Published in final edited form as:

Drug Alcohol Depend. 2017 September 01; 178: 512–518. doi:10.1016/j.drugalcdep.2017.06.009.

Racial and ethnic differences in opioid agonist treatment for opioid use disorder in a U.S. national sample*

Noa Krawczyk[a], **Kenneth A. Feder**[a], **Michael I. Fingerhood**[a,b], and **Brendan Saloner**[a,c]

[a]Johns Hopkins Bloomberg School of Public Health, Department of Mental Health, 624 N. Broadway, Baltimore MD, 21205

[b]Johns Hopkins University School of Medicine, 733 N. Broadway, Baltimore MD, 21205

[c]Johns Hopkins Bloomberg School of Public Health, Department of Health Policy and Management, 624 N. Broadway, Baltimore, MD, 21205

Abstract

Background—Opioid Agonist Treatment (OAT) is the standard of care for the treatment of opioid use disorders. However, most people in treatment do not receive OAT. This study evaluated whether there are racial and/or ethnic differences in OAT receipt among adults entering specialty treatment for opioid use disorders in publicly-funded treatment programs across the U.S.

Methods—Using data from the national Treatment Episode Data Base, odds of OAT receipt were compared among black, Hispanic and white clients. Mediation analyses were used to explore whether any racial/ethnic differences in OAT receipt were explained by variation in clinical need or by other treatment, sociodemographic, or geographic characteristics. Interaction terms were used to assess whether this association was modified by primary opioid type.

Results—Only 28.7% of clients received OAT. Odds of OAT receipt were significantly higher odds among blacks (OR: 2.27(2.14–2.41)) and Hispanics (OR: 1.98(1.88–2.09)), compared to whites. Differences in clinical need accounted for a substantial portion of this difference (76.79% and 49.74%, respectively). Differences persisted after accounting for other potential explanatory variables (adjusted OR: 1.37 (1.24–1.52); 1.21(1.11–1.32)), but were only evident for primary heroin users (adjusted OR: 1.50 (1.34- 1.69); 1.29 (1.17–1.42)) and not other opioid users.

*Supplementary material can be found by accessing the online version of this paper at http://dx.doi.org and by entering doi….

Correspondence: Noa Krawczyk, Department of Mental Health, Johns Hopkins Bloomberg School of Public Health, 624 N. BroadwayHampton House Rm. 888 Baltimore, Maryland 21205, 914-629-6796, noa.krawczyk@jhu.edu.

Author Disclosures

Contributors

NK formulated the research question, completed the analyses, and drafted the manuscript. KAF formulated the research question, assisted with analyses and edited the manuscript. MIF contributed to the framework and content of the study and edited the manuscript. BS helped conceive the framework, research question and analysis methods, and edited the manuscript. All authors approved of the final manuscript before submission.

Conflicts of Interest

No conflict declared.

Conclusions—OAT receipt in treatment programs is low overall and particularly lacking among white heroin users. Differences in OAT receipt cannot be fully explained by differences in clinical need. More research is needed to understand and address barriers that underpin these differences so more patients with opioid use disorder can access evidenced-based treatment.

Keywords

opioid agonist treatment; opioid use disorder; racial disparities; medication assisted treatment; ethnic minorities; opioid treatment programs

1. Introduction

Increases in prescription opioid and heroin misuse over the past decade (Lipari and Hughes, 2015; Saha et al., 2016) have led to troubling rates of morbidity and mortality, including increases in opioid treatment admissions, emergency room visits, neonatal abstinence syndrome, and overdoses (Kolodny et al., 2015). Despite evidence in recent years that prescription opioid overdoses may be declining, heroin use is increasing (Compton et al., 2016) and overdoses involving heroin tripled from 2010 to 2015 (Hedegaard et al., 2017). Expanding access to evidence-based treatment is an essential component of addressing the opioid epidemic (Department of Health and Human Services, 2015; Saloner and Sharfstein, 2016).

When used appropriately, treatments involving the opioid agonist medications methadone or buprenorphine are clinically similar in their effectiveness (Mattick et al., 2014) and are considered the highest standard of care for treating opioid use disorders (OUDs). While there is ample evidence supporting their use over non-medication abstinence-based therapies (Veilleux et al., 2010; Volkow et al., 2014; Connery, 2015), most programs do not offer opioid agonist treatment (OAT) (Knudsen et al., 2011). Medication-stigma along with regulatory barriers often preclude the incorporation of medication into traditional substance use care (Hettema and Sorensen, 2009; Olsen and Sharfstein, 2014). Patients seeking methadone often experience long waiting lists and have to travel long distances to access treatment (Rosenblum et al., 2011; Gryczynski et al., 2011), and buprenorphine, which is commonly prescribed by office-based providers, also remains largely inaccessible due to a shortage of certified providers (Duncan et al., 2015). While buprenorphine prescribing has significantly risen over the past decade, the number of patients receiving methadone from opioid treatment programs remains stagnant, and capacity remains an important constraint (Jones et al., 2015a).

There is significant regional variability in the burden of opioid use and overdose deaths across the U.S. (Rossen et al., 2014). However, several studies show that opioid use has recently expanded from primarily minority and urban populations to suburban and rural communities where many users are white (Paulozzi and Xi, 2008; Keyes et al., 2014; Cicero et al., 2014). Despite this change, little is known about how race and ethnicity relate to access and utilization of OAT in specialty treatment programs. Although much has changed in recent years with regards to health insurance and parity protections, black and Hispanic clients have historically experienced greater barriers to care, less support services and lower

quality of care in substance use services than white clients (Wells et al., 2001; Alegría et al., 2006; Marsh et al., 2009). One study with injection drug users in Massachusetts found that African Americans were half as likely as Caucasians to enter methadone programs (Lundgren et al., 2001). Another more recent study compared OAT across neighborhoods in New York City and found that OAT availability has increased at the highest rates in areas with the highest income and the lowest percentage of black, Hispanic, and low-income residents (Hansen et al., 2016).

