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Diagnostic remission of substance use disorders: Racial differences and correlates of remission in a nationally representative sample

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ABSTRACT

Introduction: Research has shown racial/ethnic minorities to have similar risk of developing substance use disorders (SUDs) as Whites. However, few studies have compared the likelihood of diagnostic remission (i.e., no longer meeting criteria for current SUDs).

Methods: Using nationally representative survey data from the National Epidemiologic Survey on Alcohol and Related Conditions-III (NESARC-III), we examined all adults with lifetime SUDs; compared the proportions experiencing diagnostic remission; and used logistic regression analyses to compare Black, Hispanic, and other racial/ethnic minorities to Whites. The research team initially used bivariate comparisons to identify potentially confounding factors also associated with remission. The study used multivariable-adjusted logistic regression analyses to adjust for these potentially confounding covariates. The team conducted separate analyses for alcohol use disorder (AUD) and drug use disorders (DUDs).

Results: Of 10,916 individuals with lifetime SUDs, 5120 no longer met criteria for an SUD in the past year (55.2% of White, 34.0% of Black, 38.5% Hispanic, and 40.1% of other individuals). In unadjusted analyses, Black, Hispanic, and others were significantly and about half as likely as Whites to have remitted with odds ratios (ORs) of 0.42 (95% CI 0.36–0.48), 0.51 (0.45–0.58), and 0.55 (0.45–0.65), respectively. The study found similar results for both AUD and DUDs. Adjusting for potentially confounding factors only modestly improved the likelihood of remission among racial/ethnic minorities compared to White individuals.

Conclusion: Minority race/ethnicity is robustly associated with reduced likelihood of diagnostic remission from SUDs even after adjusting for other factors. This study could identify only partial moderators of these disparities; these moderators deserve further study.

1. Introduction

Substance use disorders (SUDs) are among the most prevalent psychiatric conditions in the United States (Merikangas & McClair, 2012), but the vast majority of individuals do not receive professional treatment (Blanco et al., 2013; Grant et al., 2015; Grant et al., 2016). Racial/ethnic minorities may have even less access to SUD treatment than others, even though they share an equivalent or somewhat lower risk of developing these disorders (Arndt, Velez, Segre, & Clayton, 2010; Breslau et al., 2006; Grant et al., 2012; Grant et al., 2012; Schmidt, Ye, Greenfield, & Bond, 2007). Prior studies of racial disparities involving SUDs have focused on overall prevalence, treatment utilization, and

completion of treatment (Grella, Karno, Warda, Moore, & Niv, 2009; Heflinger, Chatman, & Saunders, 2006; Mennis & Stahler, 2016; Pinedo, 2019; Saloner & Le Cook, 2013), but we know less about outcomes over time, and specifically differences in diagnostic remission (i.e., no longer meeting criteria for a past-year disorder).

Studies have shown that a significant percentage of individuals with SUDs improve or achieve remission. One large review of SUD outcomes showed an average of approximately 50% of individuals in the general population who once met lifetime criteria for an SUD no longer meet those criteria (White, 2012), but the study did not address racial/ethnic differences. Other studies have shown mixed results. An examination of changes between waves 1 and 2 of the National Epidemiologic Survey on

Alcohol and Related Conditions (NESARC) found that Black men with alcohol use disorder (AUD) or a drug use disorder (DUD) demonstrated lower rates of diagnostic persistence than White men, suggesting *greater* rates of remission. The same was true for Hispanic men with DUDs (Evans, Grella, Washington, & Upchurch, 2017). Another study of waves 1 and 2 of NESARC, found rates of persistence of AUD were lower among Black individuals while rates for Hispanic individuals differed by age and country of birth (Grant, Verges, et al., 2012). While these studies suggest racial/ethnic minorities may have lower rates of SUD persistence and greater rates of remission than White individuals, several other studies have found no differences in SUD remission or persistence after controlling for sociodemographic variables. Arndt et al. (2010) and Dawson et al. (2005) examined NESARC wave 1 data and found that Black and Hispanic individuals were just as likely as White individuals to remit after adjustment for differences in demographics and social support (Arndt et al., 2010; Dawson et al., 2005). An examination of National Comorbidity Study data also found no difference in SUD persistence between Black and White individuals (Breslau, Kendler, Su, Gaxiola-Aguilar, & Kessler, 2005). Finally, a combined study of four large national surveys found that racial differences in persistence differed as a function of education levels, with minorities with less than a high school education demonstrating lower rates of remission than those with more education (Vilsaint et al., 2019).

