Racial-ethnic disparities across substance use disorder treatment settings: Sources of treatment insurance, socioeconomic correlates and clinical features

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REVIEW

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ABSTRACT

Aim: Contrary to expectations, studies of racial-ethnic disparities in substance use disorder (SUD) treatment frequently uncover minority-majority parity in access and utilization of services. What accounts for the anomaly? To answer the question, this study explores racial-ethnic differences in the odds of utilization of SUD treatment in varied settings (e.g., the criminal justice system, private doctor's office, etc.), adjusting for sources of treatment insurance, socioeconomic correlates of treatment (e.g., employment, income, education), as well as clients' clinical features (e.g., type of substance abuse/dependence, co-morbidities, health status). **Methods:** Data were compiled from the National Survey of Drug Use and Health (NSDUH) dataset, 2002-2014. The sample consisted of respondents with a past year diagnosis of a substance use disorder, who also reported having received treatment (n=6,207). Data were pooled to maximize subgroup analyses. Weight- and design- adjusted logistic regressions were use to analyze factors predicting SUD treatment source. **Results:** Blacks were more likely than Whites to receive treatment through the criminal justice system and Whites more likely than Blacks and Latinx to receive treatment at a doctor's office. Blacks were also more likely than Whites to receive treatment through inpatient/outpatient rehabilitation, before adjustments but not afterwards. **Discussion:** In this study we show that even after adjusting for mechanisms expected to shape pathways from race-ethnicity to SUD treatment sites, significant racial-ethnic disparities persist. This fills an important gap in the literature in that disparities research has not explicitly modeled racial-ethnic variation across the full range of SUD treatment sites.

Introduction

Racial-ethnic differences in substance use disorder (SUD) treatment are puzzling in that, while healthcare research consistently uncovers inequities

in access to, and, initiation and utilization of, healthcare services among racial-ethnic and resource-disadvantaged populations (Adepoju et al., 2015; IOM, 2003; Malat, 2006; Williams, 1990), studies of SUD treatment frequently show inter-group parity, and even a minority treatment advantage. Nationally representative, longitudinal, SUD treatment data from the National Survey of Drug Use and Health (NSDUH) uniformly depict treatment parity between Blacks and Whites from year to year. AS SAMHSA (2013) reports: "among persons in need of alcohol or illicit drug treatment, Blacks were more likely than persons of other racial and ethnic groups to receive treatment…"[1] An early study of these patterns (Le Cook & Alegria, 2011) showed that of those with a substance use disorder, 11.4 percent of Blacks, compared to 9.0 percent of Whites and 8.1 percent of Latinx received *any* kind of SUD treatment in the past year (i.e., a hospital (inpatient), rehabilitation facility (inpatient or outpatient), mental health center, and including emergency room, private doctor's office, or criminal legal system), and, 9.4 percent of Blacks, 6.8 percent of Whites and 5.3 percent of Latinx received SUD *specialty* treatment (i.e., hospital (inpatient), rehabilitation facility (inpatient or outpatient), or mental health center, only). A more recent examination of racial-ethnic disparities in SUD treatment demonstrated equivalence (i.e., no significant differences) in treatment utilization between Blacks, Whites and Latinx in *bivariate* models, but a distinct White advantage in multivariate models (Pinedo, 2019).

Although studies of racial-ethnic disparities in SUD treatment access and utilization (e.g., Pro et al., 2019; Acevedo et al., 2012; Acevedo et al., 2018; Archibald & Putnam Rankin 2013; Cummings et al., 2014) continue to emphasize a Black and Latinx treatment disadvantage, including an early study in which Whites with substance use and/or mental health disorders were typically more likely than Blacks and Latinx to receive SUD or mental health treatment (Wells et al., 2001), other research findings (in addition to the SAMHSA reports mentioned above) suggest a more complex relationship. For example, a 2002 study in northern California found Blacks were more likely than comparable groups to enter treatment, while another, in the southwest, concluded that they were least likely to enter treatment (Acevedo et al., 2012). One study of SUD and mental health uncovered a complex relationship: Blacks with a substance use and mental health disorder were least likely to receive treatment for their mental health problems, equally likely to get services for their alcohol use disorder and *more likely* to receive drug treatment. As Acevedo et al. (2018, p. 534) note: "Even when treatment is accessed in publicly funded specialty settings, Black, Latino, and American Indian clients are less likely to initiate or engage in treatment."

This is important in that there is a sizable literature showing disparities in outcomes in which Blacks and minority clients tend to have lower completion rates, higher re-arrest, and in general, experience poorer outcomes (see e.g., Finlay et al., 2020; Matsuzaka & Knapp, 2020 for discussion and review). Studies of the relationship between race-ethnicity and treatment typically report lower odds of minority-group engagement, retention and completion relative to Whites, the result of which is less successful treatment outcomes (see discussion e.g., Guerrero et al. 2013; Melnick et al. 2011; Mennis & Stahler, 2016; Saloner & Lê Cook, 2013; Stahler, Mennis & DuCette, 2016).

What accounts for these divergent findings? One explanation is unobserved heterogeneity in omitted predictive factors. Several studies found that an initially weak relationship pointing toward Black advantage in treatment utilization was reversed with the addition of explanatory variables including treatment clients' socioeconomic and clinical features, such as SUD diagnosis (Le Cook & Alegria 2011; Pinedo 2019). Since studies like these were not designed to theorize the effects of each individual predictor on odds of initiating service use, it remains unknown exactly which omitted factor(s) reversed the (suppressed) relationship between race/ethnicity and treatment utilization, and why the reversal occurred. Covariates shaping treatment utilization can be quite varied including criminal justice involvement, sources of insurance, socioeconomic status, and types of substance use (see e.g., Hinton, et al., 2018; Mennis & Stahler, 2016; Saloner & Lê Cook, 2013). For instance, patterns of substance use have been shown to condition the relationship between race-ethnicity and treatment (see e.g., Mennis et al., 2019; Mennis & Stahler 2016).