There is a lack of national research on differences in OAT receipt by race/ethnicity among patients in specialty treatment. Examining disparities in access to OAT can aid in the planning and execution of policies to promote evidence-based treatment across regions and populations affected by the opioid epidemic. This study uses the Treatment Episode Data Set – a sample of publicly funded substance use treatment episodes across the U.S. – to examine the following questions: 1) Among persons receiving specialty treatment for an OUD, are there racial or ethnic differences in the proportion of persons who receive OAT? 2) If racial or ethnic differences exist, to what extent are they explained by differences in clinical need? 3) Consistent with other health disparities research (Cook and Alegría, 2011; Saloner and Cook, 2013; Saloner et al., 2014), to what extent are differences not due to clinical need mediated by treatment setting, sociodemographic characteristics, or geographic factors that may differ across racial/ethnic groups? 4) Are any racial/ethnic differences observed similar across persons in treatment primarily for heroin versus primarily for other opioids?

2. Material and Methods

2.1 Source of Data

2.1.1 Data Set—Data were obtained from the 2014 Treatment Episode Dataset – Admissions (TEDS-A). The TEDS is managed by the Substance Abuse and Mental Health Services Administration (SAMHSA) and collects information on admissions and discharges from specialty substance use treatment programs in the 50 U.S. States, the District of Columbia and Puerto Rico. While the majority of substance use treatment programs in the U.S. are captured by this dataset, programs in private for-profit facilities that do not receive public funding, treatment occurring in certain hospitals or correctional settings, and treatment in private physician offices, including office-based buprenorphine prescribing, are excluded (SAMHSA, Center for Behavioral Health Statistics and Quality, n.d.).

2.1.2 Inclusion Criteria—Analyses were limited to treatment episodes in which clients were 18 years or older, and were admitted for treatment for heroin, other opiates and synthetics, or non-prescription methadone. Consistent with previous studies that have used this dataset (Marie et al., 2015), we limited analyses to observations in which a client had no prior treatment episodes to assure each record represents one unique client, as the possibility exists that the same client may be admitted to treatment more than once in a given year. We also excluded states that did not report information about whether OAT was used (Georgia, West Virginia, and Wyoming), or did not record OAT use in any treatment episodes (Idaho, Kansas, Montana, North Dakota, Oklahoma and Virginia). Finally, we only included clients who were non-Hispanic white, non-Hispanic black, or Hispanic of any race, as other ethnic

and racial groups made up less than 5% of this dataset. After these exclusions, a total of 106,622 treatment episodes were retained, of which 94,202 (88%) contained information on all variables of interest and were used in the complete case analysis. The variables with the highest percent missing information were for veteran status (5.25%) and homelessness status (2.23%). Appendix Table 1[1] contains information on the percent missing for each variable for which records were excluded.

2.2 Measures

2.2.1 Primary Variables—The primary outcome of interest was OAT receipt, a binary variable defined as whether or not methadone or buprenorphine was included in the client's treatment plan. Although the TEDS does not distinguish between these two types of medications, many of the facilities that provide OAT in this dataset are licensed opioid treatment programs, which for the most part dispense methadone (SAMHSA). The main predictor of interest was racial/ethnic group, which included non-Hispanic white, non-Hispanic black, or Hispanic of any race. Also of interest was whether the client was seeking treatment primarily for heroin or other opioids (which included the combined categories of "opiates and synthetics" and "non-prescription methadone") and clients were categorized based on the primary type of opioid targeted for treatment.

2.2.2 Potential Mediators—We examined five classes of mediators that could help explain any observed racial/ethnic differences in OAT receipt:

2.2.2.1 Clinical Need: We hypothesized five measures of clinical need may influence a clinician's decision about whether to provide OAT: 1) Age, as younger clients may be less likely to be prescribed OAT (Feder et al., 2017). 2) Opioid type, as heroin users may be more likely to utilize opioid treatment programs that provide OAT (SAMHSA, 2013). 3) Frequency and 4) Route of use, as more frequent and injection users with actual or perceived higher severity of disorder may be more likely to receive OAT. 4) Co-occurring use of alcohol or benzodiazepines, as this could contra-indicate use of OAT (McCance- Katz et al., 2010; Kampman and Jarvis, 2015).

2.2.2.2 Treatment Characteristics: We examined two treatment characteristics that could influence OAT receipt: 1) Treatment setting, as most licensed opioid treatment programs that dispense OAT are outpatient programs. 2) Referral source, as some referral sources, such as criminal justice settings, may be less likely to refer persons to OAT (Nunn et al., 2009).

2.2.2.3 Socio-demographic Characteristics: We also explored socio-demographic characteristics that could potentially explain racial/ethnic differences in OAT receipt: 1) Sex, 2) Educational attainment, 3) Employment status, and 4) Homelessness, which have all been explored as mediators of treatment access and outcomes in previous health disparities research (Cook and Alegría, 2011; Saloner and Cook, 2013); and 5) Veteran status, as veterans may have unique access to OAT via Veterans Health Administration facilities (Oliva et al., 2013).

[1]Supplementary material can be found by accessing the online version of this paper at http://dx.doi.org and by entering doi….

2.2.2.4 Geographic Characteristics: Given the known disparities in access to OAT across geographic regions in the U.S. (Sigmon, 2014), we assessed the influence of two geographic factors: 1) State where treatment was provided, and 2) Whether the client resided in a metro- or micropolitan of at least 10,000 residents (known as Core Based Statistical Areas (CBSA)).

2.3 Data Analysis

First, we estimated the unadjusted odds ratios of OAT receipt comparing black and Hispanic clients to white clients using logistic regression. As such crude differences may result from differences in clinical need factors that influence the use of OAT, we assessed racial/ethnic differences in OAT receipt after adjusting for differences in clinical need, and examined what proportion of the crude differences were mediated by need variables. Specifically, we used a two-stage method proposed by Kohler and Colleagues (2011) to adjust for rescaling bias that can occur when comparing logistic regression coefficients across regression models, by including in the logistic regression only residual variation in mediating variables unexplained by primary exposure variables (hereafter “KHB method”). This KHB method was used to estimate the proportion of the respective difference in OAT receipt among black, Hispanic and white clients mediated by clinical need variables (denoted as “percent mediated”).

