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The Three-Year Course of Multiple Substance Use Disorders in the United States: A National Longitudinal Study

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Abstract

Objectives—This study examined the three-year course of multiple co-occurring substance use disorders (SUDs) based on longitudinal survey data from a large, nationally representative sample.

Methods—National estimates of the prevalence of DSM-IV SUDs were derived by analyzing data from structured, face-to-face diagnostic interviews as part of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), which collected data from a large nationally representative sample of non-institutionalized U.S. adults at two waves (2001–2002 and 2004–2005; n = 34,653).

Results—U.S. adults with multiple past-year SUDs at Wave 1 were more likely than those with an individual past-year SUD at Wave 1 to report at least one past-year SUD at Wave 2. There were several sociodemographic characteristics and psychiatric disorders (i.e., male, younger age, never married, sexual minority identity, nicotine dependence, and anxiety, mood and personality disorders) associated with increased odds of developing multiple SUDs and having three-year persistence of multiple SUDs. The majority of adults with multiple past-year SUDs had a lifetime personality disorder and did not utilize substance abuse treatment or other help-seeking.

Conclusions—Multiple SUDs are associated with a more persistent three-year course of disease over time relative to individual-SUDs. Despite a more severe three-year course and higher rates of comorbidity with other psychiatric disorders, the majority of U.S. adults with multiple SUDs do not utilize substance abuse treatment or other help-seeking. Clinical assessments and the substance

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Study concept and design: Dr. Sean Esteban McCabe

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Additional information: The original data set for the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) is available from the National Institute on Alcohol Abuse and Alcoholism (http://www.niaaa.nih.gov).

abuse literature tend to focus on drug-specific individual SUDs rather than considering multiple SUDs, which are more complex in nature.

Keywords

Substance use disorder; polysubstance; drug; epidemiology; longitudinal; DSM-IV

Introduction

Recent epidemiological studies have documented high rates of polysubstance use behaviors in several countries worldwide.[1–7] Historically, large-scale epidemiological studies have found substantial comorbidity between substance use disorders (SUDs) and other psychiatric disorders in the U.S.[8–21] A few of these studies examined the prevalence of multiple co-occurring SUDs involving non-alcohol drug use disorders and other SUDs.[8–10,17] Indeed, some experts have encouraged future practice and research to move beyond binary measures of substance-specific use to polysubstance use profiles that incorporate measures of severity and multiple SUDs.[3,22,23]

There have been some important recent diagnostic changes in the most recent edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM–5). Prior to the DSM-5, “polysubstance dependence” was diagnosed by the use of three or more substances (excluding caffeine and nicotine) with no single substance dominating. In the DSM-5, the diagnosis of “polysubstance dependence” has been removed and there is no diagnosis involving multiple SUDs, despite the high rates of polysubstance use behaviors. Prior work has not investigated whether multiple SUDs are more persistent than individual SUDs over time. In order to fill these important gaps in knowledge, the objective of the present study was to examine the prevalence and three-year course associated with multiple SUDs based on a large nationally representative sample of noninstitutionalized U.S. adults, which was surveyed in 2001–2002 and had a longitudinal follow-up in 2004–2005.

Methods

Design and sample

Data collected from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) across two waves (2001–2002, or Wave 1, and 2004–2005, or Wave 2) were used as the primary sources of information regarding SUDs among the general adult population in the United States. Waves 1 and 2 of the NESARC included the NIAAA Alcohol Use Disorder and Associated Disabilities Interview Schedule (AUDADIS-IV), a fully structured diagnostic interview conducted in households. The sample for NESARC Wave 1 was representative of the civilian noninstitutionalized U.S. population, aged 18 and older. More details about the NESARC sample design and data collection methods for both Waves 1 and 2 are available elsewhere.[24,25] The United States Census Bureau and the United States Office of Budget and Management approved the NESARC research protocol. The University of Michigan Institutional Review Board approved the current study.

The overall response rate for Wave 1 of the NESARC was 81%; the household response rate was 89%, and the person response rate was 93%, with a final sample size of n = 43,093. The response rate among those eligible for Wave 2 was 86.7%, resulting in a cumulative response rate of 70.2% (the product of the response rates from Waves 1 and 2). The Wave 1 NESARC sample consisted of 43,093 adults 18 years or older, and represented a population that was 52% women, 71% White, 12% Hispanic, 11% African American, 4% Asian, and 2% Native Americans or other racial category. Nonresponse at Wave 2 differed as a function of prior-to-past-year (PPY) SUDs, as recorded at Wave 1: An estimated 20.1% of individuals with no PPY SUDs would be expected to not respond at Wave 2, as opposed to 14.9% of individuals with an individual SUD, and 15.1% of individuals with multiple SUDs in their lifetime (Rao-Scott $F(2.0, 129.7) = 48.4$, $p < 0.001$). Potential biases in Wave 2 due to this nonresponse were minimized via NESARC's weight adjustment procedures.

