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RESEARCH ARTICLE

State-level racial and ethnic disparities in buprenorphine treatment duration in the United States

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Abstract

Background and Objectives: National trends reveal a concerning escalation in racial and ethnic disparities in buprenorphine treatment duration for opioid use disorder. However, the extent of such disparities at the state level remains largely unexplored. This study aims to examine such disparities at the state level.

Methods: We analyzed 9,040,620 buprenorphine prescriptions dispensed between January 2011 and December 2020 from IQVIA Longitudinal Prescription data. The primary outcome was the difference in median treatment duration between White people and racial and ethnic minorities. We also included a second outcome measurement to quantify the difference in median treatment duration among episodes lasting ≥180 days. Using quantile regressions, we examined racial and ethnic disparities in treatment duration, adjusting for the patient's age, sex, payment type, and calendar year of the treatment episode. All analyses were conducted at the state level.

Results: Our study revealed substantial statewide variations in racial and ethnic disparities. Specifically, 21 states showed longer treatment durations for White people across all episodes, and eight states displayed similar trends among episodes lasting ≥180 days. Five states exhibited longer treatment durations for White people in both overall and long-term episodes. Fifteen states showed no racial and ethnic disparities.

Conclusion and Scientific Significance: These results are among the first to indicate substantial statewide variations in racial and ethnic disparities in buprenorphine treatment episode duration, providing a critical foundation for targeted interventions to enhance buprenorphine treatment, especially in states confronting such pronounced racial and ethnic disparities.

INTRODUCTION

Millions of Americans live with opioid use disorder,[1] a condition that, when left untreated, poses a significant risk of adverse health consequences, including fatal overdoses.[2,3] In the United States, buprenorphine has been used for over two decades as a crucial tool in addressing opioid use disorder.[4] Although the optimal duration of buprenorphine treatment needed to improve long-term outcomes has not been empirically established, the National Quality Forum has endorsed a minimum of 180 days as a quality measure for treatment continuity.[5] A growing number of studies suggest that continuous buprenorphine treatment beyond 6 months reduces the risk of overdose, opioid-related hospital use, and emergency department visits.[6–8]

Despite these benefits, racial and ethnic disparities in buprenorphine treatment are increasing nationally.[9–11] This is particularly concerning given the disproportionate and escalating overdose death rates in Black and Hispanic communities.[12,13] Therefore, in this study, we aim to identify the degree of state-level racial disparities as the first step to focusing targeted interventions on minimizing racial and ethnic disparities in buprenorphine treatment duration.

METHODS

We utilized data on buprenorphine prescriptions filled between January 2011 and December 2020 from IQVIA's Real World Longitudinal Prescription (LRx) dataset. LRx data is received electronically from pharmacies, payers, software providers, and transactional clearinghouses. This information represents activities that take place during the prescription transaction and contains information regarding the pharmaceutical product, prescriber, payer, and geography. There are four channels that are available within the LRx data: retail (i.e., a combination of Chain Pharmacies, Independent Pharmacies, Foodstores with Pharmacies, and Mass Merchandisers), mail (i.e., traditional and mail order pharmacies that provide home delivery services), long-term care (i.e., pharmacies that service nursing home residential care facilities, institutional providers, chain nursing home providers, and nursing home pharmacies), and atypical (i.e., any dispensing pharmacy that does not fall under retail, mail, or long-term care). Take-home medication-assisted treatments provided by Opioid Treatment Programs would not be captured in the LRx data. In 2011, LRx data covered 74% of retail pharmacy prescriptions, 40%–70% of traditional and specialty mail orders, and 45%–55% of long-term care. With the population coverage increasing over time, in 2020, the coverage was 92% for retail pharmacy prescriptions, 72% for traditional and specialty mail orders, and 78% for long-term care.

To select buprenorphine prescriptions, we first included all records involving market product names of “Bunavail”, “buprenorphin/nalox”, “buprenorphine hcl,” ”buprenorphine hcl/naloxone”, “buprenorphine hydrochlori”, “probuphine implant kit”, “Sublocade”, “suboxone”, “Subutex”, and “Zubsolv.” Then, the Uniform System of Classification (USC) code was used to exclude products potentially prescribed for pain management. The USC is developed by IQVIA and widely accepted in North America as the standard for pharmaceutical products.[14] Records with USC as “Drug dependence” were selected, and the ones with “Crude/bulk medicinal” and “Morphine/opium, injectable” were excluded from this analysis. With these criteria, we analyzed a random sample of 12–85 years old patients who filled 27,063,041 buprenorphine prescriptions, of which 9,342,601 had complete race and ethnicity information and 3-digit zip code. Finally, we further restricted the analysis to 9,040,620 (96.8%) prescriptions dispensed by White people and racial and ethnic minorities (i.e., Black and Hispanic).