If differences persisted after adjusting for need variables, we were interested in estimating whether remaining differences were mediated by treatment, sociodemographic, and geographic variables described above. To estimate these mediation effects, for each hypothesized mediating variable set, race/ethnicity coefficients from a logistic regression model that adjusted for both the block of hypothesized mediators and the clinical need variables were compared to race/ethnicity coefficients from a logistic regression model that adjusted only for need variables. These comparisons also used the KHB method and generated “percent mediated” estimates that denote the variability in the outcome explained by the variables in the mediator block. Lastly, we estimated a fully adjusted logistic regression model including all potential mediators, to see if there were remaining differences in OAT receipt across racial/ethnic groups after accounting for all explanatory variables.

In a third analysis, we tested for effect modification by primary opioid type (heroin vs. other opioids) on both unadjusted and fully adjusted models by including race/ethnicity by opioid type interaction terms in our regression models. Two additional sensitivity analyses were conducted to assure consistency of results. For the first analysis, we used a random intercept model in all regressions to account for clustering at the state level. In the second analysis, we performed a multiple imputation using chained equations (White et al., 2011) to account for any bias due to missing data on variables in the complete case analysis. Both sensitivity analyses revealed qualitatively similar results and did not change interpretations. Due to the large sample size, estimates are presented with 99% confidence intervals, with statistical significance assessed at the $p<0.001$ level. Analyses were conducted using STATA version 14 (StataCorp, 2014). KHB methods were implemented using the Stata package “khb” (Kohler et al., 2011).

3. Results

Among the 94,202 clients in specialty substance use treatment episodes included in the analysis, 76.7% were non-Hispanic white, 9.9% were non-Hispanic black, and 13.4% were Hispanic of any race. Primary heroin users comprised 59.8% of the sample, and primary other opioid users comprised 40.2%. A total of 28.7% of the sample received OAT as part of their treatment regimen. Characteristics related to clinical need, treatment setting, sociodemographics, and geographic location are presented in Table 1. Differences across racial/ethnic groups were all statistically significant at the $p<0.001$ level.

Odds ratios comparing the prevalence of OAT receipt among black and Hispanic clients compared to white clients are presented in Table 2. Also presented are percent-mediated statistics for each mediator block. In unadjusted analyses, black and Hispanic clients respectively had over and nearly a twofold odds of receiving OAT as compared to white clients ([OR=2.27(2.14–2.41)] and [OR=1.98(1.88–2.09)]). An estimated 76.8% of the black-white and 49.7% of the Hispanic-white crude differences were mediated by clinical need factors, but significant racial/ethnic differences persisted after accounting for need factors ([OR=1.23(1.15- 1.32)] and [OR=1.47(1.39–1.56), respectively]).

None of the remaining blocks of variables – treatment-setting characteristics, sociodemographic characteristics, or geographic characteristics – fully mediated the racial/ethnic differences in OAT that persisted after adjusting for clinical need. In fact, while adjusting for geographic characteristics attenuated differences in OAT receipt between black and Hispanic clients as compared to white clients, adjusting for treatment and sociodemographic differences actually exacerbated black-white differences (denoted by a negative percent mediated estimate), suggesting the differences in OAT receipt between these groups would be even larger were it not for the distribution of other treatment and sociodemographic characteristics among black and white clients. After adjusting for all covariates, the odds of OAT were still greater for black and Hispanic clients than white clients ([OR=1.37(1.24–1.52)] and [OR=1.21(1.11–1.32), respectively]), although the Hispanic-white difference was significantly attenuated. Detailed odds ratios from the logistic regression adjusted for all mediator variables are presented in Appendix Table II[2]; these odds ratios can be interpreted as the direct effects of each covariate on the odds of OAT receipt after controlling for other covariates.

Results of effect modification analyses by whether clients were in treatment primarily for heroin or other opioids are presented in Table 3. These results indicate that the association between race/ethnicity and OAT receipt differed considerably by whether the primary reason for admission was heroin or other opioids. Among heroin users, black and Hispanic clients had higher odds of OAT receipt as compared to whites in the unadjusted results and even after adjusting for all mediators of interest (OR=[1.50 (1.34- 1.69)] and OR= [1.29 (1.17–1.42)], respectively). By contrast, among other opioid users, there were no significant differences in odds of OAT receipt among racial/ethnic groups in either unadjusted or adjusted models.

[2]Supplementary material can be found by accessing the online version of this paper at http://dx.doi.org and by entering doi….

4. Discussion

4.1. Differences in OAT Receipt Across Racial/Ethnic Groups

Results suggest that less than a third of clients in specialty treatment programs across the U.S. are receiving OAT. We found that among primary heroin users, black and Hispanic clients were significantly more likely to receive OAT as part of their treatment regimen than white clients. This finding contrasts with other research that has explored the relationship between race/ethnicity and medication availability (Knudsen and Roman, 2009), and was unforeseen given ample evidence that minorities are often subject to a lower standard of care than white clients in health services (Mayberry et al., 2000; Smedley et al., 2002) and particularly in substance use care (Daley, 2005; Marsh et al., 2009). A host of factors have been identified in the process by which ethnic minorities often experience worse standards of care and treatment outcomes, including a lack of culturally competent care, health care policies and regulations that limit accessibility, clinician attitudes and biases, and other social and economic forces (Schmidt et al., 2006; Alegria et al., 2011). OUD treatment in specialty settings thus presents a rare case where white clients may actually be less likely to receive evidence-based care than black and Hispanic clients.