Measures

The NESARC measures assessed sociodemographic characteristics including sex, race/ethnicity, age, marital status, educational attainment, personal annual income, sexual identity, and geographical region based on the U.S. Census (Northeast, South, Midwest and West). SUDs and other psychiatric disorders were also assessed including DSM-IV anxiety, mood, and personality disorders, and more details regarding these measures are available elsewhere.[13,26]

Substance use disorders (SUDs) were assessed at both waves of the NESARC according to the criteria of the DSM-IV using the AUDADIS-IV. Substance-specific diagnoses were determined for ten substances, including alcohol, marijuana, cocaine, heroin, hallucinogens, inhalants, prescription opioids, sedatives, stimulants, and tranquilizers. A past-year diagnosis of substance abuse required at least one positive response to four criteria defined for abuse in the 12-month period preceding the interview and the absence of a dependence diagnosis. A past-year diagnosis of substance dependence was defined as a positive response to at least 3 of the 7 dependence criteria. Nicotine dependence was also assessed and included as a covariate in our models due to the differences between the nicotine dependence measure and the other ten SUD measures which included both abuse and dependence consistent with prior work.[9–11] Reliability and validity of the DSM-IV AUDADIS-IV SUD diagnoses have been documented in numerous psychometric studies, with test-retest reliability ranging from good to excellent (0.70 to 0.91).[27–34]

Substance abuse treatment utilization or other help-seeking was assessed for all respondents who had a history of alcohol and/or other drug use. Alcohol treatment and other help-seeking included self-help (e.g., Alcoholics Anonymous); social services (e.g., family services, employee assistance program, clergy); alcohol services (e.g., alcohol/drug detoxification, inpatient ward, outpatient clinic, alcohol/drug rehabilitation program, halfway house, private physician, psychiatrist, psychologist, social worker of other professional); and emergency room or crisis center. The response scale for all items was dichotomous (yes / no). Respondents were also asked a separate series of questions related to drug treatment or other help-seeking that paralleled the questions related to alcohol.

Data Analysis

All analyses presented in this study were design-based, in that: 1) NESARC sampling weights adjusted for nonresponse and calibrated to population control totals based on the U.S. Census (either for Wave 1 or Wave 2 respondents, depending on the variables being analyzed) were used to compute weighted population estimates, and 2) the stratified multi-stage cluster sample design of the NESARC was accounted for when computing linearized estimates of sampling variance for the weighted estimates. Design-adjusted Rao-Scott tests of bivariate associations between categorical measures were used to examine population associations between a) PPY SUDs at Wave 1 and past-year SUDs at Waves 1 and 2, b) past-year SUDs at Wave 1 and past-year SUDs at Wave 2, c) past-year substance dependence at Wave 1 and past-year substance dependence at Wave 2, and d) past-year SUDs and substance abuse treatment utilization or other help-seeking at either wave. Finally, pseudo maximum likelihood estimation methods (accounting for the NESARC sample design features) were used to fit multivariate logistic regression models to various past-year SUD and help-seeking outcomes as a function of sociodemographic characteristics, prior SUDs, and the various psychiatric disorders, enabling assessment of significant correlates of these outcomes at the population level.

Results

Among individuals with any PPY SUDs at Wave 1, an estimated 73.5% (SE = 0.5%) had an individual PPY SUD and 26.5% (SE = 0.5%) had multiple PPY SUDs. The three-year course of PPY SUDs was examined based on Waves 1 and 2 (see Table 1). Among individuals without any PPY SUD at Wave 1, the vast majority of these individuals did not meet criteria for any past-year SUDs at Wave 1 (98.5%) or Wave 2 (94.7%). In contrast, past-year SUDs at Waves 1 and 2 were more prevalent among those with any PPY SUDs at Wave 1, especially those with multiple PPY SUDs.

U.S. adults with multiple past-year SUDs at Wave 1 were more likely than those with an individual past-year SUD or no past-year SUD at Wave 1 to report at least one past-year SUD at Wave 2 (see Table 2). An estimated 66.3% (SE = 3.1%) of those with multiple past-year SUDs at Wave 1 still met criteria for at least one SUD at Wave 2, as compared to 46.0% (SE = 1.3%) of those with an individual past-year SUD and only 6.9% (SE = 0.2%) of individuals with no past-year SUD ($p < 0.0001$). Similarly, individuals with multiple past-year substance dependence at Wave 1 were more likely to report past-year dependence on at least one substance at Wave 2 than those with one or no past-year substance dependence at Wave 1 (results not shown). An estimated 55.7% (SE = 6.4%) of individuals with multiple past-year substance dependence at Wave 1 still met past-year dependence criteria for at least one substance at Wave 2 as compared to 36.1% (SE = 1.7%) of individuals with an individual past-year substance dependence and only 3.5% (SE = 0.1%) of individuals with no past-year substance dependence ($p < 0.0001$).