In addition to rates of remission, some studies have focused on other risk factors for the persistence of SUDs, including male gender, childhood adversity, comorbid psychiatric conditions, lower socioeconomic status, poor social support, being single, and polysubstance use (Boschloo et al., 2012; Crum et al., 2013; Evans et al., 2017; Grant, Verges, et al., 2012; Hser, 2007; McLaughlin et al., 2010; Moss, Chen, & Yi, 2014; Saha, Chou, & Grant, 2006; Tuithof, Ten Have, van den Brink, Vollebergh, & de Graaf, 2013). However, these studies did not examine differences across racial/ethnic groups in correlates of SUD remission, and specifically, the potentially important associations of remission with experiences of racial discrimination. A greater understanding of the disparities in rates and specific correlates of remission across racial/ethnic groups may inform the development of more equitable treatment approaches.

This study uses nationally representative U.S. survey data from a sample of adults with a lifetime SUD in NESARC-III, conducted in 2012–2013, to examine the likelihood that they do not have a current SUD (i.e., have achieved SUD remission), comparing Black, Hispanic, and other racial/ethnic individuals to White individuals. We further looked at the specific odds ratios by race/ethnicity for remission from AUD and any DUDs, in separate analyses. We then identify other sociodemographic, behavioral, diagnostic, and service use characteristics that are associated with remission in this sample to allow adjustment for these potentially confounding covariates (e.g., income, health insurance, and comorbidities) in estimating adjusted odds ratio of remission for each racial/ethnic group relative to White individuals. This study builds on older studies that have found mixed results by examining more recent data in NESARC-III and examining a longer follow up period of individuals with lifetime SUDs. In addition, the current study extends prior studies by not only examining rates of remission but also racial differences in correlates of remission, including experiences of racial discrimination, which studies have not previously examined.

2. Methods

2.1. Data source and study sample

Data came from the restricted version of the NESARC-III, sponsored by the National Institute on Alcohol Abuse and Alcoholism (NIAAA) (NESARC-III, 2017), a nationally representative cross-sectional survey of noninstitutionalized civilian adults aged 18 or older, conducted between April 2012 and June 2013 (NIAAA, 2018). The study selected respondents through multi-stage probability sampling with African

Americans, Asians, and Hispanics oversampled. In-person structured interviews excluded individuals who were institutionalized (e.g., in nursing homes, prisons, hospitals, or shelters). With an overall response rate of 60.1%, the total original sample of NESARC-III included 36,309 U.S. adults (NIAAA, 2018). Data were adjusted for oversampling and nonresponse, then weighted to represent the U.S. civilian population based on the 2012 American Community Survey (U.S. Census Bureau, 2012). In this study, the analytic sample included Black, White, Hispanic, and other racial/ethnic respondents who met criteria for a lifetime SUD (i.e., either AUD or a DUD). The study based race and ethnicity on respondent self-report for two questions. The first question assessed whether the respondent identified as Hispanic/Latino and the second question assessed whether the respondent identified as Black or African American, White, Asian, Native Hawaiian and other Pacific Islander, or American Indian or Alaska Native. Individuals of "other race/ethnicities" included those who identified as Asian, Native Hawaiian and other Pacific Islander, American Indian or Alaska Native, and those who identified with two or more racial categories (i.e. both Black and White). The study electronically recorded informed consent, and respondents received $90.00 for participation. Institutional review boards (IRBs) at the U.S. National Institutes of Health and Westat, Inc. approved the study protocol. The IRB committees of the VA Connecticut Healthcare System (HIC #02369) and Yale School of Medicine (HIC #2000022543) granted ethical approval for this study.

2.2. Measures

The study diagnosed *substance use disorders* using the Alcohol Use Disorder and Associated Disabilities Interview Schedule-5 (AUDADIS-5) (Grant et al., 2015), which is based on criteria from the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (DSM-5) (American Psychiatric Association, 2013), and included past-year and lifetime AUD and other DUDs (i.e., past-year and lifetime heroin, club drugs, inhalants/solvent, cocaine, stimulant, cannabis, opioid, and sedative use disorders). While detail may be lost by examining all DUDs together, DUDs rarely occur in isolation (Rhee & Rosenheck, 2020) and consideration of all DUDs together avoids the challenge of accounting for DUD comorbidities that frequently complicate the study of any one DUD.

Sociodemographic characteristics based on respondent self-report included age, sex, race/ethnicity, marital status, annual household income, education, employment, urban residence, health insurance coverage, veteran status, and trauma exposure (i.e., combat trauma or any trauma).