Similar to prior research, we defined the start of a new treatment episode as the date when a prescription was filled after more than 14 days without a buprenorphine supply.[9,15] Overlapping days were carried forward to determine whether a gap occurred if two or more prescription claims overlapped.

The primary outcome measurement was the difference in median treatment duration between White people and racial and ethnic minorities across all 50 states and the District of Columbia (DC). To better understand racial and ethnic disparities among people who achieved the recommended minimum length of treatment,[5] we also included a second outcome measurement to quantify the difference in median treatment duration among episodes lasting ≥180 days. Together, these comparisons can identify state-level racial and ethnic disparities in all treatment episodes and episodes lasting ≥180 days.

We first described the characteristics of the buprenorphine treatment episodes included in the study and summarized the trend of the median treatment duration at the state level. Next, using multivariable quantile regressions, we examined the disparities in median treatment duration between White people and racial and ethnic minorities, adjusting for the patient's age at the start of a treatment episode, sex (male, female), payment type (cash, Medicaid, Medicare, third-party), and the calendar year in which an episode started. Analyses were conducted independently for each outcome measurement at the state level. For the primary outcome (i.e., median episode duration among all episodes), we further investigated whether the trends in disparities in the episode duration varied over time by including an interaction term between the race and ethnicity variable and the year of the episode in the quantile regression. Finally, as a secondary analysis, we repeated the quantile regression analyses separately for Black and Hispanic people, aiming to assess how their treatment durations differed from White people.

All *P*-values were two-sided. Data were analyzed with R, version 4.3.1. The analysis code is available on doi.org/10.5281/zenodo.12618881. The Mass General Brigham Institutional Review Board exempted the study from review and waived informed consent because data were not obtained through participant interaction. We followed the STROBE reporting guideline.

RESULTS

The analysis included 225,301 patients (9.3% Black, 6.7% Hispanic, and 84.0% White). We constructed 720,777 treatment episodes from 9,040,620 prescriptions, of which 182,960 (25.4%) lasted ≥180 days. The median number of sequential prescriptions in an episode was three, and the median prescription length was fourteen days. Overall, 84.2% of treatment episodes involved patients aged below 55 years old, 56.6% were from male patients, and 72.0% were from third-party payers (Table 1). Nationally, the median treatment duration was 49 days among all treatment episodes during the study period, with 50 days for White people and 42 days for Black and Hispanic people. We present the yearly trend of median treatment duration for each state by racial and ethnic groups in Figure 1.

Figure 2 summarizes racial and ethnic disparities based on all treatment episodes and episodes lasting ≥180 days. Nationally ('US' in Figure 2), the median episode duration for White people was

TABLE 1 Characteristics of buprenorphine treatment episodes from 2011 to 2020, stratified by racial and ethnic groups.

Characteristics	Treatment episodes, No. (%)		
	All (*n* = 720,777)	White patients (*n* = 612,443)	Race and ethnic minority patients (*n* = 108,334)
Age at episode start, year			
12–34	298,275 (41.4)	257,475 (42.0)	40,800 (37.7)
35–54	308,448 (42.8)	260,087 (42.5)	48,361 (44.6)
55–85	114,054 (15.8)	94,881 (15.5)	19,173 (17.7)
Sex			
Female	312,489 (43.4)	260,418 (42.5)	52,071 (48.1)
Male	408,285 (56.6)	352,022 (57.5)	56,263 (51.9)
Unspecified	3 (0.0)	3 (0.0)	0 (0.0)
Region			
Midwest	140,643 (19.5)	122,936 (20.1)	17,707 (16.3)
Northeast	173,721 (24.1)	150,429 (24.6)	23,292 (21.5)
South	295,081 (40.9)	245,997 (40.2)	49,084 (45.3)
West	111,332 (15.4)	93,081 (15.2)	18,251 (16.8)
Payment type			
Cash	84,382 (11.7)	72,662 (11.9)	11,720 (10.8)
Medicaid	58,826 (8.2)	46,983 (7.7)	11,843 (10.9)
Medicare	58,714 (8.1)	48,314 (7.9)	10,400 (9.6)
Third-party	518,855 (72.0)	444,484 (72.6)	74,371 (68.6)
Episode duration ≥180 days	182,960 (25.4)	158,039 (25.8)	24,921 (23.0)

8.0 days (95% confidence interval [CI]: 7.3, 8.7) longer than for racial and ethnic minorities, adjusted for age, sex, payment type, and year of episode start. Such disparities remained among people who had treatment episodes lasting ≥180 days, with the median episode duration 19.4 days (95% CI: 12.5, 26.4) longer for White people.