We examined the sociodemographic characteristics associated with having various types of past-year SUDs at Waves 1 and 2 using both design-adjusted Rao-Scott tests of bivariate associations and multiple logistic regression models. Notably, an estimated 63.9% (SE = 3.3%) of individuals with multiple past-year SUDs at Wave 1 were aged 18–29 years old and

roughly half of these individuals (54.3%, SE = 3.3%) had at least one lifetime personality disorder (see Table 3). The results in Table 3 suggest that there are substantial differences in the socio-demographic profiles of individuals with and without multiple past-year SUDs. With the exception of education ($p < 0.05$), past-year SUD status has very strong associations with all other socio-demographic characteristics. In particular, those with multiple past-year SUDs tend to be younger, white, male, never married, lower income, nicotine dependent, and more prone to anxiety, mood, and personality disorders.

As illustrated in Table 4, the estimated multivariate models indicate that multiple SUDs are significantly more prevalent among males, younger individuals, divorced or never married adults, those who live in the West, those who self-identify as lesbian, gay or bisexual, nicotine-dependent adults, those with any past-year mood disorders, and especially those with any lifetime personality disorders. Individuals falling into several of these subgroups are at significantly increased risk of experiencing multiple SUDs.

Similarly, persistent multiple SUDs across the three-year period were significantly more prevalent among males, younger individuals, never married adults, those identifying as lesbian or gay, nicotine-dependent adults, those with multiple past-year anxiety disorders, those with multiple past-year mood disorders, and those with multiple lifetime personality disorders (see Table 4). Individuals falling into several of these subgroups are at increased risk of having multiple SUDs persist across a three-year period.

We found that the majority of adults with multiple SUDs did not utilize substance abuse treatment or other help-seeking in either 2001–2002 or 2004–2005. An estimated 67.6% (SE = 3.0%) of U.S. adults with multiple past-year SUDs in 2001–2002 and 72.5% (SE = 2.0%) of those with multiple past-year SUDs in 2001–2002 or 2004–2005 did not utilize substance abuse treatment or other help-seeking at either wave, respectively. We found a significant association between Wave 1 past-year SUD status and any substance abuse treatment utilization or other help-seeking behaviors at either Wave 1 or Wave 2 (Rao-Scott $p < 0.001$). Specifically, an estimated 32.4% (SE = 3.0%) of those with multiple SUDs at Wave 1 utilized substance abuse treatment or sought other help at either wave, compared to 9.7% (SE = 0.7%) of those with an individual past-year SUD. As illustrated in Table 5, we fitted a multivariate logistic regression model of treatment utilization or other help-seeking at either wave to data from those respondents with a past-year SUD at Wave 1 (n = 2,974), and found that individuals with multiple SUDs had significantly greater odds of utilizing substance abuse treatment or other help-seeking than those with an individual SUD (AOR = 3.21, 95% CI = 2.25 – 4.58).

Discussion

This study represents the first examination of the prevalence, three-year course, and correlates associated with multiple co-occurring SUDs among U.S. adults based on a nationally representative longitudinal survey. The findings of the present study revealed important distinctions related to multiple SUDs that have critical implications for diagnosis, research, and treatment. The present study found a more persistent three-year course associated with multiple SUDs as compared to individual SUDs over time. U.S. adults with

multiple SUDs at Wave 1 of the NESARC were more likely than those with individual SUDs to report subsequent SUDs at Wave 2. Indeed, the majority of U.S. adults with a past-year individual SUD at Wave 1 no longer met criteria for a past-year SUD three years later while the majority of those with multiple past-year SUDs at Wave 1 still met criteria for at least one SUD three years later. Notably, the same pattern held true for past-year dependence on multiple substances.

There were several subgroups of U.S. adults with increased odds of having multiple SUDs and persistent multiple SUDs, including males, younger adults, never married individuals, sexual minorities, those residing in the Western U.S. Census region, and those with past-year nicotine dependence, past-year anxiety disorders, past-year mood disorders, or lifetime personality disorders. Other cross-sectional national studies have found that similar subgroups of U.S. adults have increased risk of alcohol use disorders and other drug use disorders.[12–16,35] Although prior national longitudinal studies have not examined sociodemographic characteristics and other psychiatric disorders associated with persistent multiple SUDs, there is some evidence that polysubstance use is more prevalent among individuals with higher levels of psychological distress, men who have sex with men, and younger age groups including adolescents and young adults.[4,5,23,36]

We found that the majority of U.S. adults with multiple SUDs had nicotine dependence, and that persistent multiple SUDs were associated with nicotine dependence. Prior research has found evidence of a similar associations between nicotine dependence and symptomatic other drug use and speculated that this could be the result of analogous effects on the reward pathway, shared delivery mechanisms, or common genetic liability.[10] Notably, we found that the majority of U.S. adults with multiple SUDs had a lifetime personality disorder. The finding that multiple SUDs were more prevalent among adults with multiple anxiety, mood or personality disorders was consistent with previous work identifying a small subset of adults with high rates of psychiatric comorbidity.[15] In addition, several past studies have shown that sexual minorities have higher rates of SUDs relative to heterosexual-identified adults,[37,38] and this is the first national study to show that lesbian and gay adults have greater odds of multiple SUDs over time. Despite evidence suggesting major substance-related health disparities among sexual minorities, very little research has examined why such health disparities exist between sexual minority and heterosexual adults.