That criminal justice involvement and health insurance have been shown to influence treatment utilization, both factors associated with racial and ethnic minority status, suggests that conditions in which treatment takes place may have an important impact on racial-ethnic differences on treatment utilization. One of these conditions is likely to be the treatment setting—the site of treatment itself (e.g., hospital inpatient, doctor's office) because of the different modalities or types of addiction treatment (e.g., detoxification, medication assisted treatment- MAT) offered there.[2]

Treatment settings are more dissimilar than not, determining who gets SUD treatment under what circumstances, and therefore, may provide a key to divergent findings.[3] Yet, our knowledge of between-group disparities in treatment settings is limited. Most treatment studies either focus on relationships within a single setting such as inpatient facility, or, criminal justice system (Hinton et al., 2018; Cruza-Guet et al., 2018; Delphin-Rittmon et al., 2012) or use referral source as a proxy for setting (but cf. Pro et al., 2019). One of the disadvantages of a single-setting focus is that

by eliding treatment setting comparisons, research may obscure important variation in racial-ethnic utilization of different types of treatment settings and modalities.[4]

In the current study, we argue that at minimum, failure to examine treatment setting as a key source of unobserved heterogeneity in SUD treatment contributes to inconsistencies, such as those mentioned above, in explanations of racial-ethnic treatment utilization. It also limits what we can know about other relationships, between clients' sources of treatment insurance, their socioeconomic characteristics as well as their clinical features, since the impact of these factors on the likelihood of treatment utilization is likely to vary across treatment settings. We argue these factors vary across SUD treatment settings because different institutional environments (e.g., criminal justice, private medicine, family/community) require different kinds of material and symbolic (cultural) resources for access to their services, the deployment of which is shaped by racial-ethnic, socioeconomic and clinical factors. For example, a number of studies show race-ethnicity, socioeconomic and clinical factors shape access to and utilization of SUD treatment in settings such as the criminal justice system (Pro et al., 2019), specialty SUD treatment compared to non specialty treatment (Le Cook & Alegria 2011), and between residential/non residential sites (Toombs et al. 2021), among others.

Given the urgency of the need to address SUD treatment disparities (Burlew et al., 2021; Burlew et al., 2009), the overarching goal of our study is simple: to investigate whether there is significant racial-ethnic variation in SUD treatment utilization between different treatment settings, all else being equal.

Except for the perfunctory use of inpatient/outpatient, residential/non-residential, criminal justice/noncriminal justice comparisons, disparities research has not explicitly modeled racial-ethnic variation across the full range of treatment sites. Attenuated sources of treatment is an important gap this study is designed to fill.[5]

Additionally, we investigate whether there is significant variation between settings vis-a-vis sources of treatment insurance, clients' socioeconomic characteristics (e.g., income, education) and clinical features (e.g., substance use). While race-ethnicity is undoubtably related to these factors, because of the racialized nature of healthcare (Hicken et al., 2018; Mendoza et al., 2019; Williams et al., 2019), it is expected that race-ethnicity will have an independent effect on utilization of SUD treatment in particular settings. That is, there are not only resource barriers to SUD treatment but also cultural ones, such as discrimination, sorting groups into culturally appropriate settings (Rafalovich 2020).

First, we investigate whether race-ethnicity predicts SUD clients' likelihood of receipt of treatment in a particular setting. Specifically, we consider

how six sources of treatment differ by the racial-ethnic profiles of clients. There are several reasons to believe that they will. As a number of scholars argue, racial-ethnic status markers result in differential allocation of societal opportunities and resources (see above e.g., Williams et al.,2019). Race and ethnicity are used to sort groups into different healthcare treatment settings and modalities (Mendoza et al., 2019; Rafalovich, 2020). In studies of SUD treatment quality, private treatment programs associated with Whites and resource-advantaged groups offer more extensive service options (i.e., better programming) than public ones in which Blacks and other disadvantaged groups are overrepresented (Matsuzaka & Knapp, 2020; Melnick et al., 2011; Roman et al., 2006; Saloner & Lê Cook, 2013).

Public sources of treatment include those linked to the criminal justice system. Substance use disorder is prevalent in the criminal justice system (Finlay et al., 2020) and many individuals with SUDs are legally mandated to treatment. Blacks make up a disproportionate share of the criminal justice population as a result of the so-called war on drugs. Imprisonment of nonviolent drug offenders since the 1990s increased, leading to more frequent contact with the criminal justice system among minority and disadvantaged communities. Not only has there been greater attention to and prosecution of lower level, nonviolent offenders, but the evidence shows that there is intensified law enforcement in resource disadvantaged and minority communities (Western, 2006). African Americans and Latinx make up two-thirds of incarcerated individuals in state institutions, and Black males were noted to be up to eight times more likely to be incarcerated than Whites (Western, 2006), data that is further supported by subsequent research (Enders et al., 2019). Consequently, Blacks are more likely than other groups to be referred to SUD treatment through the criminal justice system (Cruza-Guet et al., 2018; Delphin-Rittmon et al., 2012; Sahker et al., 2015). This institutional setting serves as a key source of SUD treatment for minority populations.[6]

In contrast, Whites and resource-advantaged groups are more likely to self-refer to treatment (Delphin-Rittmon et al, 2012), or rely on other avenues to SUD treatment (although post-ACA; see e.g., Sohn, 2017). Although this study cannot evaluate the quality of services in these different settings, it is notable that in the criminal justice system, there are fewer strictly medically-oriented treatment resources available to SUD clients (NIDA 2020).

Secondly, our study aims to investigate how sources of treatment insurance, socioeconomic correlates of treatment and client clinical characteristics impact clients' likelihood of receipt of treatment in a particular setting. Importantly, since research does not focus on treatment settings per se, we know little about how clients' socioeconomic and clinical

correlates vary by setting. Specifically, we investigate the extent to which sources of treatment insurance, socioeconomic correlates of treatment (e.g., employment, income, education), as well as clients' clinical features (e.g., type of substance abuse or dependence, co-morbidities, health status) predicted SUD clients' likelihood of receipt of treatment in a particular setting.

With regard to access, studies of treatment access cover a broad range of potential mechanisms facilitating or constraining treatment utilization. These include payment sources and policies, firm programming and practices (see e.g., Bouchery et al., 2012; Chuang et al., 2011; Edwards et al. 2011; Friedmann et al., 2003). Despite the range of factors that impact access to treatment, lack of insurance coverage and inability to pay are most often cited as barriers to access (Bouchery et al., 2012). Since different treatment settings require different kinds of payment sources (ranging from none in self-help informal group settings to private insurance for SUD treatment visits to a doctor's office), we expect that as a special type of socioeconomic mechanism, more intensive and exclusive insurance will be associated with private healthcare while less intensive/exclusive resources will be associated with publicly available treatment. Results of studies of payment regimes predicting SUD treatment utilization generally support these expectations with some caveats (see e.g. Le Cook & Alegria 2011; Pinedo 2019). For example, in one study (Cummings et al., 2014) private insurance was associated with greater use of any specialty substance use disorder treatment. However, this condition held only among those with alcohol dependence (and not alcohol abuse or drug abuse/dependence).

With regard to socioeconomic factors which might facilitate or impede SUD treatment, studies of the link between SUD and socioeconomic factors are similarly nuanced; they reveal unexpected relationships. SAMHSA's national prevalence estimates, for example, show a treatment utilization advantage for socioeconomically *marginal* groups where health disparities frameworks would lead us to expect a simple resource-to-resource relationship (SAMHSA, NSDUH 2002- 2019). Similarly, in Pineda's study, while being employed did increase the odds of treatment utilization, individuals with more of socioeconomic resources were *less* likely to use treatment services than those with fewer resources.