At the state level, 21 states had significantly longer treatment for White people among all treatment episodes. Among them, five states (i.e., Alaska, Arkansas, Illinois, New York, and Pennsylvania) also had significantly longer treatment for White people with episodes lasting ≥180 days. Additionally, in three states (California, Minnesota, and New Hampshire), there were no significant racial and ethnic disparities in treatment duration among all treatment episodes; however, among episodes lasting ≥180 days, White people had significantly longer treatment in these states. Among all treatment episodes, significantly longer treatment was observed for Black and Hispanic people in three states (Georgia, New Mexico, and Oklahoma), but none of them displayed significantly longer treatment for Black and Hispanic people with episodes lasting ≥180 days.

In investigating temporal changes in racial and ethnic disparities in treatment duration across all treatment episodes, we found that more treatment days among White people compared to Black and Hispanic people increased over time in Michigan (p-value < 0.001) and Kentucky (p-value = 0.005). In New Mexico, with Black and Hispanic people experiencing longer treatment episodes compared to White people among all episodes, this difference also increased over time (p-value = 0.015). These findings were also consistent with the observations in Figure 1.

We did not find significant racial and ethnic disparities in the two outcome measures in fifteen states. Nine states (i.e., Hawaii, Iowa, Idaho, Montana, Nebraska, North Dakota, South Dakota, Vermont, Wyoming) had small sample sizes (i.e., <40 episodes for Black and Hispanic people combined), which were not presented to avoid potentially unstable estimates.

In the secondary analysis, we repeated the quantile regression analyses separately for Black and Hispanic people. The results also revealed large statewide variations in racial and ethnic disparities. Since disparities were assessed separately for Black and Hispanic people, an additional eight states (i.e., Alaska, Arkansas, Delaware, Kansas, Maine, Minnesota, New Hampshire, New Mexico) and Washington, DC had small sample sizes (i.e., <40 episodes for Black or Hispanic people), and therefore were not included. Among the 33 states included in the secondary analysis, we did not find a significant difference in treatment duration comparing Black and White people in sixteen states. Among all episodes, White people had longer treatment in fifteen states, including Arizona, Colorado, Illinois, Indiana, Kentucky, Massachusetts, Michigan, Missouri, North Carolina, New Jersey, Nevada, Ohio, Pennsylvania, Rhode Island, and South Carolina. Among them, White people in Pennsylvania and Illinois also had longer treatment among people with episodes lasting ≥180 days. Georgia had longer treatment for Black people among all episodes, and Utah had longer treatment for Black people among episodes lasting ≥180 days. When comparing Hispanic people to White people, we did not find a significant difference in treatment duration in seventeen states. White people had longer treatment among all episodes in fourteen states, including Arizona, Alabama, Connecticut, Florida, Kentucky, Massachusetts, Michigan, North Carolina, New Jersey, Nevada, New York, Ohio, Texas, and Washington, and they also had longer treatment among episodes lasting ≥180 days in Califonia, Nevada, and New York. Oklahoma had longer treatment for Hispanic people among all episodes as well as those lasting ≥180 days.

DISCUSSION

This analysis identifies states with high racial and ethnic disparities in buprenorphine treatment duration and large statewide variations in such disparities. Out of 41 states and Washington, DC, we did not identify significant racial and ethnic disparities in treatment episode duration in fifteen (35.7%) states based on the two outcome measurements. Three states (Georgia, New Mexico, and Oklahoma) had longer treatment durations for Black and Hispanic people among