Prior work indicates there could be a need to distinguish individual and multiple SUDs because the adverse consequences appear to differ between polysubstance use behaviors and other types of substance use behaviors.[36,39] Despite evidence indicating high rates of polysubstance use behaviors and a more severe three-year course associated with multiple SUDs, there is no current DSM-5 diagnosis involving multiple SUDs. Taken together, these findings reinforce the notion that the substance abuse field should move beyond a binary individual drug-specific approach towards diagnosing, studying and treating individual SUDs to one that takes greater account into multiple SUDs and comorbidity with other psychiatric disorders.[3,22,23]

The findings of the present study raise some important questions about how to best conceptualize, diagnose and treat individuals with multiple co-occurring SUDs. Although

multiple SUDs had a more severe three-year course and higher degree of comorbidity with other psychiatric disorders, the majority of U.S. adults with multiple SUDs do not utilize substance abuse treatment or seek other help. Although personality disorders were significantly associated with multiple SUDs and persistent multiple SUDs, personality disorders did not predict substance abuse treatment or help seeking behaviors. Prior work found similar strong associations between persistence of drug use disorders and antisocial, borderline, or schizotypal personality disorders and noted that treating these types of comorbid disorders pose unique challenges because these individuals might be unable to recognize their disorders and/or reflect that their symptoms merit change.[11] In contrast, we found that both anxiety and mood disorders increased the probability of substance abuse treatment or other help seeking. At least two studies have found that patients with comorbid bipolar disorder and substance dependence had fewer days of substance use following integrated group therapy, which addressed the two disorders simultaneously, than group drug counseling alone.[40,41] Future research should examine whether treating multiple SUDs and comorbid psychiatric disorders simultaneously is more effective than treating each disorder individually and sequentially based on severity.

There were several strengths that are noteworthy based on the objectives of the present study. Both waves of the NESARC used similar methodology and survey wording which allowed for valid comparisons of estimates based on data collected over time, including identical criteria to assess SUDs at both waves. The large, nationally representative sample of the NESARC allowed for calculation of national prevalence estimates for sociodemographic characteristics, SUDs, other psychiatric disorders, substance abuse treatment and other help-seeking behaviors. Notably, attrition was higher among individuals with no SUDs, which is consistent with recent studies of this phenomenon.[42,43] There were also some limitations that should be taken into account while considering implications of the findings. First, the NESARC only sampled individuals aged 18 years and older and patterns of multiple SUDs may differ for adolescents. Future studies are needed that examine potential differences in the course of multiple SUDs among adolescents and adults, including those that incorporate nicotine use disorder. Second, the NESARC was limited to two waves only three years apart; future longitudinal studies are needed to examine the long-term developmental course of multiple SUDs over a more extensive time period that includes childhood and adolescence, including studies with more than two waves that would enable assessment of any causal relationships of the sociodemographic factors and other predictors with persistence of multiple SUDs. Finally, the NESARC was interviewer-administered, so caution should be exercised when comparing results from these studies and other sources of data based on different modes of data collection; the survey methodology literature suggests that our estimates may be biased low, given the ability of self-administered modes to generate more frequent reports of sensitive behaviors like drug use.[44]

In conclusion, the present study extends prior work by demonstrating a more persistent three-year course associated with multiple SUDs over time among U.S. adults. There were important differences in the three-year course of individual SUDs versus multiple SUDs. We hope that these findings will enhance the diagnosis and treatment of multiple SUDs and lead to more focused research regarding the long-term developmental course, trends, remission and relapse rates associated with multiple SUDs.

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Clinical Points

First bullet: Prior research has not investigated whether multiple co-occurring SUDs are more persistent than individual SUDs over time.

Second bullet: Health professionals should move beyond a binary drug-specific approach towards diagnosing, studying and treating SUDs to one that takes into account multiple SUDs and comorbidity with other psychiatric disorders.

Third bullet: If a patient presents with multiple SUDs, clinicians should assess for other psychiatric disorders (e.g., anxiety, mood and personality disorders) and plan treatment accordingly.