Where do such anomalies leave us? With respect to treatment setting and SUD clients' socioeconomic characteristics, it seems reasonable to use a broad disparities framework, with attention to the results of previous research. We therefore argue that differential allocation of societal opportunities and resources sort groups into different healthcare treatment modalities, in this case, SUD treatment settings, such that those with fewer socioeconomic resources end up in public (and criminal justice) programs

while those with greater socioeconomic resources end up in private programs.

Lastly, we include SUD clients' clinical features in our analyses as controls, in case utilization of SUD treatment in a particular setting is a function of individuals' medical need, rather than racial-ethnic, capacity to access treatment and/or socioeconomic characteristics. Following previous research, we adjust for client clinical features to determine whether racial-ethnic, access and socioeconomic characteristics are actual disparities in utilization between groups (based on setting) and not differences in clinical morbidities between individuals. [ii]

Methods

Data and study population

To understand factors that predict differential utilization of sources of treatment, we examine pooled data from the NSDUH (2002-2014), a nationally representative sample of behavioral health information. NSDUH data serve as a preeminent source of yearly U.S. incidence and prevalence estimates of illicit drug and alcohol use disorders, clinical and treatment features of those with substance use disorders, and includes treatment access information as well as socioeconomic characteristics of those with substance use disorder.

Extending previous disparities' scholarship, sampling begins with respondents with a past year diagnosis of a substance use disorder (n = 63,586), and selects those who also reported having received treatment. In 2002-2014 the number of cases that fit these criteria was n = 6,207. We use pooled data from this dataset, rather than individual years, because pooled data provide the necessary statistical power for our regression models, which have limited degrees of freedom due to their sampling design (see e.g., Allison, 1999; Gujarati 2003).[7]

While our study focuses on pooled NSDUH 2002-2014 data (n = 6,207), we also conducted analyses of pooled NSDUH 2015-2019 data for the same subgroup respondents. Since the results were the same we do not show these analyses.[8]

Measures

Dependent variables

NSDUH asks respondents whether they received any substance use disorder treatment during the past year, and, if affirmative, the primary site of that treatment. There are eight central treatment sites (and an "other" category) from which to choose: hospital inpatient, inpatient rehabilitation, outpatient

rehabilitation, mental health center, emergency room, private doctor's office, prison/jail, self-help/mutual aid and other. In an additional query, respondents are asked in detail about treatment sites, such as "detox" and "methadone clinic," "school," "family," and "friends," among other alternatives. To create the six dichotomous dependent variables (coded 0,1), we combined the answers to these questions into sources of treatment services, indicating the primary site of drug and/or alcohol abuse/dependence treatment during the past year. These were: criminal justice system, private doctor's office, hospital emergency (including detox but not overnight stays), rehabilitation (e.g., hospital inpatient, inpatient/outpatient rehabilitation), self-help/mutual aid and other (including e.g., school, family, friends, church). Table 1 reports the percentage of those receiving treatment at each site (e.g., 3.8 percent of the sample received SUD treatment in a criminal justice setting).

Independent variables

Following previous studies, we operationalized racial and ethnic group membership based on self-identified race-ethnicity: Latinx/Hispanic, White (non-Latino/non-Hispanic), and Black (non-Latinx/Non-Hispanic). Since we cannot theorize about sources of treatment for other racial-ethnic groups such as Asian Americans, Native Americans, and mixed racial-ethnic groups, and because their sample sizes diminish rapidly, these populations were excluded from analyses.

Health disparities' research, research in healthcare access, as well as prior studies using NSDUH data suggest a number of factors, besides race-ethnicity, that might explain variation between individuals' utilization of a particular source of SUD treatment. These factors are access, clients' socioeconomic characteristics and their clinical features. As shown in Table 1, source of treatment insurance, (i.e., type of insurance); socioeconomic factors, including levels of family income, education, unemployment status, age, gender, marital status and region, and; clinical or so-called need factors, comprising SUD diagnosis/severity, criminal history, health status, mental health co-morbidities, disability, and general health, make up the main sets of explanatory and control variables.

Table 1 provides details of the variables in our study. Estimates for NSDUH data are sample weight and design-adjusted.[9]

Analytic strategy

The primary goal of this study is to establish the extent to which race and ethnicity align with different sources of treatment, as well as to investigate the extent to which sources of treatment insurance,

Table 1. Descriptive statistics National Survey of Drug Use and Health adult respondents.[a]