Experiences of discrimination: Six discrimination questions contained within the AUDADIS-5 (Grant et al., 2015) were modeled after the Experiences of Discrimination (EOD) Scale, which has been consistently shown to have good validity and reliability for measuring experiences of racial discrimination (Krieger et al., 2005; Ruan et al., 2008). The six discrimination questions ask about experienced racial discrimination in multiple domains, including (1) obtaining health care/health insurance, (2) receiving care, (3) in public, (4) obtaining a job, (5) being called racist names, and (6) hit/threatened with harm. The study used a Likert scale to assess the frequency of experiences of discrimination in the past year and prior to the past year: 0 = never, 1 = almost never, 2 = sometimes, 3 = fairly often, or 4 = very often. The research team performed orthogonal factor analysis, to identify factors independent of one another, on the six items to identify common domains and a three-factor solution was suggested by a scree plot showing three factors with Eigen values greater than 2 explaining 77% of the variance (Bommersbach, Rhee, Stefanovics, & Rosenheck, 2021). Factor 1 included items 3 and 4 and we labeled it public or job discrimination, factor 2 included items 1 and 2 and we labeled it health system discrimination, and factor 3 included items 5 and 6 and we labeled it abusive discrimination in public spaces. The study used Cronbach's alpha (α) to evaluate the internal consistency and reliability of the factors, and it showed a high level for all three factors: factor 1 ($\alpha = 0.88$), factor 2 ($\alpha = 0.88$), and

factor 3 (α = 0.81). The Appendix A shows the results of the factor analysis. Two additional dichotomous measures, addressed to those who had experienced discrimination, asked whether they were likely to 1) "accept discrimination" as contrasted to trying to "do something about it" and 2) "talk to other people about discrimination" as contrasted to "keeping it to yourself."

Behavioral adversities that the study documented included past homelessness, suicide attempts, criminal justice history, violent behavior, parental history of problems, importance of religion and frequency of religious service attendance, quality of life, and social support. The study team created a continuous measure of violence, following Harford's research (Harford, Chen, Kerridge, & Grant, 2018), by summing the number of 7 violent behaviors since age 15. The study measured parental history by dichotomous variables reflecting parental alcohol or drug use, jail or prison, psychiatric hospitalization, and suicide attempt.

The study based personal importance of religious or spiritual beliefs on a 4-point scale from 1 (i.e., not important at all) to 4 (i.e., very important) while the study based frequency of religious service attendance on a 5-point scale: 1 (once a year), 2 (a few times a year), 3 (1 to 3 times a month), 4 (once a week), and 5 (twice a week or more).

The study measured health-related quality of life (HRQOL) using the Mental Health Component Score (MCS) and Physical Health Component Score (PCS) estimated from the 12-Item Short Form Health Survey (SF-12), version 2. The MCS and PCS are standardized, ranging from 0 to 100. With a mean score of 50, standard deviation of 10, lower scores indicate greater impairment. The study measured perceived social support by the Interpersonal Support and Evaluation List-12 (ISEL-12), a 12-item questionnaire with potential range of 12–48; higher scores indicate greater perceived social support. The study measured social contacts through a series of questions that asked respondents the number of people with whom they had social contact in the past two weeks and addressed family, friends, and others, which were summed to create an index of social contacts.

The study also constructed *psychiatric diagnoses* using AUDADIS-5 criteria for any of the following lifetime and past-year psychiatric disorders based on DSM-5 criteria: eating disorder, phobia, major depressive disorder, dysthymia, bipolar I disorder, generalized anxiety disorder, posttraumatic stress disorder, and panic disorder. Additionally, the study asked individuals whether they had been diagnosed by a physician with schizophrenia or other psychoses in the past year or prior to the past year.

Multimorbidity for psychiatric and SUD diagnoses were represented by one dichotomous variable indicating the presence of only one such diagnosis and another indicating two or more such diagnoses, again with separate indicators for past-year and lifetime diagnoses.

Psychiatric and SUD treatment measures represented lifetime treatment for any SUD (drug or alcohol) and for any of the psychiatric disorders that the AUDADIS-5 identified (i.e., not specifically for the self-reported physician diagnoses of schizophrenia).

2.3. Data analysis

First, in the entire sample of adults with lifetime SUDs, we estimated the proportion of each racial/ethnic subgroup who no longer met criteria for a current SUD. We then used bivariate logistic regression analyses to estimate odds ratios (ORs) and their corresponding 95% confidence intervals (CI) for SUD remission (i.e., not having a past-year SUD) among the three minority groups, compared to White individuals. The study repeated this analysis for individuals with lifetime AUD and DUDs.