Table 1

Three-year Course of Lifetime Substance Use Disorders[a] based on NESARC Wave 1 (2001–02) and NESARC Wave 2 (2004–05)

2001–02 NESARC Wave 1 Prior-to-past-year z(PPY) (n = 43,093 Wave 1) (n = 34,653 Waves 1 & 2)	**2001–02 NESARC Wave 1 Past-year (PY) (n = 43,093)**	**2004–05 NESARC Wave 2 Past-year (PY) (n = 34,653)**
0 SUDs	0 SUDs: 98.5% (n = 30,387)	0 SUDs: 94.7% (n = 23,115)
(n = 30,797 Wave 1)	1 SUD: 1.4% (n = 383)	1 SUD: 4.7% (n = 1,077)
(n = 24,318 Waves 1 & 2)	2+ SUDs: 0.1% (n = 27)	2+ SUDs: 0.6% (n = 126)
1 SUD	0 SUDs: 77.4% (n = 7,016)	0 SUDs: 81.2% (n = 6,205)
(n = 9,061 Wave 1)	1 SUD: 22.0% (n = 1,989)	1 SUD: 17.1% (n = 1,286)
(n = 7,607 Waves 1 & 2)	2+ SUDs: 0.6% (n = 56)	2+ SUDs: 1.7% (n = 116)
2+ SUDs	0 SUDs: 62.2% (n = 2,011)	0 SUDs: 67.1% (n = 1,853)
(n = 3,235 Wave 1)	1 SUD: 25.9% (n = 845)	1 SUD: 25.1% (n = 664)
(n = 2,728 Waves 1 & 2)	2+ SUDs: 11.9% (n = 379)	2+ SUDs: 7.8% (n = 211)

[a]All estimates are weighted. Design-adjusted Rao-Scott tests of the association between Wave 1 PPY disorder and PY disorder status at each wave were significant at the $p < 0.0001$ level, suggesting substantial differences in the distribution of PY disorder status as a function of PPY disorder status at Wave 1.

Abbreviations: NESARC = National Epidemiologic Survey on Alcohol and Related Conditions; PPY = Prior-to-past-year; PY = Past-year; SUD = Substance Use Disorder

Table 2

Three-year Course of Past-Year Substance Use Disorders and Comorbid Substance Use Disorders[a] based on NESARC Wave 1 (2001–02) and NESARC Wave 2 (2004–05)

2001–02 NESARC Wave 1 Past-year (n = 34,653)	2004–05 NESARC Wave 2 Past-year (n = 34,653)
0 SUDs (n = 31,678)	0 SUDs: 93.1% (n = 29,601) 1 SUD: 6.1% (n = 1,873) 2+ SUDs: 0.8% (n = 204)
1 SUD (n = 2,620)	0 SUDs: 54.0% (n = 1,446) 1 SUD: 40.1% (n = 1,026) 2+ SUDs: 5.9% (n = 148)
2+ SUDs (n = 355)	0 SUDs: 33.7% (n = 126) 1 SUD: 38.7% (n = 128) 2+ SUDs: 27.6% (n = 101)

[a]All estimates are weighted. Design-adjusted Rao-Scott test of the association between Wave 1 PY disorder status and Wave 2 PY disorder status was significant at the $p < 0.0001$ level, suggesting substantial differences in the distribution of Wave 2 PY disorder status as a function of PY disorder status at Wave 1.

Abbreviations: NESARC = National Epidemiologic Survey on Alcohol and Related Conditions; SUD = Substance Use Disorder.

Table 3

Estimated Distributions of Sociodemographic Characteristics and Other Psychiatric Disorders as a Function of Past-Year Substance Use Disorder Status (NESARC Wave 1) (Wave 1 measures; case base = respondents at both Waves 1 and 2[a])