| | Substance use disorder with past year SUD treatment 2002–2014[a] | | | | | | |
| | | | | | Adjusted t-tests[b] | | |
	Total (N = 6,207) Percent/SE	Whites (N = 4,578) Percent/SE	Blacks (N = 742) Percent/SE	Latinx (N = 887) Percent/SE	Wh v. Bl	Wh v. Lat	Bl v. Lat
Dependent variables – treatment setting (0,1)							
Criminal justice system	3.8 (0.33)	3.2 (0.35)	5.6 (1.10)	5.1 (1.38)	*		
Doctor's office	9.2 (0.73)	11.4 (0.99)	1.2 (0.32)	6.8 (1.38)	*	*	*
Hospital	1.3 (0.21)	1.2 (0.26)	1.1 (0.54)	2.1 (0.73)			
Rehabilitation facility	48.1 (1.04)	48.2 (1.14)	54.7 (2.89)	40.6 (3.25)	*	*	*
Self-help/mutual-aid	22.8 (0.94)	23.6 (1.07)	18.1 (2.25)	24.0 (2.83)	*		*
Other – not specified	5.8 (0.50)	5.3 (0.62)	5.4 (1.07)	8.7 (1.15)		*	*
Source of treatment insurance							
Private insurance	41.8 (1.09)	47.4 (1.31)	26.5 (2.71)	29.6 (2.45)	*	*	
Medicare	7.9 (0.61)	7.6 (0.75)	10.6 (1.58)	6.7 (1.73)			*
Medicaid	21.0 (0.81)	16.6 (0.77)	36.3 (2.66)	27.1 (2.77)	*	*	*
Other public insurance	8.3 (0.54)	7.2 (0.61)	15.0 (1.93)	6.7 (1.38)	*		*
No insurance	29.0 (1.01)	28.2 (1.22)	25.5 (2.23)	36.7 (3.14)		*	*
Socioeconomic correlates							
Black (=1)	14.8 (0.82)	–	–	–			
Latinx (=1)	14.0 (0.72)	–	–	–			
Family income <$20,000	35.6 (0.90)	31.0 (1.05)	51.8 (2.63)	41.5 (2.92)	*	*	*
$20,000–49,999	34.5 (1.08)	33.7 (1.17)	34.8 (2.90)	38.2 (3.11)			
$50,000–74,999	12.7 (0.73)	14.0 (0.91)	7.9 (1.18)	11.2 (2.09)	*		
$75,000 plus	17.3 (0.99)	21.3 (1.22)	5.5 (1.22)	9.2 (1.60)	*	*	*
Education < High school	24.7 (0.94)	18.5 (1.03)	35.3 (2.69)	44.6 (3.15)	*	*	*
High school grad	35.4 (1.06)	36.0 (1.34)	38.5 (3.02)	29.5 (2.33)		*	*
Some college	28.4 (0.90)	31.6 (1.08)	21.2 (2.36)	20.1 (2.58)	*	*	
College grad	11.4 (0.75)	13.9 (0.89)	4.9 (1.44)	5.8 (1.63)	*	*	
Unemployed (=1)	20.1 (0.75)	21.0 (0.95)	14.8 (2.08)	21.1 (2.36)	*		*
Age							
Age 18–25	28.4 (0.68)	29.8 (0.84)	16.9 (1.51)	33.3 (2.24)	*		*
Age 26–35	23.0 (0.93)	23.4 (0.98)	17.0 (2.21)	27.1 (2.31)	*		*
Age 36 and older	48.6 (1.11)	46.8 (1.22)	66.1 (2.46)	39.7 (2.79)	*	*	*
Male (=1)	68.7 (1.04)	65.7 (1.30)	72.8 (2.14)	79.1 (2.23)	*	*	*
Married (=1)	21.4 (1.01)	22.0 (1.16)	16.3 (2.25)	23.7 (3.05)	*		*
Residence							
Metro area	55.1 (0.94)	49.6 (1.17)	70.3 (2.63)	67.0 (2.17)	*	*	
City area	30.3 (0.86)	32.6 (1.07)	21.5 (2.22)	27.9 (2.18)	*	*	*
Non metro	14.6 (0.57)	17.8 (0.75)	8.2 (1.58)	5.1 (0.98)	*	*	*
Criminal history	51.9 (0.84)	49.7 (1.15)	54.5 (2.89)	60.7 (2.83)		*	*
Clinical characteristics							
Alcohol abuse past year	22.6 (0.76)	20.9 (0.89)	24.4 (2.33)	29.0 (2.78)		*	
Alcohol dependence past year	51.7 (0.91)	53.2 (1.12)	47.9 (2.98)	48.0 (3.18)			
Illicit drug abuse past year	8.6 (0.56)	7.6 (0.58)	12.6 (1.91)	9.4 (1.70)	*		
Illicit drug dependence past year	42.6 (0.92)	41.8 (1.19)	48.8 (2.67)	40.0 (2.80)	*		*
Severe mental illness past year	14.3 (0.80)	16.2 (1.01)	9.4 (1.67)	9.9 (1.79)	*	*	
Major depressive episode	16.3 (0.77)	17.8 (0.93)	12.5 (2.11)	13.0 (1.95)	*	*	
Functional limitations disability	13.4 (0.75)	12.0 (0.82)	21.8 (2.32)	11.6 (1.79)	*		*
Poor health	4.0 (0.46)	3.7 (0.54)	3.9 (1.10)	5.3 (1.46)			
Fair health	16.2 (0.79)	15.0 (0.90)	20.2 (2.27)	17.6 (2.24)	*		
Good health	34.5 (0.91)	34.3 (1.01)	31.7 (2.74)	38.5 (2.96)			*
Very good health	32.0 (1.04)	34.1 (1.20)	28.6 (2.64)	24.9 (2.38)	*	*	
Excellent health	13.3 (0.69)	12.8 (0.74)	15.7 (1.81)	13.6 (2.02)			

[a]Samples weight- and design- adjusted: see series NSDUH releases 2002-2014 as well as later versions: https://www.samhsa.gov/data/data-we-collect/nsduh-national-survey-drug-use-and-health.
[b]Rao-Scott adjusted contrasts df. 168, p < .05.

socioeconomic correlates of treatment, and client clinical features explain utilization of SUD treatment in a particular setting. Generally, expectations point to significant racial-ethnic differences between treatment received through the criminal justice system for Blacks/Latinx (as well as resource-disadvantaged groups, e.g., those without insurance, lower income, fewer educational resources, and so on; See Pro et al., 2019), compared with treatment in private healthcare systems, such as drug and alcohol treatment services provided in a doctor's office (i.e., for Whites and resource-advantaged groups). Note, prior studies using NSDUH data found that socioeconomic status, such as lower educational attainment and income, *increased* the likelihood of substance use disorder treatment overall (SAMHSA, 2013). We argue that disaggregating setting will help us better understand prior findings that run counter to a health disparities framework.

To address these questions, we use six separate logistic regressions for each dependent variable (Hosmer & Lemeshow, 2000). These are weight- and design- adjusted to meet criteria for complex sampling designs (see SAMHSA, 2020). Odds ratios for independent variables predict, that, given some configuration of background characteristics (e.g., type of insurance, socioeconomic correlates, clinical traits) the likelihood of having received treatment in a setting, such as the criminal justice system, doctor's office, a hospital ER, will be significantly greater (or lesser) than the other settings. We use this separate-regressions-strategy rather than a single multinomial regression because while both give similar results (e.g., see Cramer & Ridder, 1991; but cf. Agresti, 2002), preserving degrees of freedom under complex sampling adjustments, especially in these NSDUH data, provided more accurate results. In addition, multinomial models theoretically imply selection of one outcome versus another (or ordered others), while our theoretical framework simply suggests differences between one outcome and all other possible outcomes (see discussion in e.g., Biesheuvel et al., 2008).

There are three models for each of the six dichotomous dependent variables. Each model represents a step in the analyses of SUD treatment setting. Because prior studies have uncovered a number of confounding relations between these three sets of variables, close examination of each step of the model provides relevant information. First, we determine whether race-ethnicity is related to treatment source. Second, we control for client clinical features in case these impact the other relationships. Third, since sources of treatment insurance and socioeconomic status are theorized to impact SUD treatment utilization and will vary by setting, we include these in the full model.

Results

Sample characteristics

Figure 1 serves two purposes: 1) it provides a snapshot of the steps we took to filter cases of those with an SUD diagnosis (n = 63,586) who received treatment (n = 6,207) in order to understand where they received that treatment; and 2) it shows differences in receipt of *any* substance use disorder treatment (i.e., a hospital (inpatient), rehabilitation facility (inpatient or outpatient), mental health center, and including emergency room, private doctor's office, or criminal legal system), as well as in receipt of *specialty* SUD treatment (i.e., hospital (inpatient), rehabilitation facility (inpatient or outpatient), or mental health center, only) for Blacks, Whites and Latinx. We include this figure to highlight the paradox that Blacks are more likely than Whites and Latinx to receive SUD treatment. About twelve percent of Blacks (12.3 percent), 9.8 percent of Whites and 9.2 percent of Latinx received any substance use disorder treatment and 9.1 percent of Blacks, 6.8 percent of Whites, and 5.0 percent of Latinx received specialty treatment.