4.2. Differences in OAT Mediated by Clinical Need Factors

Much of the difference in OAT receipt across racial/ethnic groups was explained by clinical characteristics that differed across groups. Clinical need factors explained nearly 77% of differences in OAT receipt between black and white clients and nearly 50% of differences in OAT receipt between Hispanic and white clients, indicating that much of the disparities in OAT receipt are due to differential patterns of substance use and other clinical factors among these groups. Notably, characteristics including being older, using heroin, using opioids more frequently and using via injection or inhalation increased clients' odds of receiving OAT (Appendix Table II[3]). It is possible that black and Hispanic clients enter treatment programs for the first time after greater length of substance use or at more severe stages of disorder, and may therefore be more likely to receive OAT. However, as treatment guidelines recommend OAT as the standard of care for all patients with OUD (Kampman and Jarvis, 2015), it is concerning that only persons with more severe patterns of opioid use and who primarily use heroin are receiving OAT.

4.3. Differences in OAT Mediated by Treatment, Sociodemographic, and Geographic Factors

Overall, disparities in OAT receipt persisted across racial/ethnic groups after adjusting for all treatment, sociodemographic and geographic factors. And while adjusting for these factors further attenuated the difference in OAT receipt between Hispanic and white clients, it did little to explain differences in OAT receipt between black and white clients beyond what was already accounted for by clinical need.

Mediation analyses revealed that treatment setting characteristics greatly impacted whether a person received OAT: clients in non-intensive outpatient treatment and ambulatory

[3]Supplementary material can be found by accessing the online version of this paper at http://dx.doi.org and by entering doi….

detoxification were much more likely to receive OAT than in other treatment settings, although it is not possible to know whether these were licensed opioid treatment programs versus other treatment programs. Clients were also more likely to receive OAT if they were self-referred than if referred by any other source (Appendix Table II[3]). These mediators explained a significant proportion of the disparity in OAT receipt between Hispanic and white clients, but had a suppressing effect for black clients, in which disparities in OAT receipt would have been wider were it not for the distribution of treatment characteristics among these populations.

Sociodemographic characteristics, which have previously been found to explain several health disparities in substance use treatment across racial/ethnic groups (Saloner et al., 2014), had suppressing effects for both groups and especially for black clients: Had it not been for the distribution of other demographic characteristics other than race/ethnicity among these groups that made black and Hispanic clients less likely to receive OAT, the observed differences in OAT receipt would have been even wider.

Measures of geographic location, on the other hand, were found to mediate a large proportion of the racial/ethnic differences in OAT observed, especially between Hispanic and white clients. This was driven by certain states and micro/metropolitan areas having higher OAT participation (state odds ratios not shown). This is consistent with evidence of the shortage of capacity to meet demand for OAT in certain regions of the country and non-urban areas where there has been a surge in OUD, especially among white persons (Sigmon, 2006; Lenardson et al., 2009; Quest et al., 2012).

4.4. Effect Modification by Primary Opioid Type

Notably, effect modification analyses indicated that ethnic/racial disparities in OAT receipt were only evident among clients in treatment for heroin use, but not among those in treatment for other opioid use. In fact, all groups were less likely to receive OAT if they were in treatment primarily for other opioid use. This is noteworthy given heroin and other opioids are chemically similar and have all been indicated as best treated with OAT (Volkow, 2014). As non-heroin opioid users are often found to have less severe use and more favorable treatment outcomes than heroin users (Sigmon, 2006; Nielsen et al., 2015), it is possible that actual or perceived lower severity of disorder among non-heroin opioid users make them less inclined to seek or be indicated OAT upon first treatment admission.

Among clients primarily admitted for heroin use, black and Hispanic clients had significantly higher odds of OAT receipt than white clients. Likely contributing to this disparity is that prevalence of heroin use disorders is growing among white populations. Although heroin use has risen across most demographic groups, it has increased most sharply among non-Hispanic whites (Jones et al., 2015b) and evidence suggests that many whites that initiate heroin use previously misused prescription opioids (Martins et al., 2015; Martins et al., 2017). Providers who serve populations not historically affected by opioid use may lack training about OUD, and stigma in addition to regulatory and insurance obstacles may further bar integrating medication into existent treatment settings (Heinrich and Cummings, 2014). Treatment programs may therefore be more likely to rely on counseling

without medication to treat heroin users, which is concerning given increasing trends in heroin use and overdose risk (Hedegaard et al., 2017).

Clients who belong to racial and ethnic minority groups, whose communities have historically been affected by heroin use (DuPont, 1971; Greene, 1974), may be more likely to live in regions where there are long-existent specialty treatment programs and a greater availability of providers trained and licensed to administer OAT (Rosenblatt et al., 2015). Some authors have proposed that minorities are overrepresented in disadvantaged neighborhoods, and may thus be more likely to have public insurance coverage and access to publicly funded substance use treatment centers (Alegria et al., 2011). Still, significant stigma and negative attitudes towards OAT persist as a barrier to care among black and Hispanic communities (Zaller et al., 2009). It is possible that methadone, in particular, which is likely used in the majority of the treatment episodes in this data set, may be used more commonly to treat minority clients. White users may be more likely to receive buprenorphine from office-based physicians, but this hypothesis could not be tested here. More nuanced studies are needed to understand the complex relationship that race and ethnicity play into access, service utilization, and quality of OUD treatment.

4.5. Limitations

This study is subject to several limitations. First, this dataset excludes office-based buprenorphine prescribing, which plays a central role in provision of OAT in the U.S. Therefore, implications of this study are only relevant to the utilization of OAT in specialty substance use treatment programs. Moreover, as TEDS data does not specify whether the OAT received was methadone or buprenorphine, we are unable to capture how access to these two types of medications differs across racial/ethnic groups. This dataset also does not contain information about quality of treatment provided or treatment outcomes, including whether OAT was administered in clinically appropriate doses or in conjunction with adequate supportive services. Thus, more research is needed to understand the quality of care being provided in settings that offer OAT. Third, reporting guidelines for the TEDS vary by state, and nine states did not report information regarding OAT utilization. Furthermore, while our study attempted to control for urbanicity by adjusting for whether the treatment program was in a CBSA-designated area, this measure may misclassify some areas (Hall et al., 2006), and the TEDS coding system groups “unknown” counties with non-CBSA counties, which may further confound this relationship. More accurate measurement of geographic areas may help explain differences across groups. Health insurance was also not accounted for, as most states in this dataset do not report this variable, which may also influence eligibility and financial access to services that provide OAT. Lastly, this was a cross-sectional study, and causal inference is therefore limited.