The study then used bivariate analyses to identify sociodemographic, behavioral, diagnostic, and service use characteristics that were associated with remission by comparing individuals who remitted to those with active past-year SUDs on a variety of characteristics. In large samples such as those in this study, small differences are often

statistically significant although they are not of a clinically meaningful magnitude. We thus relied on effect sizes to identify differences of substantial magnitude between each minority group and White individuals. The study used risk ratios (RR) to compare effect sizes for dichotomous variables, with differences considered substantial if the RR was greater or equal to 1.5 or less than or equal to 0.67, a conservative standard (Ferguson, 2009). We used Cohen's *d* (i.e., the difference in means divided by the pooled standard deviation) to compare effect sizes in continuous variables and considered it to be substantial if ≥0.2 or ≤ −0.2, the conventional standard for at least a small, meaningful effect (Cohen, 1988).

Finally, we conducted multivariate logistic regression analyses to calculate adjusted ORs of SUD remission for each racial/ethnic group relative to White individuals, controlling for other confounding factors that were substantially associated with remission in the bivariate analyses. The research team also repeated these analyses separately for individuals with lifetime AUD and DUD. We used the concordance statistic (*c*-statistic) to measure the goodness-of-fit of the overall models. The *c*-statistic ranges from 0.5, indicating entirely random concordance, to 1.0, indicating perfect concordance (Caetano, Sonpavde, & Pond, 2018).

For all analyses, the team applied post-stratification NESARC-III-estimated weights. The research team performed all analyses using SAS statistical program version 9.4 (SAS, 2014).

3. Results

3.1. Sample and unadjusted analyses of race/ethnicity and SUD remission

In the entire NESARC-III sample (*n* = 36,309 unweighted, representing 235.4 million adults nationwide), 10,916 individuals (30.1%) met criteria for a lifetime SUD, which included 73.0% White, 9.8% Black, 11.8% Hispanic, and 5.4% individuals of other racial/ethnic groups.

Of these individuals, 5120 no longer met criteria for an SUD in the past year, for an overall remission rate of 46.9% (including 55.2% for White individuals, but only 34.0% for Black individuals, 38.5% for Hispanic individuals, and 40.1% for individuals of other race/ethnicities). In a separate analysis examining individuals with lifetime AUD (*n* = 10,001) and DUD (*n* = 3522), remission was identified as 57.0%, 34.8%, 40.9%, and 41.1% of White, Black, Hispanic, and other race/ethnicity individuals with AUD, respectively, and 66.1%, 40.8%, 46.6%, and 62.2% of White, Black, Hispanic, and other race/ethnicity individuals with DUDs, respectively.

In unadjusted logistic regression comparison with White individuals with lifetime SUDs, Black, Hispanic, and other race individuals were less likely to have remitted with ORs of 0.42 (95% CI 0.36–0.48), 0.51 (95% CI 0.45–0.58), and 0.55 (95% CI 0.45–0.65), respectively. In the subgroup with lifetime AUD, minority groups were also less likely to have remitted with ORs of 0.40 (95% CI 0.40–0.40), 0.52 (95% CI 0.52–0.52), and 0.53 (95% CI 0.52–0.53), respectively. Black, Hispanic, and other race/ethnicity individuals were similarly less likely to remit DUDs with ORs of 0.35 (95% CI 0.35–0.35), 0.45 (95% CI 0.44–0.45), and 0.84 (95% CI 0.83–0.84), respectively.

3.2. Bivariate analyses of other factors associated with SUD remission by race/ethnic group

To identify potentially confounding factors associated with remission, we compared individuals who remitted to those with active past-year SUDs (Tables 1 and 2). Potentially confounding sociodemographic factors also associated with remission included: lower likelihood of being unemployed, low income (<$20,000 per year), past year homelessness and trouble with the police, experiencing lifetime discrimination, and higher likelihood of being older or retired, married or widowed, or being a veteran. Clinical factors associated with

Table 1
Sociodemographic characteristics of individuals with lifetime SUDs, comparison by remission status.