Table 1 (above) disaggregates these treatment settings as well as providing basic descriptive information about the sample. Design- and weight-corrected estimates of differences between racial and ethnic groups are included. As expected, given our theoretical framework, Blacks were more likely than Whites (but not Latinx) to have received SUD treatment in the criminal justice system (5.6 percent versus 3.2 percent), but least likely of all three groups have gotten treatment in a doctor's office (1.2 percent compared to Whites 11.4 percent and Latinx 6.8 percent).
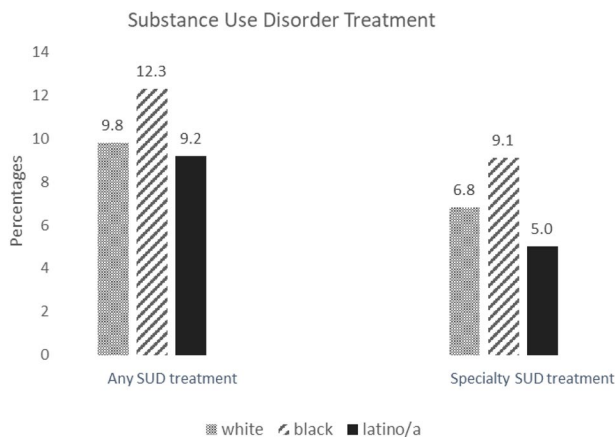
Figure 1. Substance use disorder treatment settings for those with an SUD diagnosis (n = 63,586). Percentages are based on design- and weight-adjusted samples. Design- and weight- corrected contrasts p<.05 for "Any SUD treatment: Bl > Wh and Latinx; Design- and weight- corrected contrasts p<.05 for "Specialty SUD treatment: Bl > Wh and Latinx, Wh > Latinx.
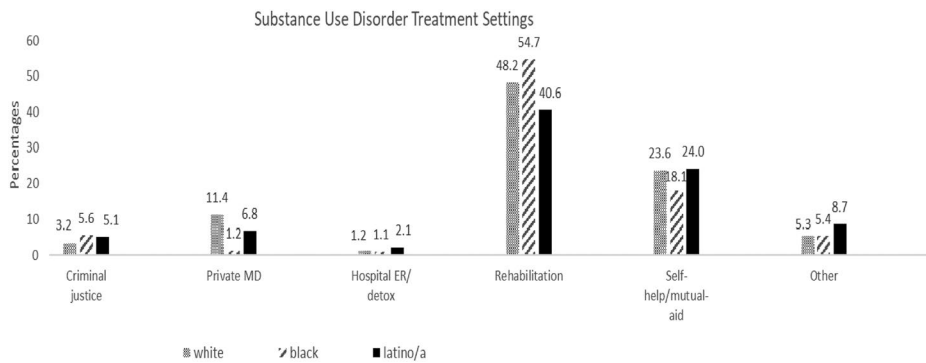
Figure 2. Substance use disorder treatment settings for those with an SUD diagnosis and source of treatment (n = 6,207). Percentages are based on design- and weight-adjusted samples. See Table 1 for Rao-Scott adjusted contrasts.

Other notable differences between groups included: private treatment insurance (Whites were more likely than Blacks and Latinx to have it, while Blacks were more likely to have Medicaid or other public insurance); criminal justice involvement (Blacks and Whites had similar rates 54.5 percent and 49.7 percent, which were less than Latinx 60.7 percent); SUD alcohol and/or drug abuse and dependence (Blacks were more likely than Whites to have illicit drug problems).

Racial-ethnic and SUD treatment settings

Figure 2 depicts racial-ethnic treatment differences providing a visualization of the data in Table 1. In this analysis, race-ethnicity are expected to determine source of treatment, with racial and ethnic minorities receiving treatment in non-medical settings, while Whites have the financial means to access treatment in medical settings, such as private doctors' offices. Both Blacks and Latinx were more likely than Whites to receive treatment in criminal justice settings (5.6 percent, 5.1 percent and 3.2 percent, respectively) and less likely to obtain it in doctors' offices (1.2 percent, 6.8 percent versus 11.4 percent, respectively). As for inpatient and outpatient rehabilitation, Blacks were more likely than Whites and Whites more likely than Latinx to receive treatment in this setting (54.7 percent of Blacks, 48.2 percent of Whites, and 40.6 percent of Latinx). Contrary to expectations, Blacks were able to access services at rehabilitation sites more readily than Whites. As will become apparent when we examine Table 2, Black- White differences in utilization of treatment in rehabilitation settings become insignificant (but not White-Latinx differences) when clinical features of each subgroup are considered, as well as when both treatment

Table 2. Logistic regression models of substance use disorder treatment settings[a].

	Odds ratio (S.E.)								
	Model 1 criminal justice	Model 2 criminal justice	Model 3 criminal justice	Model 4 private MD	Model 5 private MD	Model 6 private MD	Model 7 hospital ER/ Detox	Model 8 hospital ER/ Detox	Model 9 hospital ER/ Detox
Black (=1) (White referent)	1.79 (0.25)*	1.73 (0.25)*	1.91 (0.28)*	0.09 (0.29)*	0.10 (0.28)*	0.16 (0.30)*	0.89 (0.54)	0.93 (0.52)	0.87 (0.57)
Latinx (=1) (White referent)	1.62 (0.31)	1.50 (0.31)	1.27 (0.30)	0.57 (0.24)*	0.60 (0.25)*	0.95 (0.26)	1.75 (0.44)	1.73 (0.45)	1.69 (0.42)
Source treatment insurance									
Insurance (reference: private)									
Medicare			1.35 (0.53)			1.11 (0.33)			1.20 (0.65)
Medicaid			0.84 (0.34)			0.55 (0.23)			1.43 (0.50)
Other public insurance			0.43 (0.54)			0.38 (0.34)*			3.05 (0.56)*
No insurance			1.22 (0.27)			0.45 (0.20)*			1.86 (0.48)
Socioeconomic correlates									
Family income (reference: <$20,000)									
$20,000–49,999			0.97 (0.22)			1.15 (0.17)			0.81 (0.43)
$50,000–74,999			0.71 (0.37)			1.83 (0.24)*			1.95 (0.65)
$75,000 plus			0.64 (0.31)			2.15 (0.22)*			0.86 (0.57)
Education (reference: < High school)									
High school grad			0.89 (0.25)			1.59 (0.24)*			2.25 (0.40)*
Some college			0.68 (0.26)			2.05 (0.23)*			1.67 (0.45)
College grad			0.98 (0.35)			2.12 (0.27)*			0.53 (0.88)
Unemployed (=1)			0.74 (0.21)			0.86 (0.19)			3.22 (0.39)*
Age (reference: 18–25)									
26–35			1.32 (0.23)			0.69 (0.20)			1.55 (0.38)
36 and older			0.64 (0.28)			0.68 (0.24)			0.89 (0.47)
Male (=1)			1.18 (0.23)			0.71 (0.16)*			0.77 (0.37)
Married (=1)			0.79 (0.37)			1.61 (0.23)*			1.20 (0.54)
Residence (reference: non metro)									
Large metro area			0.62 (0.28)			0.94 (0.20)			1.99 (0.43)
Small metro			0.73 (0.28)			0.84 (0.18)			1.81 (0.44)

(Continued)

Table 2. Continued.