5. Conclusions

This study highlights that OAT remains largely under-utilized for the treatment of OUD in specialty treatment programs across the U.S. It is troubling that the large majority of clients are still being treated for OUD without use of medications. As compared to OAT, non-medication treatment has much lower effectiveness (Mayet et al., 2005; Veilleux et al., 2010)

and may lead to more adverse outcomes, including higher risk of overdose (Jerry and Collins, 2013; Volkow et al., 2014; Connery, 2015). Unexpectedly, white clients who are primary heroin users were found to be significantly less likely to receive OAT than black and Hispanic clients. We believe this suggests that, in populations and communities that have seen recent dramatic increases in heroin use, access to OAT may be particularly lacking. The adoption of OAT as the recommended treatment by federal government agencies, as urged by the recent Surgeon General(U.S. Department of Health and Human Services (HHS), Office of the Surgeon General, 2016) and SAMHSA(SAMHSA, 2016), makes it ever more pressing that programs receiving public funding be held to treatment standards and be given the tools to administer evidence-based treatment that can help mitigate the harms of the ongoing opioid epidemic.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Role of Funding Source

This work was conducted with the support of a training grant by the National institute of Drug Abuse T32-DA007293 (PI: Renee Johnson). In addition, Kenneth A. Feder was supported as a pre-doctoral Department of Mental Health Scholar, Johns Hopkins Bloomberg School of Public Health.

References

Alegria M, Carson NJ, Goncalves M, Keefe K. Disparities in treatment for substance use disorders and co-occurring disorders for ethnic/racial minority youth. J Am Acad Child Adolesc Psychiatry. 2011; 50:22–31. [PubMed: 21156267]

Alegría M, Page JB, Hansen H, Cauce AM, Robles R, Blanco C, Cortes DE, Amaro H, Morales A, Berry P. Improving drug treatment services for hispanics: Research gaps and scientific opportunities. Drug Alcohol Depend. 2006; 84:S76–S84. [PubMed: 16781087]

Cicero TJ, Ellis MS, Surratt HL, Kurtz SP. The changing face of heroin use in the united states: A retrospective analysis of the past 50 years. JAMA Psychiatry. 2014; 71:821–826. [PubMed: 24871348]

Compton WM, Jones CM, Baldwin GT. Relationship between nonmedical prescription-opioid use and heroin use. N Engl J Med. 2016; 374:154–163. [PubMed: 26760086]

Connery HS. Medication-assisted treatment of opioid use disorder: Review of the evidence and future directions. Harv Rev Psychiatry. 2015; 23:63–75. [PubMed: 25747920]

Daley MC. Race, managed care, and the quality of substance abuse treatment. Adm Policy Ment Health. 2005; 32:457–476. [PubMed: 15844860]

Department of Health and Human Services. Opioid Abuse in the US and HHS Actions to Address Opioid-Drug Related Overdoses and Deaths. Department of Health and Human Services; Washington, D.C.: p. 2015

Duncan LG, Mendoza S, Hansen H. Buprenorphine maintenance for opioid dependence in public sector healthcare: Benefits and barriers. J Addict Med Ther Sci. 2015; 1:31. [PubMed: 27088135]

DuPont RL. Profile of a heroin-addiction epidemic. N Engl J Med. 1971; 285:320–324. [PubMed: 5091324]

Feder KA, Krawczyk N, Saloner B. Medication-assisted treatment for adolescents in specialty treatment for opioid use disorder. J Adoles Health. 2017; 60:747–50.

Greene MH. An epidemiologic assessment of heroin use. Am J Public Health. 1974; 64(Suppl 12):1–10.

Gryczynski J, Schwartz RP, Salkever DS, Mitchell SG, Jaffe JH. Patterns in admission delays to outpatient methadone treatment in the United States. J Subst Abuse Treat. 2011; 41:431–439. [PubMed: 21821378]

Hall SA, Kaufman JS, Ricketts TC. Defining urban and rural areas in US epidemiologic studies. J Urban Health. 2006; 83:162–175. [PubMed: 16736366]

Hansen H, Siegel C, Wanderling J, DiRocco D. Buprenorphine and methadone treatment for opioid dependence by income, ethnicity and race of neighborhoods in New York City. Drug Alcohol Depend. 2016; 164:14–21. [PubMed: 27179822]

Hedegaard H, Warner M, Miniño AM. Drug overdose deaths in the United States, 1999–2015. NCHS Data Brief. 2017

Heinrich CJ, Cummings GR. Adoption and diffusion of evidence- based addiction medications in substance abuse treatment. Health Serv Res. 2014; 49:127–152. [PubMed: 23855719]

Hettema JE, Sorensen JL. Access to care for methadone maintenance patients in the United States. Int J Ment Health Addict. 2009; 7:468–474. [PubMed: 22876215]

Jerry JM, Collins GB. Medication-assisted treatment of opiate dependence is gaining favor. Cleve Clin J Med. 2013; 80:345–349. [PubMed: 23733899]

Jones CM, Campopiano M, Baldwin G, McCance- Katz E. National and state treatment need and capacity for opioid agonist medication-assisted treatment. Am J Public Health. 2015a; 105:e55–63.

Jones CM, Logan J, Gladden RM, Bohm MK. Vital signs: Demographic and substance use trends among heroin users - United States, 2002–2013. MMWR Morb Mortal Wkly Rep. 2015b; 64:719–725. [PubMed: 26158353]

Kampman K, Jarvis M. American society of addiction medicine (ASAM) national practice guideline for the use of medications in the treatment of addiction involving opioid use. J Addict Med. 2015; 9:358–367. [PubMed: 26406300]

Keyes KM, Cerdá M, Brady JE, Havens JR, Galea S. Understanding the rural– urban differences in nonmedical prescription opioid use and abuse in the United States. Am J Public Health. 2014; 104:e52–e59. [PubMed: 24328642]

Knudsen HK, Roman PM. Racial and ethnic composition as a correlate of medication availability within addiction treatment organizations. Sociol Focus. 2009; 42:133–151. [PubMed: 20414366]

Knudsen HK, Abraham AJ, Roman PM. Adoption and implementation of medications in addiction treatment programs. J Addict Med. 2011; 5:21–27. [PubMed: 21359109]

Kohler U, Karlson KB, Holm A. Comparing coefficients of nested nonlinear probability models. Stata J. 2011; 11:420–438.