	Remission (n = 5120; 46.9%)	Past year SUD (n = 5796; 53.1%)	RR/Cohens D
	%/mean ± SD	%/mean ± SD	
Age (mean ± SD)	46.75 ± 14.69	36.38 ± 14.00	**−0.72**[b]
Gender (male)	57.6%	60.6%	1.05
Race/ethnicity			
White	80.4%	66.5%	0.83
Black	6.4%	12.7%	**1.97**[a]
Hispanic	8.9%	14.4%	**1.62**[a]
Others	4.2%	6.4%	**1.52**[a]
Marital status			
Married/cohabited	64.5%	42.9%	**0.66**[a]
Never married	15.5%	40.3%	**2.6**[a]
Separated/divorced	17.1%	15.3%	0.90
Widowed	2.9%	1.5%	**0.52**[a]
Employment status			
Employed	75.4%	81.5%	1.08
Disabled	6.9%	5.6%	0.81
Retired	13.7%	4.9%	**0.36**[a]
Unemployed	7.3%	12.7%	**1.72**[a]
Other (school, etc.)	12.8%	20.8%	**1.63**[a]
Income			
<$20,000	18.2%	28.5%	**1.56**[a]
≥$20,000-$39,999	22.5%	24.2%	1.08
≥$40,000-59,999	23.7%	20.5%	0.86
>$60,000	35.6%	26.8%	0.75
Education			
Pre-high school	9.1%	11.8%	1.30
Graduated high school	23.9%	27.5%	1.15
Some college	34.7%	36.9%	1.06
College or higher	32.2%	23.8%	0.74
Health insurance			
Any insurance	83.6%	74.3%	0.89
Private	63.2%	55.9%	0.88
Medicare	17.7%	9.6%	**0.54**[a]
Medicaid	10.1%	12.4%	1.22
Homelessness			
Past year homelessness	2.4%	4.4%	**1.89**[a]
Lifetime homelessness	8.6%	9.9%	1.16
Urban residence	74.6%	83.7%	1.12
Veteran status and trauma exposure			
Veteran	14.9%	7.8%	**0.52**[a]
Combat trauma	4.5%	2.8%	**0.61**[a]
Any trauma	65.8%	58.7%	0.89
Legal			
Incarcerated before 15 y.o.	6.7%	9.5%	1.42
Incarcerated after 15 y.o.	21.4%	23.4%	1.09
Past year police trouble	1.7%	5.7%	**3.33**[a]
Violence	1.01 ± 1.30	1.14 ± 1.44	0.09
Discrimination			
Past year discrimination	1.27 ± 0.49	1.34 ± 0.55	0.13
Lifetime discrimination	1.19 ± 0.42	1.29 ± 0.52	**0.23**[b]
Accepting of discrimination	62.3%	58.8%	0.94
Talk about discrimination	60.8%	61.5%	1.01
Abusive discrimination	1.24 ± 0.49	1.32 ± 0.58	0.15
Health system discrimination	1.13 ± 0.43	1.19 ± 0.53	0.11
Public/job discrimination	1.30 ± 0.58	1.41 ± 0.70	0.18

Bolded values indicate substantial differences.
[a] Relative risk (RR) > 1.50 or < 0.67.
[b] Cohens D > 0.20 or < −0.20.

Table 2
Clinical and service use characteristics of individuals with lifetime SUDs, comparison by remission status.

	Remission (n = 5120; 46.9%)	Past Year SUD (n = 5796; 53.1%)	RR/Cohens D
	%/mean ± SD	%/mean ± SD	
Lifetime SUDs			
Single SUD	80.1%	70.6%	0.88
Multimorbid SUD	19.7%	29.3%	1.49
AUD	91.4%	93.1%	1.02
Drug use disorder	26.8%	35.7%	1.33
Marijuana	16.4%	23.4%	1.42
Sedative	2.6%	4.2%	**1.62**[a]
Cocaine	8.2%	7.0%	0.86
Opioid	4.6%	8.5%	**1.84**[a]
Stimulant	6.0%	4.9%	0.82
Psychiatric diagnoses			
Past year			
Single psychiatric diagnosis	17.9%	19.4%	1.08
Multimorbid diagnoses	13.7%	16.8%	1.23
Major depression	15.4%	20.8%	1.35
Bipolar	3.2%	4.5%	1.39
PTSD	8.3%	9.4%	1.13
Panic	5.2%	6.4%	1.23
Schizophrenia or other psychosis	1.0%	1.8%	**1.72**[a]
Lifetime			
Single psychiatric diagnosis	23.0%	22.3%	0.97
Multimorbidity	26.4%	24.8%	0.94
Major depression	34.3%	32.3%	0.94
Bipolar	4.4%	5.3%	1.21
PTSD	11.0%	11.5%	1.04
Panic	9.7%	9.1%	0.94
Schizophrenia or other psychosis	2.3%	4.0%	**1.72**[a]
Suicide history			
PY suicide attempt	0.2%	0.7%	**3.16**[a]
Lifetime suicide attempt	9.5%	10.0%	1.05
Parental history			
History of drug abuse	9.6%	11.2%	1.16
Experience of prison	10.3%	13.9%	1.34
Experience of psych hospitalization	8.4%	7.7%	0.93
History of a suicide attempt	5.1%	5.1%	0.99
Social support			
Subjective social support	3.00 ± 0.49	2.96 ± 0.51	−0.07
Total social contacts	15.50 ± 13.12	16.37 ± 15.87	0.06
Religion			
Frequency religious service attendance	1.47 ± 1.84	1.07 ± 1.62	**−0.23**[b]
Importance of religion	3.16 ± 0.97	3.01 ± 1.01	−0.15
Body mass index	28.51 ± 6.40	27.13 ± 6.19	**−0.22**[b]
Health-related quality of life			
Aggregate physical health (SF 12)	48.67 ± 11.16	51.11 ± 9.67	**0.24**[b]
Aggregate mental health (SF 12)	49.70 ± 10.12	47.22 ± 10.73	**−0.24**[b]
Psychiatric and SUD treatment			
Lifetime			
Ever mental (psych or SUD) treatment	50.1%	46.4%	0.93
SUD treatment	16.5%	17.8%	1.08
Psychiatric treatment	37.5%	34.0%	0.91