					Odds ratio (S.E.)				
	Model 1 criminal justice	Model 2 criminal justice	Model 3 criminal justice	Model 4 private MD	Model 5 private MD	Model 6 private MD	Model 7 hospital ER/ Detox	Model 8 hospital ER/ Detox	Model 9 hospital ER/ Detox
Criminal history (=1)			4.79 (0.33)*			0.40 (0.17)*			0.55 (0.34)
Clinical characteristics									
Alcohol dependence (reference: alc abuse)		0.55 (0.23)*	0.63 (0.23)		1.06 (0.13)	0.95 (0.15)		1.35 (0.44)	1.31 (0.44)
Illicit drug dependence (reference: drug abuse)		0.82 (0.21)	0.86 (0.20)		0.91 (0.15)	0.98 (0.16)		0.64 (0.37)	0.55 (0.40)
Severe mental illness past year (reference: absent)		0.60 (0.32)	0.55 (0.35)		1.14 (0.28)	1.26 (0.28)		1.14 (0.42)	0.98 (0.41)
Major depressive episode (reference: absent)		0.47 (0.24)*	0.57 (0.25)*		1.31 (0.28)	1.16 (0.27)		0.81 (0.42)	0.76 (0.44)
Functional limitations - disability (=1)		0.56 (0.46)	0.64 (0.47)		0.99 (0.26)	1.35 (0.32)		1.04 (0.53)	1.51 (0.50)
Health (reference: excellent =1)									
Poor health		0.51 (0.79)	0.64 (0.83)		0.87 (0.38)	1.29 (0.40)		2.20 (0.64)	2.32 (0.61)
Fair health		0.99 (0.37)	1.17 (0.37)		0.62 (0.26)	0.74 (0.26)		0.74 (0.59)	0.75 (0.55)
Good health		0.54 (0.31)	0.60 (0.32)		1.00 (0.23)	1.05 (0.22)		1.06 (0.59)	1.05 (0.51)
Very good health		0.77 (0.25)	0.89 (0.26)		1.07 (0.22)	1.03 (0.21)		0.78 (0.50)	0.75 (0.47)

(Continued)

Table 2. Continued.

	Odds ratio (S.E.)								
	Model 10 rehab facility	Model 11 rehab facility	Model 12 rehab facility	Model 13 Sh/Ma	Model 14 Sh/Ma	Model 15 Sh/Ma	Model 16 other	Model 17 other	Model 18 other
Black (=1) (White referent)	1.30 (0.12)*	1.19 (0.13)	0.98 (0.13)	0.72 (0.15)*	0.80 (0.16)	0.80 (0.17)	1.02 (0.25)	1.08 (0.26)	1.15 (0.28)
Latinx (=1) (White referent)	0.73 (0.15)*	0.73 (0.14)*	0.67 (0.14)*	1.02 (0.17)	1.05 (0.16)	1.08 (0.18)	1.72 (0.19)	1.66 (0.18)*	1.65 (0.18)*
Source of treatment insurance									
Insurance (reference: private)									
Medicare			1.06 (0.20)			0.63 (0.30)			0.53 (0.56)
Medicaid			1.59 (0.13)*			0.64 (0.19)*			1.03 (0.25)
Other public insurance			1.67 (0.17)*			0.78 (0.24)			0.99 (0.36)
No insurance			1.49 (0.10)*			0.83 (0.13)			0.75 (0.22)
Socioeconomic correlates									
Family income (reference: <$20,000)									
$20,000–49,999			1.08 (0.11)			0.99 (0.13)			0.76 (0.20)
$50,000–74,999			0.79 (0.16)			0.95 (0.18)			0.71 (0.25)
$75,000 plus			0.86 (0.13)			0.93 (0.16)			0.61 (0.25)
Education (reference: < High school)									
High school grad			0.94 (0.11)			1.16 (0.16)			1.23 (0.23)
Some college			0.97 (0.13)			1.22 (0.16)			0.77 (0.22)
College grad			0.76 (0.19)			1.33 (0.22)			1.35 (0.39)
Unemployed (=1)			0.98 (0.09)*			1.11 (0.12)			0.76 (0.16)
Age (reference: 18–25)									
26–35			1.12 (0.09)			1.31 (0.13)*			0.47 (0.22)*
36 and older			1.43 (0.11)*			1.25 (0.13)			0.49 (0.24)*
Male (=1)			0.93 (0.11)			1.01 (0.12)			1.36 (0.20)
Married (=1)			0.82 (0.14)			1.05 (0.13)			1.05 (0.25)
Residence (reference: non metro)									
Large metro area			0.80 (0.11)			1.42 (0.14)*			0.85 (0.23)
Small metro			0.93 (0.13)*			1.02 (0.14)			1.34 (0.24)

(Continued)

Table 2. Continued.

					Odds ratio (S.E.)				
	Model 10 rehab facility	Model 11 rehab facility	Model 12 rehab facility	Model 13 Sh/Ma	Model 14 Sh/Ma	Model 15 Sh/Ma	Model 16 other	Model 17 other	Model 18 other
Criminal history (=1)			1.22 (0.10)*			1.17 (0.10)			0.73 (0.21)
Clinical characteristics									
Alcohol dependence (reference: alc abuse)		1.03 (0.09)	1.05 (0.09)		1.19 (0.10)	1.16 (0.10)		1.03 (0.22)	1.09 (0.20)
Illicit drug dependence (reference: drug abuse)		1.67 (0.10)*	1.67 (0.10)*		0.77 (0.12)*	0.81 (0.13)		0.63 (0.20)*	0.60 (0.21)*
Severe mental illness past year (reference: absent)		1.05 (0.19)	0.98 (0.20)		0.96 (0.26)	0.93 (0.27)		1.05 (0.43)	1.24 (0.42)
Major depressive episode (reference: absent)		0.95 (0.19)	0.99 (0.19)		1.26 (0.24)	1.24 (0.24)		0.69 (0.40)	0.65 (0.41)
Functional limitations - disability (=1)		1.91 (0.12)*	1.47 (0.13)*		0.47 (0.17)*	0.59 (0.18)*		0.48 (0.36)*	0.52 (0.43)
Health (reference: excellent = 1)									
Poor health		1.33 (0.29)	1.07 (0.29)		0.59 (0.40)	0.70 (0.41)		0.74 (0.65)	0.85 (0.68)
Fair health		1.08 (0.18)	0.93 (0.18)		0.81 (0.20)	0.89 (0.20)		1.43 (0.35)	1.60 (0.34)
Good health		1.15 (0.16)	1.08 (0.16)		0.95 (0.17)	0.99 (0.16)		1.01 (0.25)	1.07 (0.25)
Very good health		1.03 (0.15)	1.01 (0.14)		1.06 (0.17)	1.06 (0.17)		1.05 (0.25)	1.10 (0.25)

ᵃSamples weight- and design- adjusted: see 2014 NSDUH. Releases: https://www.samhsa.gov/data/data-we-collect/nsduh-national-survey-drug-use-and-health . *p < .05, Bonferroni

access (e.g., publicly funded treatment versus private insurance) and socio-economic correlates were introduced into the models.