Kolodny A, Courtwright DT, Hwang CS, Kreiner P, Eadie JL, Clark TW, Alexander GC. The prescription opioid and heroin crisis: A public health approach to an epidemic of addiction. Annu Rev Public Health. 2015; 36:559–574. [PubMed: 25581144]

Lê Cook B, Alegría M. Racial-ethnic disparities in substance abuse treatment: The role of criminal history and socioeconomic status. Psychiatr Serv. 2011; 62:1273–1281. [PubMed: 22211205]

Lenardson, J., Race, M., Gale, J. Availability, characteristics, and role of detoxification services in rural areas (Working Paper #41). University of Southern Maine, Maine Rural Health Research Center; Portland, ME: 2009.

Lipari, R., Hughes, A. The NSDUH report: Trends in heroin use in the United States: 2002 to 2013. Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality; Rockville, MD: 2015. Available at: http://www.webcitation.org/6dhbHb7dJ on. 11

Lundgren LM, Amodeo M, Ferguson F, Davis K. Racial and ethnic differences in drug treatment entry of injection drug users in Massachusetts. J Subst Abuse Treat. 2001; 21:145–153. [PubMed: 11728788]

Marie BS, Sahker E, Arndt S. Referrals and treatment completion for prescription opioid admissions: Five years of national data. J Subst Abuse Treat. 2015; 59:109–114. [PubMed: 26362002]

Marsh JC, Cao D, Guerrero E, Shin H. Need-service matching in substance abuse treatment: Racial/ethnic differences. Eval Program Plann. 2009; 32:43–51. [PubMed: 19019434]

Martins SS, Santaella-Tenorio J, Marshall BD, Maldonado A, Cerdá M. Racial/ethnic differences in trends in heroin use and heroin-related risk behaviors among nonmedical prescription opioid users. Drug Alcohol Depend. 2015; 151:278–283. [PubMed: 25869542]

Martins SS, Sarvet A, Santaella-Tenorio J, Saha T, Grant BF, Hasin DS. Changes in US lifetime heroin use and heroin use disorder: Prevalence from the 2001–2002 to 2012–2013 national epidemiologic survey on alcohol and related conditions. JAMA Psychiatry. 2017; 74:445–455. [PubMed: 28355458]

Mattick, RP., Breen, C., Kimber, J., Davoli, M. Buprenorphine maintenance versus placebo or methadone maintenance for opioid dependence. The Cochrane Library; 2014.

Mayberry RM, Mili F, Ofili E. Racial and ethnic differences in access to medical care. Med Care Res Rev. 2000; 57:108–145. [PubMed: 11092160]

Mayet, S., Farrell, M., Ferri, M., Amato, L., Davoli, M. Psychosocial treatment for opiate abuse and dependence. The Cochrane Library; 2005.

McCance- Katz EF, Sullivan LE, Nallani S. Drug interactions of clinical importance among the opioids, methadone and buprenorphine, and other frequently prescribed medications: A review. Am J Addict. 2010; 19:4–16. [PubMed: 20132117]

Nielsen S, Hillhouse M, Mooney L, Ang A, Ling W. Buprenorphine pharmacotherapy and behavioral treatment: Comparison of outcomes among prescription opioid users, heroin users and combination users. J Subst Abuse Treat. 2015; 48:70–76. [PubMed: 25065489]

Nunn A, Zaller N, Dickman S, Trimbur C, Nijhawan A, Rich JD. Methadone and buprenorphine prescribing and referral practices in US prison systems: Results from a nationwide survey. Drug Alcohol Depend. 2009; 105:83–88. [PubMed: 19625142]

Oliva EM, Trafton JA, Harris AH, Gordon AJ. Trends in opioid agonist therapy in the veterans health administration: Is supply keeping up with demand? Am J Drug Alcohol Abuse. 2013; 39:103–107. [PubMed: 23421571]

Olsen Y, Sharfstein JM. Confronting the stigma of opioid use disorder—and its treatment. JAMA. 2014; 311:1393–1394. [PubMed: 24577059]

Paulozzi LJ, Xi Y. Recent changes in drug poisoning mortality in the United States by urban–rural status and by drug type. Pharmacoepidemiol Drug Saf. 2008; 17:997–1005. [PubMed: 18512264]

Quest TL, Merrill JO, Roll J, Saxon AJ, Rosenblatt RA. Buprenorphine therapy for opioid addiction in rural Washington: The experience of the early adopters. J Opioid Manag. 2012; 8:29–38. [PubMed: 22479882]

Rosenblatt RA, Andrilla CH, Catlin M, Larson EH. Geographic and specialty distribution of US physicians trained to treat opioid use disorder. Ann Fam Med. 2015; 13:23–26. [PubMed: 25583888]

Rosenblum A, Cleland CM, Fong C, Kayman DJ, Tempalski B, Parrino M. Distance traveled and cross-state commuting to opioid treatment programs in the United States. J Environ Public Health. 2011; 2011:948789. [PubMed: 21776440]

Rossen LM, Khan D, Warner M. Hot spots in mortality from drug poisoning in the United States, 2007–2009. Health Place. 2014; 26:14–20. [PubMed: 24333939]

Rudd RA. Increases in drug and opioid-involved overdose Deaths—United States, 2010–2015. MMWR Morb Mortal Wkly Rep. 2016; 65

Saha TD, Kerridge BT, Goldstein RB, Chou SP, Zhang H, Jung J, Pickering RP, Ruan WJ, Smith SM, Huang B. Nonmedical prescription opioid use and DSM-5 nonmedical prescription opioid use disorder in the United States. J Clin Psychiatry. 2016; 77:772–780. [PubMed: 27337416]

Saloner B, Carson N, Lê Cook B. Explaining racial/ethnic differences in adolescent substance abuse treatment completion in the United States: A decomposition analysis. J Adolesc Health. 2014; 54:646–653. [PubMed: 24613095]

Saloner B, Le Cook B. Blacks and hispanics are less likely than whites to complete addiction treatment, largely due to socioeconomic factors. Health Aff (Millwood). 2013; 32:135–145. [PubMed: 23297281]

Saloner B, Sharfstein J. A stronger treatment system for opioid use disorders. JAMA. 2016; 315:2165–2166.