PY = past year; AUD = alcohol use disorder; DUD = drug use disorder; psych = psychiatric.
Bolded values indicate substantial differences.
[a] Relative risk (RR) > 1.50 or < 0.67.
[b] Cohens D, >0.20 or < −0.20.

remission included lower likelihood of having a past year suicide attempt, lifetime opioid or sedative use disorder, lifetime and past year schizophrenia or other psychoses, as well as higher likelihood of attending religious services, reporting a higher mental health and lower physical health–related quality of life, and having a higher body mass index.

3.3. Adjusted analyses of race/ethnicity and SUD remission

In the adjusted logistic regression analyses, controlling for factors that, in addition to race/ethnicity, were also substantially associated with remission in the bivariate analysis, Black, Hispanic, and other race individuals with lifetime SUDs remained significantly less likely than White individuals to have remitted with modestly larger ORs of 0.49 (95% CI 0.41–0.57), 0.68 (95% CI 0.59–0.78), and 0.66 (95% CI 0.54–0.80), respectively. In the adjusted analyses of individuals with AUD, racial minorities were similarly less likely than White individuals to have remitted with ORs of 0.46 (95% CI 0.39–0.54), 0.72 (95% CI 0.62–0.83), and 0.65 (95% CI 0.53–0.79). Finally, in the adjusted analysis of individuals with any DUD, Black and Hispanic individuals were less likely to remit than White individuals with ORs of 0.37 (95% CI 0.29–0.48) and 0.57 (95% CI 0.45–0.74), respectively, while individuals of other race/ethnicities were not significantly less likely to remit than White individuals (OR = 0.93, 95% CI 0.66–1.32).

In the adjusted analysis, the factors most important in predicting SUD remission (in order of magnitude) were less likelihood of being Black (standardized regression coefficient (SRC) = −0.72), having past year trouble with the police (SRC = −0.51), being of another race/ethnicity (SRC = −0.42), being Hispanic (SRC = −0.39), having lifetime opioid use disorder (SRC = −0.40), and greater likelihood of being married or cohabitating (SRC = 0.33).

The *c*-statistics, measuring goodness-of-fit for the unadjusted and adjusted models, respectively, was $c = 0.59$ and $c = 0.73$ for all SUDs, $c = 0.60$ and $c = 0.73$ for AUD, and $c = 0.60$ and $c = 0.74$ for DUD, indicating only a modest fit for the adjusted models. Thus, consideration of factors other than race/ethnicity only modestly improved the fit of the models and accounted for changes of only 17%–27% in the odds ratios representing race/ethnicity effects.

4. Discussion

In this nationally representative sample of U.S. adults with lifetime SUDs, we found that racial/ethnic minorities, especially Black individuals, showed significantly reduced likelihood of diagnostic remission from SUDs, including both AUD and DUDs, relative to White individuals. These findings were robust and significant, even after controlling for potentially confounding factors associated with remission. Multivariate analyses demonstrated that racial/ethnic minorities, especially being Black, was the strongest factor associated with lower likelihood of remission from SUDs. Despite examining a wide range of potentially confounding sociodemographic, behavioral, diagnostic, and service use factors, this study could not identify definitive reasons for these disparities. Future research should help us to better understand the association between racial/ethnic minorities and SUD remission.