Additional findings from Figure 2 complete the analyses of racial-ethnic sources of SUD treatment. Blacks were least likely to utilize self-help/mutual-aid (18.1 percent) while Latinx were most likely of the three sub-groups to utilize other sources of treatment (8.7 percent compared with 5.4 percent for Blacks and 5.3 percent for Whites). These other sources included school, church, family, and friends. All three groups were equally likely to have accessed a hospital ER/detox for SUD treatment.

Multivariate models: racial-ethnic sources of SUD treatment

Table 2 contains column headings for each of the six dependent variables for each set of explanatory variables entered into the model. For example, criminal justice system (0,1), Model 1, regresses utilization of treatment in the criminal justice system on race-ethnicity; Model 2 adds clinical characteristics to model 1; Model 3 then adds the SES variables.

The first set of models (i.e., models 1, 4, 7, 10, 13, and 16) for each dependent variable in Table 2 reinforces findings presented in Figure 2; Blacks and Latinx received treatment in the criminal justice system and in rehabilitation facilities (under some circumstances) and Whites in private doctors' offices and, relative to Latinx, in rehabilitation facilities, also. Whites and Latinx utilized self-help/mutual-aid, and Latinx were more likely to receive treatment in "other" settings, but only when clinical features along with socioeconomic correlates were modeled as covariates. That is, in other settings there was a suppression effect for White-Latinx utilization. Further analyses should develop theoretically sound arguments to distinguish so-called suppression effects from multicollinearity (Watson et al., 2013).

Based on the odds ratios; Blacks and Latinx were significantly more likely than Whites to receive treatment through the criminal justice system (OR = 1.79 and 1.62, respectively), and less likely to have received care in a doctor's office (OR=.09 and .57, respectively). This relationship was robust across the sets of covariates measuring access, socioeconomic resources and clinical characteristics (models 2-3). Of those covariates, utilization was explained by having a less severe substance use diagnosis (i.e., alcohol abuse versus dependence – significant only in model 2), and no major mental health issues, particularly vis-à-vis depression (significant in both models 2 and 3). Naturally, criminal history was significant, although access, along with other socioeconomic correlates were not.

Opposite relationships emerged in results of logistic regression of private doctor's office treatment on race-ethnicity, access, socioeconomic resources

and clinical features. In this set of regressions (models 4-6), being White versus Black (OR = 0.90) or Latinx (OR = 0.57), predicted a greater likelihood of treatment in a private doctor's office. While none of the clinical features were significantly related to treatment, treatment access through private insurance (as the referent category) relative to public insurance (OR = 0.38) and no insurance (OR = 0.45) was significant. A number of the dichotomous socioeconomic indicators were also significantly related to the odds of treatment in a private office. Having a higher income and educational attainment, being younger (18-25), female and married, predicted treatment in a doctor's office.

For hospital ER/Detox (models 7-9), race-ethnicity were not significant predictors of utilization although having public insurance (relative to private insurance, OR = 3.05), being unemployed (OR = 3.22) was. For SUD rehabilitation settings (models 10-12), while Blacks were more likely than Whites to receive treatment in a rehabilitation facility, and Whites more likely than Latinx (compare Figure 2 and model 10, Table 2), clinical characteristics such as drug dependence and disability eliminated the impact and significance of the Black-White effect (i.e., the odds ratio for Blacks compared to Whites was 1.30 in the model without clinical covariates and 1.19 in models with it). Socioeconomic correlates altered the expected race-ethnicity differential in the rehabilitation model (model 10 Table 2), completely (i.e., 0.98 for black-White odds and 0.67 for Latino-White odds, model 12).

Note that the full rehabilitation model (model 12) appears to be similar to the private doctor's office model (model 6) insofar as Whites have higher odds of treatment in this setting when access, socioeconomic resources and clinical factors are taken into account, except that, whereas in the doctor's office model treatment was dependent on clients with a clear resource advantage such as higher income and education, in the rehabilitation model, it is resource *disadvantage*, such a lower income and education, and public (or no) insurance, including having a criminal history (OR = 1.22 in the rehab model 12 and OR = 0.40 in the private doctor's office model 6), that seems to improve Whites' (versus Blacks' and Latinx') odds of treatment receipt. In addition, clinical covariates, drug dependence and disability, enhanced the odds of rehabilitation treatment but not getting treatment in a doctor's office. Importantly, the reversal of the Black-White-Latinx relationship in model 12 resembles Le Cook and Alegria's (OR = 2011) findings showing a White treatment advantage in "specialty treatment" settings.

Lastly, for self-help/mutual-aid and "other" sources of treatment, the results were as nuanced as in previous models 1 through 12. There was no independent race-ethnicity effect in self-help/mutual-aid models 13,14 and 15, while for "other" sources of treatment models 16, 17 and 18,

Latinx, relative to Whites, were more likely to report receipt of treatment in this setting. Having Medicaid predicted utilization of self-help/mutual-aid (Or = 0.64) as did ages 26-35, living in a city and not having a disability. For "other," as noted, Latinx were more likely than Whites to have indicated this site as the source of their SUD treatment. They were also younger, and were more likely to have had a drug abuse problem relative to being drug dependent.

Discussion

Studies of racial-ethnic disparities in substance use disorder treatment frequently uncover paradoxical results in that, compared with most healthcare research demonstrating uniform barriers to access and utilization of services among racial-ethnic and resource-disadvantaged populations, research in substance use disorder treatment shows cross-population parity, and even a racial-ethnic minority treatment advantage. [10]

What accounts for the anomaly? In this study we argue that race and ethnicity correlate with differential allocation of healthcare resources which sorts groups into different SUD treatment settings. Although we have used the language of utilization and initiation (i.e., individual agency) consistent with previous health research, the issue is less about individual choice and more about access to treatment conditioned by structural opportunities and barriers, which are largely racialized (Williams et al. 2019). We tested this argument by examining whether the odds of utilization of SUD treatment in a particular setting are associated with race-ethnicity and/or some race-ethnicity-related factor such as private/public health insurance. This fills an important gap in the literature in that disparities research has not explicitly modeled racial-ethnic variation across the full range of SUD treatment sites. Doing so helps make sense of previous studies in the healthcare access and utilization literature which show under some conditions, cross-population parity, and even a racial-ethnic minority treatment advantage, and under others, the expected minority bias.