SAMHSA. Medication-Assisted Treatment. 2016; 2016 http://www.samhsa.gov/medication-assisted-treatment.

SAMHSA, Center for Behavioral Health Statistics and Quality. TEDS-Treatment Episode Data Set. 2015 n.d. http://wwwdasis.samhsa.gov/webt/information.htm.

Schmidt L, Greenfield T, Mulia N. Unequal treatment: Racial and ethnic disparities in alcoholism treatment services. Alcohol Res Health. 2006; 29:49. [PubMed: 16767854]

Sigmon SC. Access to treatment for opioid dependence in rural America: Challenges and future directions. JAMA Psychiatry. 2014; 71:359–360. [PubMed: 24500040]

Sigmon SC. Characterizing the emerging population of prescription opioid abusers. Am J Addict. 2006; 15:208–212. [PubMed: 16923666]

Smedley, BD., Stith, AY., Nelson, AR. Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care (Full Printed Version). National Academies Press; 2002.

StataCorp. Stata Statistical Software: Release 14. StataCorp LP; College Station, TX: 2014.

Substance Abuse and Mental Health Services Administration. 2011 Opioid Treatment Program (OTP) Survey: Data on Substance Abuse Treatment Facilities with OTPs. Rockville, MD: 2013. Substance Abuse and Mental Health Services AdministrationBHSIS Series S-65, HHS Publication No. (SMA) 14-4807

US Department of Health and Human Services (HHS), Office of the Surgeon General. Facing Addiction in America: The Surgeon General's Report on Alcohol, Drugs, and Health. HHS; Washington, DC: 2016.

Veilleux JC, Colvin PJ, Anderson J, York C, Heinz AJ. A review of opioid dependence treatment: Pharmacological and psychosocial interventions to treat opioid addiction. Clin Psychol Rev. 2010; 30:155–166. [PubMed: 19926374]

Volkow, ND. America's addiction to opioids: Heroin and prescription drug abuse. Senate Caucus on International Narcotics Control; Washington, DC: 2014.

Volkow ND, Frieden TR, Hyde PS, Cha SS. Medication-assisted therapies— tackling the opioid-overdose epidemic. N Engl J Med. 2014; 370:2063–2066. [PubMed: 24758595]

Wells K, Klap R, Koike A, Sherbourne C. Ethnic disparities in unmet need for alcoholism, drug abuse, and mental health care. Am J Psychiatry. 2001; 158:2027–2032. [PubMed: 11729020]

White IR, Royston P, Wood AM. Multiple imputation using chained equations: Issues and guidance for practice. Stat Med. 2011; 30:377–399. [PubMed: 21225900]

Zaller ND, Bazazi AR, Velazquez L, Rich JD. Attitudes toward methadone among out-of-treatment minority injection drug users: Implications for health disparities. Int J Environ Res Public Health. 2009; 6:787–797. [PubMed: 19440415]

Highlights

- Opioid agonist therapies are underutilized in specialty substance use disorder (SUD) treatment programs
- Whites are less likely to receive opioid agonist therapy than blacks and Hispanics
- Differences in opioid agonist receipt only partially explained by clinical factors
- Disparities in opioid agonist receipt are only evident among primary heroin users

Table 1

Characteristics of Sample by Race/Ethnicity

	Non-Hispanic White N=72,270 (76.7%)	Non-Hispanic Black N= 9,350 (9.9%)	Hispanic (any race) N=12,582 (13.4%)	Total N=94,202
OAT Receipt	18,041 (25%)	4,023 (43%)	5,002 (39.8%)	27,066 (28.7%)
Clinical Need Characteristics				
Age in Years				
18–24	18429 (25.5%)	832 (8.9%)	2625 (20.9%)	21886 (23.2%)
24–34	33739 (46.7%)	1884 (20.1%)	4420 (35.1%)	40043 (42.5%)
35–44	11941 (16.5%)	1910 (20.4%)	2709 (21.5%)	16560 (17.6%)
45–54	5723 (7.9%)	2972 (31.8%)	2005 (15.9%)	10700 (11.4%)
55 and over	2438 (3.4%)	1752 (18.7%)	823 (6.5%)	5013 (5.3%)
Primary Opioid Type				
Heroin	39698 (54.9%)	7174 (76.7%)	9496 (75.5%)	56368 (59.8%)
Other Opioids	32572 (45.1%)	2176 (23.3%)	3086 (24.5%)	37834 (40.2%)
Frequency of Opioid Use				
No use in past month	14893 (20.6%)	1433 (15.3%)	2311 (18.4%)	18637 (19.8%)
Few to mult. times in past month	6098 (8.4%)	728 (7.8%)	1125 (8.9%)	7951 (8.4%)
Daily/near daily	51279 (71.0%)	7189 (76.9%)	9146 (72.7%)	67614 (71.8%)
Route of Administration				
Oral	19471 (26.9%)	1845 (19.7%)	2288 (18.2%)	23604 (25.1%)
Smoking	4156 (5.8%)	301 (3.2%)	1399 (11.1%)	5856 (6.2%)
Inhalation	12106 (16.8%)	4706 (50.3%)	2491 (19.8%)	19303 (20.5%)
Injection	34807 (48.2%)	2389 (25.6%)	6231 (49.5%)	43427 (46.1%)
Other	1730 (2.4%)	109 (1.2%)	173 (1.4%)	2012 (2.1%)
Alcohol/Benzodiazepine Use	14788 (20.5%)	1573 (16.8%)	1717 (13.6%)	18078 (19.2%)
Treatment Setting Characteristics				
Treatment Facility Type				
Non-intensive outpatient	31894 (44.1%)	4738 (50.7%)	6332 (50.3%)	42964 (45.6%)
Intensive outpatient	7112 (9.8%)	1278 (13.7%)	759 (6.0%)	9149 (9.7%)
Hospital residential	204 (0.3%)	14 (0.1%)	18 (0.1%)	236 (0.3%)
Short-term residential	6373 (8.8%)	649 (6.9%)	733 (5.8%)	7755 (8.2%)
Long-term residential	3870 (5.4%)	621 (6.6%)	927 (7.4%)	5418 (5.8%)
24-Hour detoxification	19717 (27.3%)	1625 (17.4%)	2545 (20.2%)	23887 (25.4%)
Ambulatory detoxification	3100 (4.3%)	425 (4.5%)	1268 (10.1%)	4793 (5.1%)
Referral Source				
Self/individual	39997 (55.3%)	5557 (59.4%)	7825 (62.2%)	53379 (56.7%)
Criminal justice	13738 (19.0%)	1713 (18.3%)	2279 (18.1%)	17730 (18.8%)
Health/substance use provider	12438 (17.2%)	1392 (14.9%)	1599 (12.7%)	15429 (16.4%)
Community organization	268 (0.4%)	19 (0.2%)	21 (0.2%)	308 (0.3%)