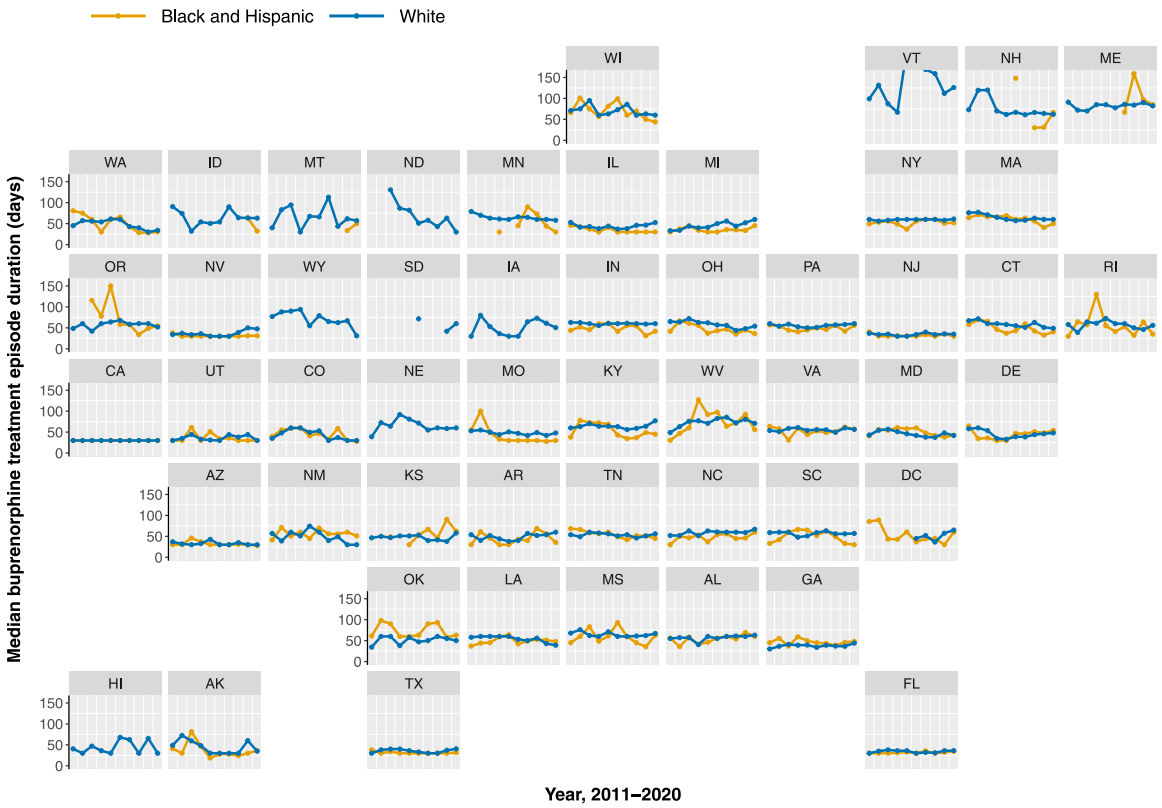

FIGURE 1 State-level median buprenorphine treatment duration among all treatment episodes in the United States, 2011–2020. Within each state, years that had a small sample size (i.e., <20 episodes) were not presented in the figure to avoid inappropriate inferences due to potentially unstable estimates.

all treatment episodes, and none of the analyzed states had longer treatment durations for racial and ethnic minorities among episodes lasting for at least 180 days. Conversely, White people had significantly longer treatment than racial and ethnic minorities in at least one outcome measurement in 24 (57.1%) examined states. Among them, eight states had significantly longer treatment for White people among patients who achieved the recommended minimum length of treatment. White people had significantly longer treatment using both outcome measurements in Alaska, Arkansas, Illinois, New York, and Pennsylvania. Efforts are needed to address the barriers faced by racial and ethnic minorities in the states that are largely impacted by these disparities.

The observed heterogeneity of racial and ethnic disparities across states could be attributed to variations in multiple factors, including patient characteristics (e.g., socioeconomic status, overdose history, comorbid conditions), provider factors (e.g., clinical approach, psychosocial services, peer support services), systemic racism, and state differences in treatment and insurance coverage policies.[11,16–19] For example, various policy initiatives have been implemented at different time points across states, such as increasing the number of buprenorphine-waivered prescribers[20] and expanding insurance coverage for opioid use disorder treatment.[21] However, despite these efforts, emerging evidence suggests growing racial and ethnic disparities in buprenorphine treatment distribution and access over time, particularly in geographic regions (e.g., counties, 3-digit zip code regions) with a higher percentage of racial and ethnic minorities.[22–24] Our study findings further indicate that even among individuals who initiated buprenorphine treatment, racial and ethnic disparities in treatment duration persist, with significant variation across states. However, we did not find any obvious patterns, such as clustering in specific geographic regions or having unique treatment policies, to explain why these disparities existed among these states. Future research could hypothesize and examine how state demographics and state-level policies, including treatment and insurance policies, contribute to the observed variations in racial and ethnic disparities across states. As suggested by the literature,[24–26] targeted interventions aiming to reduce disparities in buprenorphine treatment access, improve treatment affordability, and promote culturally tailored treatment could address the pronounced racial and ethnic disparities in buprenorphine treatment duration.