Sociodemographic and Psychiatric Variables[a]	No Past-Year SUDs (n = 31,678) % (SE)	1 Past-Year SUD (n = 2,620) % (SE)	2+ Past-Year SUDs (n = 355) % (SE)	Design-Adjusted Rao-Scott Test of Association
Sex				
Female	54.2% (0.4%)	31.2% (1.1%)	28.0% (2.8%)	F(2,129.8) = 214.5, p < 0.0001
Male	45.8% (0.4%)	68.9% (1.1%)	72.0% (2.8%)	
Race/Ethnicity				
White	70.7% (1.6%)	74.1% (1.9%)	69.6% (3.4%)	F(6.8,439.3) = 5.4, p < 0.0001
Black	11.2% (0.7%)	9.6% (0.8%)	9.6% (1.8%)	
Native American	2.1% (0.2%)	2.5% (0.4%)	7.3% (2.0%)	
Asian	4.5% (0.6%)	2.4% (0.6%)	2.3% (1.2%)	
Hispanic	11.6% (1.2%)	11.6% (1.7%)	11.2% (2.0%)	
Age				
45 and older	49.8% (0.5%)	23.9% (1.1%)	9.1% (2.0%)	F(3.9,250.6) = 187.5, p < 0.0001
30–44	30.4% (0.4%)	36.8% (1.2%)	26.9% (2.9%)	
18–29	19.7% (0.4%)	39.4% (1.2%)	63.9% (3.3%)	
Marital Status				
Married/Partnered	64.8% (0.5%)	48.7% (1.1%)	24.8% (2.6%)	F(5.1,329.8) = 104.8, p < 0.0001
Divorced/Separated	10.1% (0.2%)	13.9% (0.8%)	12.8% (2.0%)	
Widowed	6.5% (0.2%)	1.7% (0.3%)	2.0% (1.2%)	
Never married	18.6% (0.5%)	35.7% (1.2%)	60.4% (3.1%)	
Education				
Some college	56.2% (0.6%)	58.7% (1.3%)	47.6% (3.4%)	F(3.9,253.3) = 3.4, p = 0.0104
High school / GED	29.0% (0.6%)	28.9% (1.2%)	33.2% (3.2%)	
Less than high school	14.8% (0.5%)	12.5% (1.0%)	19.2% (2.9%)	
Personal Income				
$70,000 or more	8.5% (0.4%)	8.6% (0.7%)	2.1% (0.8%)	F(5.8,377.9) = 12.5, p < 0.0001
$35,000–69,999	22.4% (0.4%)	25.3% (1.1%)	11.0% (1.9%)	
$20,000–34,999	22.6% (0.4%)	25.6% (1.2%)	22.5% (2.8%)	
$19,999 of less	46.5% (0.6%)	40.5% (1.3%)	64.5% (3.2%)	
Geographical region				
South	35.8% (3.2%)	30.7% (3.0%)	23.9% (3.6%)	F(5.3,344.8) = 6.3, p < 0.0001
Northeast	19.8% (3.4%)	18.2% (3.0%)	20.2% (4.3%)	
Midwest	22.6% (3.1%)	28.6% (3.2%)	26.6% (4.1%)	
West	21.8% (3.4%)	22.5% (3.3%)	29.3% (4.3%)	

Sociodemographic and Psychiatric Variables[a]	No Past-Year SUDs (n = 31,678) % (SE)	1 Past-Year SUD (n = 2,620) % (SE)	2+ Past-Year SUDs (n = 355) % (SE)	Design-Adjusted Rao-Scott Test of Association
Sexual Identity[a]				
Heterosexual	97.4% (0.2%)	96.2% (0.5%)	92.5% (1.7%)	F(5.8,379.0) = 11.7, p < 0.0001
Lesbian/Gay	0.7% (<0.1%)	1.5% (0.3%)	4.4% (1.5%)	
Bisexual	0.5% (<0.1%)	1.3% (0.3%)	1.9% (0.9%)	
Not sure/unknown	1.3% (0.1%)	0.9% (0.3%)	1.2% (0.7%)	
Past-year Nicotine Dependence				
No	89.8% (0.4%)	69.0% (1.3%)	39.6% (3.4%)	F(2,129.8) = 475.3, p < 0.0001
Yes	10.2% (0.4%)	31.0% (1.3%)	60.4% (3.4%)	
Past-year Anxiety Disorders				
None	89.6% (0.3%)	83.1% (0.9%)	69.3% (3.2%)	F(3.9,251.7) = 49.1, p < 0.0001
1	8.3% (0.3%)	13.2% (0.8%)	18.8% (2.9%)	
2+	2.1% (0.1%)	3.6% (0.4%)	12.0% (2.0%)	
Past-year Mood Disorders				
None	91.8% (0.2%)	82.4% (0.8%)	60.5% (3.3%)	F(4,257.2) = 127.0, p < 0.0001
1	6.3% (0.2%)	13.0% (0.8%)	23.0% (2.7%)	
2+	1.9% (0.1%)	4.7% (0.5%)	16.5% (2.4%)	
Lifetime Personality Disorders				
None	86.6% (0.3%)	73.0% (1.1%)	45.7% (3.3%)	F(3.8,248.1) = 149.8, p < 0.0001
1	8.9% (0.2%)	15.9% (0.9%)	25.1% (3.1%)	
2+	4.4% (0.2%)	11.2% (0.7%)	29.3% (3.3%)	

[a]All socio-demographic characteristics and other psychiatric disorders are based on W1 with the exception of sexual identity, which is based on W2. This is the reason that the case base was defined by respondents at both W1 and W2.

Abbreviations: NESARC = National Epidemiologic Survey on Alcohol and Related Conditions; SUD = Substance Use Disorder.