	Non-Hispanic White N=72,270 (76.7%)	Non-Hispanic Black N= 9,350 (9.9%)	Hispanic (any race) N=12,582 (13.4%)	Total N=94,202
School/employer	5829 (8.1%)	669 (7.2%)	858 (6.8%)	7356 (7.8%)
Sociodemographic Characteristics				
Female Sex	30831 (42.7%)	3282 (35.1%)	3870 (30.8%)	37983 (40.3%)
Level of Education				
8yrs or less	3136 (4.3%)	461 (4.9%)	1238 (9.8%)	4835 (5.1%)
9–11 years	13111 (18.1%)	2847 (30.4%)	3573 (28.4%)	19531 (20.7%)
12 years	35915 (49.7%)	4320 (46.2%)	5604 (44.5%)	45839 (48.7%)
13–15 years	16473 (22.8%)	1474 (15.8%)	1850 (14.7%)	19797 (21.0%)
16 or more years	3635 (5.0%)	248 (2.7%)	317 (2.5%)	4200 (4.5%)
Employment Status				
Employed	17084 (23.6%)	1098 (11.7%)	2266 (18.0%)	20448 (21.7%)
Unemployed	36122 (50.0%)	4548 (48.6%)	5754 (45.7%)	46424 (49.3%)
Not in labor force	19064 (26.4%)	3704 (39.6%)	4562 (36.3%)	27330 (29.0%)
Homeless	7306 (10.1%)	1146 (12.3%)	1583 (12.6%)	10035 (10.7%)
Veteran	1548 (2.1%)	339 (3.6%)	234 (1.9%)	2121 (2.3%)
Geographic Characteristics *				
CBSA Designation				
Non micro/metropolitan area	18052 (25.0%)	1112 (11.9%)	2439 (19.4%)	21603 (22.9%)
Micro/metropolitan area	54218 (75.0%)	8238 (88.1%)	10143 (80.6%)	72599 (77.1%)

Note: All variables had Chi^2 P-values < 0.001

*Individual States N(%) not shown for brevity

Table 2

Logistic regression comparing odds of OAT receipt by black and Hispanic clients as compared to white clients, displaying KHB mediation analyses by blocks of explanatory variables

	Unadjusted Model	Adjusted for clinical need only[1]	Adjusted for clinical need[#]+			Adjusted for all mediators
			Treatment setting characteristics[2]	*Sociodemographic characteristics*[3]	*Geographic characteristics*[4]	
White (ref)		1				
	1		1	1	1	1
Black						
Odds Ratio (99% C.I.)		1.23 (1.15–1.32)*				
Percent Mediated		76.79%				
Hispanic						
Odds Ratio (99% C.I.)	2.27 (2.14–2.41)*	1.47 (1.39–1.56)*	1.51 (1.38–1.64)*	1.31 (1.22–1.40)*	1.15 (1.06–1.24)*	1.37 (1.24–1.52)*
Percent Mediated		49.74%				
	–		−39.20%	−24.81%	45.10%	78.33%
			1.23 (1.15–1.32)*			
			54.46%			
	1.98 (1.88–2.09)*			1.52 (1.44–1.61)*	1.20 (1.13–1.28)*	1.21 (1.11–1.32)*
	–			−6.00%	60.47%	83.76%

Note:

*P-Value<0.001

#Models display odds ratio and percent mediation by each variable block after accounting for clinical need factors

1age, opioid type, frequency of use, route of administration, alcohol or benzodiazepine use

2treatment facility type, referral source

3sex, level of education, employment status, homelessness, veteran status

4micropolitan or metropolitan area, state

Table 3

Comparing odds of OAT receipt by black and Hispanic clients as compared to white clients after including interaction by primary opioid type

	Odds Ratio (99% C.I.) Primarily Heroin		Odds Ratio (99% C.I.) Primarily Other Opiates and Synthetics	
	Unadjusted	**Fully Adjusted**	**Unadjusted**	**Fully Adjusted**
White (ref)	1	1	1	1
Non-Hispanic Black	2.88 (2.70–3.08) *	1.50 (1.34–1.69) *	0.92 (0.81–1.05)	1.10 (0.90–1.33)
Hispanic (any race)	2.41 (2.27–2.55) *	1.29 (1.17–1.42) *	1.01 (0.91–1.13)	1.02 (0.86–1.20)

Notes:

* P-Value<0.001

Likelihood ratio test comparing fully adjusted model with and without interaction Chi2=20.60 p<0.001