The diagnostic remission rates in this study, ranging from 34% to 55.2% depending on race/ethnicity, were similar to the rates found in other studies (White, 2012). However, the findings pertaining to racial/ethnic differences in SUD remission diverged from the few studies that examined this indicator previously. As described, prior studies suggest that Black and Hispanic individuals either have lower rates of diagnostic persistence (i.e., greater rates of remission) (Evans et al., 2017; Grant, Verges, et al., 2012) or similar rates of remission after controlling for sociodemographic factors (Arndt et al., 2010; Breslau et al., 2005; Dawson et al., 2005; Vilsaint et al., 2019), especially age (Arndt et al., 2010), education (Arndt et al., 2010; Vilsaint et al., 2019), marital status (Arndt et al., 2010), and social support (Arndt et al., 2010; Dawson et al.,

2005). The findings of these latter studies, most of which relied on data from earlier waves of NESARC, have concluded that racial/ethnic disparities in remission are partially due to differences in these factors. Our study takes into account a larger number of sociodemographic, behavioral, diagnostic, and service use variables, and demonstrates that controlling for these factors made little overall difference in changing the lower likelihood of remission among racial/ethnic differences. Our findings suggest that other factors, not assessed in this study, likely account for differences in remission rates.

One natural hypothesis could be that structural and social factors, such as racial discrimination and its many ramifications, could account for differences in remission rates (Broman, n.d.; Gerrard et al., 2012; Otiniano Verissimo, Grella, Amaro, & Gee, 2014). While racial discrimination was associated with reduced likelihood of diagnostic remission in this sample, even after controlling for this effect in the multivariate analysis, the lower likelihood of remission remained significant. Other contributors not measured in this study could include: different cultural attitudes and criminal justice consequences of substance use (Hwang, Myers, Abe-Kim, & Ting, 2008; Mulia, Ye, Greenfield, & Zemore, 2009), higher environmental substance exposures (Mennis, Stahler, & Mason, 2016) or neighborhood disadvantage (Boardman, Finch, Williams, & Jackson, 2001), higher rates of exposure to stress and racial trauma/oppression (Gerrard et al., 2012; Skewes & Blume, 2019; Turner & Lloyd, 2003), medical provider bias in diagnosis and referral to treatment, and lack of access to culturally competent treatment (Evans et al., 2017; Miranda et al., 2005). It is important to note that the racial differences observed in this study should be considered a byproduct of structural or social inequalities and not a result of biological differences across race. Qualitative or mixed method studies may shed more light on underlying reasons for the racial differences that this study observed.

It is not entirely clear why our findings pertaining to racial differences in rates of diagnostic remission differed from those found in older studies. Perhaps the most important difference is that prior studies examined shorter and more specific follow-up periods, often from 1 to 3 years (Evans et al., 2017; Grant, Verges, et al., 2012). In contrast, our study examined past-year remission from lifetime SUDs that could have occurred at any time in the past. Thus, our study included remissions that could have occurred more than 2–3 years in the past, and this finding suggests that while there may be limited difference in remission between racial groups over a specified 2–3 year period, Black individuals may have had less likelihood of remission during the more extensive period of time before 2–3 years ago. Furthermore, follow-up studies reflect outcomes for the subset of respondents who were successfully followed up. Fewer differences may exist between individuals identifying with different racial groups in this selected subset, compared to the entire sample examined in this study.

Most prior studies on diagnostic remission of SUDs have been conducted in earlier waves of NESARC. Our study is the first to examine this topic in NESARC-III. Remission rates may have changed for different racial groups, especially for Black individuals, since earlier waves of NESARC. Specifically, recent studies have found that the recent growth in medical cannabis laws may have contributed to increases in rates of cannabis use disorder to a greater extent among Black individuals than other racial/ethnic groups (Hasin, Shmuleqitz, & Sarvet, 2019). Further research on racial differences in diagnostic remission is needed to see if our findings can be replicated in other nationally representative samples.

In addition to examining overall proportion and likelihood of remission, this study also identified a wide range of factors associated with remission in this sample. Factors included older age, being a veteran, married, and attending religious services, and a lower likelihood of unemployment, low income, homelessness, having trouble with the police, experiencing racial discrimination, and lifetime opioid use disorder and psychosis. Similar factors have been found in other studies examining risk of SUD persistence (Boschloo et al., 2012; Crum et al.,

2013; Evans et al., 2017; Grant, Verges, et al., 2012; Hser, 2007; McLaughlin et al., 2010; Moss et al., 2014; Saha et al., 2006; Tuithof et al., 2013).

