3 (4.4–6.4)
Sex					
Males	874	71.5 (68.4–74.4)	16.1 (13.8–18.7)	12.2 (10.2–14.6)	8.0 (6.4–10.0)
Females	1,124	85.9 (83.8–87.9)	7.5 (6.1–9.2)	6.6 (5.3–8.2)	3.2 (2.3–4.4)
Race/ethnicity					
White, non-Hispanic	577	78.9 (75.3–82.0)	13.7 (11.1–16.7)	7.3 (5.4–9.7)	4.3 (3.0–6.3)
Black, non-Hispanic	1,058	79.0 (76.5–81.4)	10.8 (9.0–12.8)	10.2 (8.5–12.2)	5.4 (4.2–6.9)

	ASSIST score category				
	Sample size Total N	No use Row % (95% CI)	Low-risk use ^d Row % (95% CI)	Moderate/high-risk use ^e Row % (95% CI)	Past 3-month use Row % (95% CI)
Hispanic	233	79.4 (73.7–84.1)	10.3 (7.0–14.9)	10.3 (7.0–14.9)	7.7 (4.9–11.9)
Other/unknown	132	88.6 (82.1–93.0)	6.1 (3.1–11.5)	5.3 (2.6–10.5)	4.5 (2.1–9.6)
Age in years					
18–25	225	89.8 (85.1–93.1)	7.1 (4.4–11.2)	3.1 (1.5–6.3)	4.0 (2.1–7.4)
26–34	301	81.1 (76.3–85.1)	11.6 (8.5–15.7)	7.3 (4.9–10.8)	5.0 (3.0–8.1)
35–49	528	77.3 (73.5–80.6)	11.2 (8.8–14.1)	11.4 (8.9–14.4)	7.6 (5.6–10.2)
50+	946	78.1 (75.4–80.6)	12.2 (10.2–14.4)	9.7 (8.0–11.8)	4.4 (3.3–5.9)

CI: confidence interval.

^aLow-risk score on the ASSIST for drugs = 0–3; low-risk score for alcohol = 0–10.

^bModerate/high-risk score on the ASSIST for drugs = 4; moderate/high-risk score for alcohol = 11.

^cIncludes cannabis, cocaine, amphetamine type stimulants, inhalants, sedatives or sleeping pills, hallucinogens, opioids, and other drugs.

^dIncludes prescription opioids and heroin.

^eOne participant reported lifetime opioid use but had missing ASSIST score.

Table 2. Multinomial logistic regression of level of substance risk based on the ASSIST scores.