Table 4

Adjusted Odds Ratios and 95% CIs in Logistic Regression Models Predicting Four Wave-Specific Indicators of Substance Use Disorder Status

Sociodemographic and Psychiatric Variables[a]	Model 1[b] No PY Substance Use Disorders (W1)	Model 2 One PY Substance Use Disorder (W1)	Model 3 Multiple PY Substance Use Disorders (W1)	Model 4 Multiple PY Substance Use Disorders (W2)
Sex				
Male	0.37 (0.33–0.41)***	2.46 (2.20–2.75)***	3.36 (2.48–4.55)***	2.60 (1.96–3.45)***
Race/Ethnicity				
Black	1.19 (1.04–1.37)*	0.84 (0.72–0.97)*	1.02 (0.68–1.54)	0.96 (0.69–1.33)
Native American	0.83 (0.59–1.18)	0.96 (0.66–1.39)	2.62 (1.27–5.37)*	0.79 (0.39–1.62)
Asian	2.07 (1.38–3.10)**	0.50 (0.31–0.79)**	0.53 (0.16–1.73)	0.51 (0.22–1.16)
Hispanic	1.09 (0.88–1.34)	0.94 (0.75–1.18)	0.81 (0.51–1.29)	0.61 (0.43–0.85)**
Age				
30–44	0.44 (0.39–0.51)***	2.15 (1.87–2.47)***	3.84 (2.34–6.28)***	2.45 (1.69–3.56)***
18–29	0.27 (0.23–0.31)***	3.27 (2.81–3.81)***	7.83 (4.75–12.91)***	4.69 (3.17–6.93)***
Marital Status				
Divorced/Separated	0.53 (0.46–0.61)***	1.82 (1.57–2.10)***	2.40 (1.55–3.73)***	1.90 (1.31–2.74)**
Widowed	0.95 (0.70–1.29)	0.90 (0.66–1.24)	3.73 (1.12–12.44)*	0.23 (0.06–0.85)*
Never married	0.59 (0.52–0.66)***	1.54 (1.35–1.75)***	2.68 (1.93–3.70)***	1.83 (1.39–2.41)***
Personal Income				
$35,000–69,999	1.00 (0.83–1.19)	1.01 (0.84–1.21)	1.30 (0.54–3.16)	1.31 (0.68–2.55)
$20,000–34,999	1.08 (0.89–1.30)	0.90 (0.75–1.09)	1.79 (0.77–4.13)	1.46 (0.77–2.78)
$19,999 of less	1.31 (1.08–1.59)**	0.71 (0.58–0.86)**	2.09 (0.92–4.73)	1.93 (1.03–3.60)*
Geographical Region				
Northeast	0.86 (0.72–1.05)	1.08 (0.89–1.32)	1.78 (1.15–2.74)*	1.09 (0.76–1.56)
Midwest	0.72 (0.61–0.84)***	1.36 (1.15–1.61)**	1.40 (1.00–1.97)	0.82 (0.55–1.22)
West	0.76 (0.65–0.90)**	1.20 (1.02–1.41)*	2.26 (1.52–3.34)***	1.57 (1.11–2.20)*
Sexual Identity[a]				
Lesbian/Gay	0.67 (0.43–1.05)	1.17 (0.73–1.87)	2.56 (1.30–5.01)**	4.63 (2.30–9.31)***
Bisexual	0.57 (0.35–0.92)*	1.78 (1.10–2.87)*	1.25 (0.32–4.84)	4.24 (2.14–8.41)***
Not sure/unknown	1.18 (0.72–1.94)	0.85 (0.48–1.50)	0.99 (0.32–3.01)	1.10 (0.35–3.50)
Past-Year Nicotine Dependence				
Yes	0.30 (0.26–0.33)***	2.76 (2.41–3.16)***	5.94 (4.24–8.32)***	2.66 (2.08–3.40)***
Past-Year Anxiety Disorders				

Sociodemographic and Psychiatric Variables[a]	Model 1[b] No PY Substance Use Disorders (W1)	Model 2 One PY Substance Use Disorder (W1)	Model 3 Multiple PY Substance Use Disorders (W1)	Model 4 Multiple PY Substance Use Disorders (W2)
1	0.72 (0.62–0.85) ***	1.36 (1.16–1.60) ***	1.45 (0.96–2.20)	0.99 (0.69–1.44)
2+	0.90 (0.69–1.17)	0.96 (0.72–1.29)	1.77 (1.07–2.95) *	1.33 (0.68–2.61)
Past-Year Mood Disorders				
1	0.63 (0.53–0.74) ***	1.47 (1.23–1.76) ***	1.86 (1.28–2.69) **	1.56 (1.09–2.22) *
2+	0.60 (0.47–0.77) ***	1.28 (0.96–1.72)	2.56 (1.60–4.09) ***	1.17 (0.67–2.04)
Lifetime Personality Disorders				
1	0.64 (0.55–0.75) ***	1.41 (1.20–1.66) ***	2.34 (1.60–3.42) ***	1.69 (1.21–2.34) **
2+	0.53 (0.45–0.64) ***	1.56 (1.27–1.90) ***	2.94 (1.98–4.36) ***	2.06 (1.45–2.91) ***

[a] Sociodemographic and psychiatric variables are based on W1 with the exception of sexual identity, which is based on W2. Reference categories for these variables were Female, White, 45 and older, Married / Partnered, $70,000 or more, South, Heterosexual, No, 0, 0, and 0. Sample size is n = 34,653 for all models. Education was not a significant predictor in any model.