Another important contribution of our study was the observation that lower levels of self-reported racial discrimination were independently associated with SUD remission in the multivariate analysis. Prior studies of clinical samples have demonstrated similar findings (Borrell et al., 2007; Gerrard et al., 2012; Gibbons et al., 2010), especially in adolescents and young adults. However, studies examining risk factors for SUD persistence or remission in nationally representative samples have not previously included measures of racial discrimination. Further research can help the field to understand the factors mediating the association between racial discrimination and substance use persistence. Whether experiences of racial discrimination directly drive individuals to use substances or whether substance use reflects other factors, such as poor access to treatment or experiences of discrimination during treatment, is not yet clear (Gerrard et al., 2012; Gibbons et al., 2010). These results, nonetheless, underscore the importance of efforts to reduce discrimination and structural barriers in treatment settings that may impede engagement and effectiveness of treatment for racial minorities, especially given data from several studies showing that racial minorities are less likely to complete treatment than are White individuals (Arndt, Acion, & White, 2013; Mennis & Stahler, 2016; Milligan, Nich, & Carroll, 2004).

Finally, these results should be viewed in the context of a number of potential limitations. First, this is a cross-sectional study of associations and thus precludes conclusions of causality that require a stronger longitudinal design that prospectively examines factors such as race/ethnicity that predict more or less relative SUD remission. Second, the retrospective, self-report nature of the data introduces the possibility of recall bias in examining service use, behavioral characteristics, and substance use. Third, the 60% response rate may mean that marginalized individuals, such as homeless or institutionalized individuals, many of whom have SUDs, were underrepresented. Fourth, the broad racial/ethnic categories available in NESARC-III did not allow for a more nuanced understanding of racial/ethnic subgroups, such as people who identify as African American, Afro-Caribbean, or individuals born in Africa or Mexican Americans as contrasted to Cuban Americans. In addition, our broad definition of remission, based on diagnostic remission, may mask more nuanced understandings of specific outcomes, such as partial remission, current use, or abstinence. Finally, our examination of all DUDs together may have masked race-specific variation in individual drugs. Future studies could examine this question in greater detail.

Nevertheless, minority race/ethnicity groups are robustly associated with reduced likelihood of diagnostic remission from SUDs even after adjustment for other factors. This study identified several partial moderators of these disparities but does not provide a full explanation of these disparities.

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CRediT authorship contribution statement

Tanner J. Bommersbach: Writing – original draft, Conceptualization, Methodology. **Oluwole Jegede:** Methodology, Writing – review & editing. **Elina A. Stefanovics:** Formal analysis, Methodology. **Taeho Greg Rhee:** Data curation, Formal analysis, Writing – review & editing. **Robert A. Rosenheck:** Conceptualization, Formal analysis, Project administration, Supervision, Writing – review & editing.

Declaration of competing interest

The authors have no competing interests to declare.

Appendix A. Factor loadings of the three-factor model of the experiences of discrimination questions

		Factor1	Factor2	Factor3
Question #3	Prior to the past year, how often did you experience discrimination in public, like on the street, in stores, or in restaurants, because of your race/ethnicity?	0.79658	.	.
	During the past 12 mos, how often did you experience discrimination in public, like on the street, in stores, or in restaurants, because of your race/ ethnicity?	0.77396	.	.
Question #4	Prior to the past year, how often did you experience discrimination because of you race or ethnicity in ANY other situation, like obtaining a job or other the job, getting admitted to a school or training program, in the courts or by the police, or obtaining housing?	0.78762	.	.
	During the past 12 mos, how often did you experience discrimination because of you race or ethnicity in ANY other situation, like obtaining a job or other the job, getting admitted to a school or training program, in the courts or by the police, or obtaining housing?	0.75912	.	.
Question #1	Prior to the past year, how often did you experience discrimination in your ability to obtain healthcare or health insurance because of your race/ ethnicity?	.	0.83464	.
	During the past 12 mos, how often did you experience discrimination in your ability to obtain healthcare or health insurance because of your race/ethnicity?	.	0.83160	.
Question #2	Prior to the past year, how often did you experience discrimination in how you were treated when you got care because of your race/ethnicity?	.	0.80625	.
	During the past 12 mos, how often did you experience discrimination in how you were treated when you got care because of your race/ethnicity?	.	0.77397	.
Question #6	Prior to the past year, how often were you made fun of, picked on, pushed, shoved, hit or threatened with harm because of your race/ethnicity?	.	.	0.79930
	During the past 12 mos, how often were you made fun of, picked on, pushed, shoved, hit or threatened with harm because of your race/ethnicity?	.	.	0.78989
Question #5	Prior to the past year, how often were you made fun of, picked on, pushed, shoved, hit or threatened with harm because of your race/ethnicity?	.	.	0.69771
	During the past 12 months, how often were you made fun of, picked on, pushed, shoved, hit or threatened with harm because of your race/ethnicity?	.	.	0.66757

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