ASSIST score category (vs. no substance use) Adjusted odds ratio (AOR)	Tobacco (n = 1,996)			Alcohol (n = 1,996)			Drugs (n = 1,996)			Opioids (n = 1,995)		
	Low-risk use AOR (95% CI)	Moderate/high risk use AOR (95% CI)	High risk use AOR (95% CI)	Low-risk use AOR (95% CI)	Moderate/high risk use AOR (95% CI)	High risk use AOR (95% CI)	Low-risk use AOR (95% CI)	Moderate/high risk use AOR (95% CI)	High risk use AOR (95% CI)	Low-risk use AOR (95% CI)	Moderate/high risk use AOR (95% CI)	High risk use AOR (95% CI)
Sex												
Females	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Males	1.46 (1.12–1.91)	2.65 (2.07–3.40)	5.00 (3.27–7.64)	2.26 (1.58–3.22)	5.00 (3.27–7.64)	4.28 (3.28–5.59)	2.46 (1.93–3.14)	4.28 (3.28–5.59)	1.80 (1.31–2.49)	2.21 (1.63–2.99)	4.28 (3.28–5.59)	1.80 (1.31–2.49)
Age groups, years												
18–25	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
26–34	1.20 (0.76–1.89)	1.18 (0.76–1.83)	2.17 (0.88–5.34)	1.17 (0.56–2.43)	2.17 (0.88–5.34)	0.79 (0.47–1.33)	0.96 (0.61–1.50)	0.79 (0.47–1.33)	2.15 (0.89–5.19)	1.32 (0.68–2.57)	0.79 (0.47–1.33)	2.15 (0.89–5.19)
35–49	1.19 (0.77–1.84)	1.58 (1.05–2.40)	1.02 (0.46–2.26)	0.74 (0.40–1.37)	1.02 (0.46–2.26)	0.64 (0.39–1.04)	1.07 (0.71–1.62)	0.64 (0.39–1.04)	3.35 (1.42–7.89)	1.47 (0.79–2.74)	0.64 (0.39–1.04)	3.35 (1.42–7.89)
50+	1.19 (0.77–1.83)	1.38 (0.91–2.10)	0.67 (0.31–1.47)	0.54 (0.29–1.00)	0.67 (0.31–1.47)	0.49 (0.31–0.80)	0.95 (0.62–1.44)	0.49 (0.31–0.80)	2.42 (1.03–5.67)	1.50 (0.80–2.81)	0.49 (0.31–0.80)	2.42 (1.03–5.67)
Race/Ethnicity												
White, non-Hispanic	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Black/African American, non-Hispanic	0.65 (0.48–0.89)	0.57 (0.43–0.76)	0.34 (0.21–0.57)	0.45 (0.30–0.68)	0.34 (0.21–0.57)	0.81 (0.59–1.12)	0.70 (0.54–0.91)	0.81 (0.59–1.12)	0.64 (0.42–0.96)	0.60 (0.43–0.83)	0.81 (0.59–1.12)	0.64 (0.42–0.96)
Hispanic	0.74 (0.48–1.16)	0.51 (0.34–0.77)	0.33 (0.16–0.68)	0.50 (0.28–0.89)	0.33 (0.16–0.68)	0.63 (0.40–0.99)	0.57 (0.38–0.86)	0.63 (0.40–0.99)	0.92 (0.51–1.65)	0.62 (0.36–1.08)	0.63 (0.40–0.99)	0.92 (0.51–1.65)
Other/unknown	0.44 (0.27–0.71)	0.25 (0.15–0.41)	0.13 (0.06–0.28)	0.19 (0.11–0.34)	0.13 (0.06–0.28)	0.33 (0.18–0.57)	0.37 (0.23–0.58)	0.33 (0.18–0.57)	0.42 (0.18–0.98)	0.30 (0.14–0.67)	0.33 (0.18–0.57)	0.42 (0.18–0.98)
Education												
Less than high school	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
High school/GED	1.00 (0.67–1.48)	0.73 (0.52–1.03)	0.55 (0.33–0.91)	1.10 (0.73–1.66)	0.55 (0.33–0.91)	0.89 (0.64–1.25)	1.36 (0.98–1.89)	0.89 (0.64–1.25)	0.85 (0.57–1.28)	1.31 (0.84–2.06)	0.89 (0.64–1.25)	0.85 (0.57–1.28)
Some college/associate, bachelor, or graduate degree	0.98 (0.68–1.39)	0.45 (0.33–0.62)	0.80 (0.49–1.30)	1.65 (1.10–2.48)	0.80 (0.49–1.30)	0.60 (0.43–0.82)	1.18 (0.88–1.60)	0.60 (0.43–0.82)	0.33 (0.21–0.52)	1.23 (0.80–1.88)	0.60 (0.43–0.82)	0.33 (0.21–0.52)
Marital Status												
Married/cohabited	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

ASSIST score category (vs. no substance use) Adjusted odds ratio (AOR)	Tobacco (n = 1,996)			Alcohol (n = 1,996)			Drugs (n = 1,996)			Opioids (n = 1,995)		
	Low-risk use AOR (95% CI)	Moderate/high risk use AOR (95% CI)	Low-risk use AOR (95% CI)	Moderate/high risk use AOR (95% CI)	Low-risk use AOR (95% CI)	Moderate/high risk use AOR (95% CI)	Low-risk use AOR (95% CI)	Moderate/high risk use AOR (95% CI)	Low-risk use AOR (95% CI)	Moderate/high risk use AOR (95% CI)	Low-risk use AOR (95% CI)	Moderate/high risk use AOR (95% CI)
Separated/divorced/ widowed	1.17 (0.84– 1.62)	1.55 (1.13–2.13)	1.29 (0.87– 1.92)	1.49 (0.87–2.53)	0.93 (0.69– 1.24)	1.23 (0.87–1.74)	1.06 (0.69– 1.61)	1.84 (1.09–3.10)	0.94 (0.69– 1.28)	1.55 (1.16–2.08)	1.20 (0.80– 1.79)	1.72 (1.03–2.86)
Never married	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Study site (state)												
New York	1.46 (1.01– 2.10)	1.94 (1.38–2.71)	2.29 (1.39– 3.77)	1.89 (1.07–3.35)	2.10 (1.48– 2.98)	2.63 (1.84–3.77)	1.68 (1.13– 2.49)	2.95 (1.95–4.46)	1.38 (0.86– 2.20)	1.34 (0.86–2.07)	1.01 (0.64–1.59)	0.73 (0.39–1.37)
Maryland	1.09 (0.76– 1.57)	1.24 (0.88–1.74)	0.95 (0.61– 1.46)	0.49 (0.27–0.88)	1.02 (0.74– 1.42)	0.36 (0.24–0.53)	0.47 (0.29– 0.75)	0.28 (0.15–0.55)	1.09 (0.76–1.57)	1.24 (0.88–1.74)	0.95 (0.61–1.46)	0.28 (0.15–0.55)
Virginia												
North Carolina												

AOR: adjusted odds ratio; CI: confidence interval.

Cases with missing demographic or substance use information were excluded from the models. Bold values estimate significantly different from reference group ($p < 0.05$).