[b] Each column represents a separate model and odds ratios were adjusted for all the sociodemographic and psychiatric variables in each column.

* $p < 0.05$,

** $p < 0.01$,

*** $p < 0.001$.

Abbreviations: CI = Confidence Interval; W1 = Wave 1; W2 = Wave 2

Table 5

Adjusted Odds Ratios in Logistic Regression Models Predicting Persistence in Substance Use Disorders across Waves (Models 5 and 6) and Substance Abuse Treatment/Help Seeking at Either Wave among Individuals with a Past-Year Substance Use Disorder at Wave 1 (Model 7)

Sociodemographic and Psychiatric Variables[a]	Model 5 Multiple PY Substance Use Disorders at W1 and W2 AOR (95% CI)[b] (n = 31,597)	Model 6 Wave 1 PPY SUD and Multiple PY SUDs at W1 and W2 AOR (95% CI)[b] (n = 31,597)	Model 7 Substance Abuse Treatment or Help Seeking at W1 or W2 AOR (95% CI)[b] (n = 2,974)
Sex			
Male	5.34 (2.90–9.86)***	5.16 (2.82–9.43)***	1.77 (1.26–2.50)**
Age			
30–44	2.96 (1.08–8.08)*	2.88 (1.06–7.84)*	1.25 (0.86–1.81)
18–29	5.62 (2.27–13.89)***	5.48 (2.19–13.73)***	0.53 (0.33–0.87)*
Marital Status			
Divorced/Separated	2.05 (0.77–5.47)	2.04 (0.76–5.47)	1.35 (0.91–2.02)
Widowed	N/A (all zeroes)	N/A (all zeroes)	1.51 (0.71–3.22)
Never married	2.28 (1.30–4.01)***	2.12 (1.20–3.76)*	1.26 (0.84–1.89)
Geographical Region			
Northeast	1.94 (0.96–3.94)	2.17 (1.06–4.42)*	1.00 (0.66–1.50)
Midwest	1.88 (0.97–3.64)	1.87 (0.95–3.67)	1.14 (0.82–1.59)
West	2.05 (1.01–4.13)*	2.19 (1.06–4.54)*	1.29 (0.86–1.93)
Sexual Identity[a]			
Lesbian/Gay	8.31 (3.22–21.46)***	8.60 (3.32–22.25)***	1.19 (0.53–2.67)
Bisexual	4.08 (0.79–20.94)	4.63 (0.92–23.28)	2.13 (0.84–5.37)
Not sure/unknown	1.98 (0.38–10.27)	2.03 (0.41–10.16)	0.41 (0.07–2.39)
Past-Year Nicotine Dependence			
Yes	4.74 (2.85–7.88)***	4.50 (2.69–7.54)***	1.39 (1.01–1.92)*
Past-Year Substance Use Disorders (W1)			
2+	N/A	N/A	3.21 (2.25–4.58)***
Past-Year Anxiety Disorders			
1	1.76 (0.92–3.37)	1.89 (0.99–3.63)	1.66 (1.11–2.49)*
2+	3.05 (1.31–7.11)*	3.57 (1.51–8.43)**	1.79 (1.07–3.00)*
Past-Year Mood Disorders			
1	1.63 (0.91–2.92)	1.49 (0.82–2.69)	1.75 (1.26–2.43)**
2+	2.90 (1.24–6.76)*	2.62 (1.06–6.48)*	2.22 (1.42–3.45)**

Sociodemographic and Psychiatric Variables[a]	Model 5 Multiple PY Substance Use Disorders at W1 and W2 AOR (95% CI)[b] (n = 31,597)	Model 6 Wave 1 PPY SUD and Multiple PY SUDs at W1 and W2 AOR (95% CI)[b] (n = 31,597)	Model 7 Substance Abuse Treatment or Help Seeking at W1 or W2 AOR (95% CI)[b] (n = 2,974)
Lifetime Personality Disorders			
1	1.94 (0.98–3.86)	1.90 (0.95–3.80)	1.03 (0.68–1.56)
2+	1.99 (1.09–3.64) *	1.74 (0.91–3.31)	1.20 (0.80–1.79)

[a] Sociodemographic and psychiatric variables are based on W1 with the exception of sexual identity, which is based on W2. Reference categories for these variables were Female, White, 45 and older, Married / Partnered, $70,000 or more, South, Heterosexual, No, 0, 0, and 0. Race/Ethnicity, Education and Personal Income were not significant predictors in any model.

[b] Each column represents a separate model and AORs were adjusted for all the sociodemographic and psychiatric variables in each column.

* $p < 0.05$,

** $p < 0.01$,

*** $p < 0.001$

Abbreviations: AOR = Adjusted Odds Ratio; CI = Confidence Interval; Ref = Reference Category; W1 = Wave 1; W2 = Wave 2; N/A = Not applicable