Study limitations include that treatment durations were estimated using prescriptions dispensed, which may not accurately reflect patients' acutal duration of treatment adherence. Additionally, the study did not consider the complexities of possible multiracial and multiethnic identities and experiences, which might influence treatment episode duration in ways not captured by the measurements in the data. Furthermore, we had limited ability to analyze disparities in some states with smaller sample sizes or insufficient

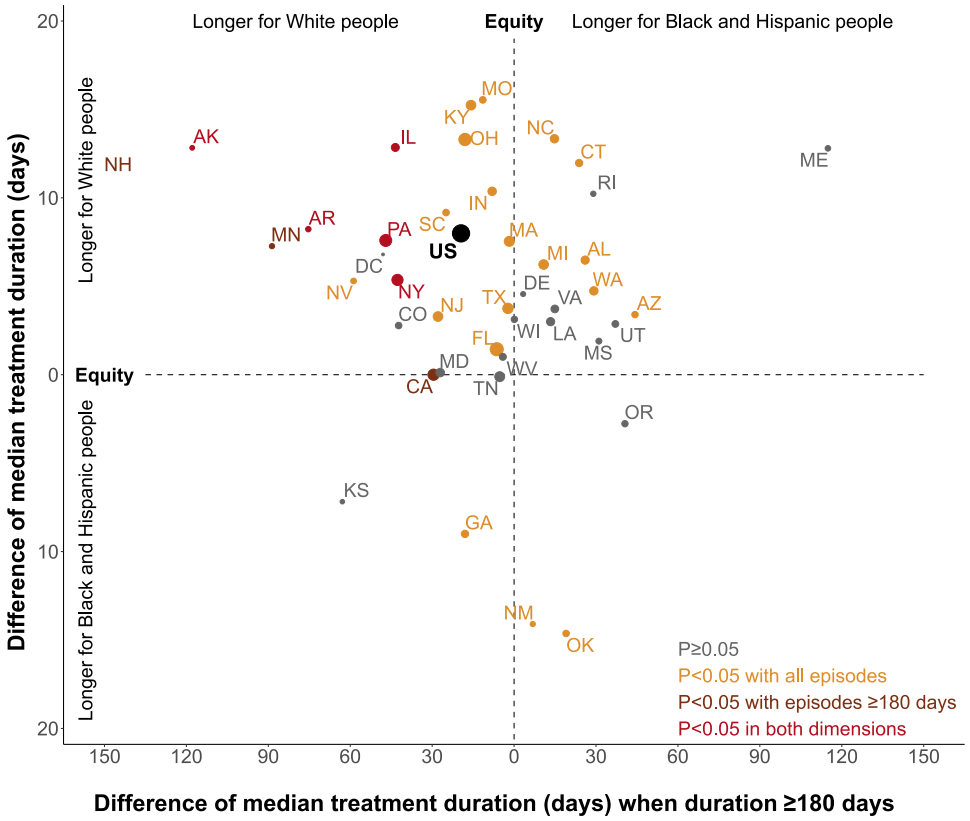

FIGURE 2 National and state-level racial and ethnic disparities in buprenorphine treatment duration in the United States (US), 2011–2020. The sample size weighted the size of the dot in each state (except the US). All results were adjusted for age, sex, payment type, and year of episode start.

representation of racial and ethnic minorities. Finally, potential confounding factors, such as socioeconomic status, the severity of opioid use disorder, additional comorbid substance use disorders, and structural factors, including state-level differences in healthcare practices and treatment policies, were not controlled for in this analysis.

In conclusion, our study identified significant racial and ethnic disparities in buprenorphine treatment duration at the state level. The substantial variations across states underscore the complex interplay of potential factors contributing to these disparities, such as state demographics and different state-level treatment policies. This study serves as a crucial first step toward developing targeted interventions aimed at improving equitable access to effective opioid use disorder treatments for all racial and ethnic groups.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

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