We now know that racial-ethnic disparities in SUD treatment vary across treatment settings ranging from criminal justice to inpatient and outpatient rehabilitation to informal settings such as school, church and family. Adjusting for covariates, race-ethnicity explained utilization of treatment in criminal justice settings, doctors' offices, rehabilitation facilities, and "other" settings, but not hospital ER/detox or self-help/mutual-aid. As Mendoza et al. (2019) argue, the racialization of substance use disorders yields different policy and clinical responses which often criminalizes addiction for Blacks and Latinos (and other nonwhites) and medicalizes it for Whites. Reasons for the persistence of a racial-ethnic disparities'

effect on utilization are therefore likely to be discovered in the institutional histories of different settings vis-a-vis the manner in which they process different racial-ethnic groups (Rafalovich, 2020).

Study limitations

To explain racial-ethnic disparities in SUD treatment, studies of utilization would benefit from crucial firm-level data specifying, at minimum, type and quality of SUD treatment received in the identified settings. This information is lacking in most individual-level treatment studies. [11] While it is safe to argue that there will be important differences in the quality of public, compared to private sources of treatment, our data do not contain detailed information about the kinds and qualities of services provided or received by respondents of the NSDUH survey. For example, in research related to treatment in criminal justice settings (Finlay, 2020; Pro et al., 2019), to understand racial-ethnic disparities in those settings, it is essential to define their treatment components more precisely than we have done here. Is criminal justice "treatment" produced by staff while offenders are under diversion, in jail or prison, or under parole or probation, or, is it out-sourced to other medical providers? Additionally, what are treatment protocols and how effective are they in criminal justice settings?

Parallel issues arise with respect to medical settings such as doctors' offices and inpatient- outpatient rehabilitation. Research needs to be supplemented with more detailed analyses of the mix of patient and program characteristics, and their impact of outcomes, in an array of treatment settings (see e.g., Melnick et al., 2011).

Conclusion

Despite these limitations, study results address gaps in our knowledge of SUD treatment. First, this study explored anomalies in racial-ethnic SUD treatment identified in previous studies. SAMHSA's SUD treatment reports suggesting minority group parity can be surprising, since we now know that the Black and (occasional) Latinx treatment utilization gains vary across treatment settings, which themselves, are likely to reflect disparities in service provision and quality (Matsuzaka & Knapp 2020). Whites, and those with resources are able to take advantage of treatment in settings in which the primary goal is medical care: private doctors' offices. Even in settings in which SUD treatment is a priority, such as specialty rehabilitation (model 12, Table 2), it is unclear which of the combined "rehabilitation" settings produced which kinds of disparities. For example, as noted, one limitation of these data is that we were unable to discern

whether the bivariate Black rehabilitation advantage pertained to settings with high performance protocols or ones in which Blacks are more likely to experience less than adequate treatment. [12] Nor do we know anything about our sample's treatment outcomes vis-à-vis the kind of program individuals attended. Future research would be more theoretically robust if it differentiated settings in greater detail, including descriptions of treatment modalities and protocols, investigating their link to treatment goals. It would also provide a better foundation for policy interventions since we cannot know who benefits from SUD interventions as long as we continue to believe that Black-White treatment parity is normative, or that disparities at worst, are simply a matter of accessibility (Alegría et al., 2016).

Hence, second, with regard to treatment policies, understanding the dynamics of these institutional settings has implications for evaluating the quality of treatment services under diverse organization regimens, and will help determine the likelihood of their success in equitable health promotion between racial-ethnic groups. While examining broad policy effects such as the implementation (and limitations) of the ACA, for instance, is important for improving treatment access, intensive sector analyses will reveal organization-level gaps in service provision and program quality (for instance, between both firms and between catchment areas), where intervention might be most effective in eliminating racial-ethnic disparities. Understanding the source of anomalies in racial-ethnic SUD treatment studies helps focus research in an effort to uncover real disparities between groups.

Notes

1. See also, SAMHSA Data Tables 2002 through 2019, https://www.samhsa.gov/data/data-we-collect/nsduh-national-survey-drug-use-and-health).
2. While definitions of SUD treatment modality are varied most SUD professionals argue that it covers services from 12-step groups to MAT to family therapy, among other approaches: see https://truthpharm.org/addiction-treatment/treatment-modalities/
3. SAMHSA (p. 55) TIP 24 cautions: "Understanding the specialized substance abuse treatment system, however, can be a challenging task. No single definition of treatment exists, and no standard terminology describes different dimensions and elements of treatment. Describing a facility as providing inpatient care or ambulatory services characterizes only one aspect (albeit an important one): the setting. Moreover, the specialized substance abuse treatment system differs around the country, with each State or city having its own peculiarities and specialties."
4. In the current study we have data on settings but not on the kinds of services (modalities) they offered.
5. This is not to argue that single setting- dichotomous study comparisons are not worthwhile. For a good example examining indigenous groups and residential/ nonresidential treatment see Toombs et al. (2021).
6. Note that SUD treatment under the auspices of the criminal justice system is provided by the state, by community-based nonprofit organizations contracted with the

state, and through informal service delivery systems such as self-help groups like Narcotics Anonymous (McCorkel, 2017).

7. In addition, our study does not predict variation in use of treatment settings over time, which would require more theoretical development than utilization and access research currently offers.

8. We separated the 2015-2019 data from 2002-2014 because in 2015, the RTI modified NSDUH alcohol and drug use/abuse/dependence survey questions which precludes merging 2002-2014 with post-2014 data. We would have liked to have pooled all of these years, 2002-2019, to achieve an adequate sample size for detailed subgroup analyses, but doing so would have breached SAMHSA recommendations. However, ongoing analysis of post- 2014 NSDUH data show that overtime differences in latent constructs, such as SUD treatment and alcohol and or drug abuse and or dependence, especially in pooled samples, may be negligible. We demonstrate this by replicating our 2002-2014 analyses with 2015-2019 data (not shown- available by request).

9. Because the NSDUH employs a multistage (stratified cluster) sample design, analyses using design- and weight- adjusted estimates were run. Design estimates are based on Rao and Scott (1984) procedures. See http://samhda-faqs.blogspot.com/ retrieved July 2020.

10. See SAMHSA Data Tables through 2019. Although the weight-adjusted percentages vary from year to year, the pattern of Black parity and occasional advantage is clear (e.g., 2019 NSDUH Releases: https://www.samhsa.gov/data/data-we-collect/nsduh-national-survey-drug-use-and-health).

11. Firm-level studies focus on these kinds of data; see e.g., Ducharme et al., 2006; Roman et al 2006.

12. See Melnick, Duncan &Thompson 2011 for a good example of this type of individual-frim analysis.

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Conflict of interest

The authors have no conflicting interests in this study or its data.

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