

Individual and Health Policy Factors Associated With Positive Heroin and Opioid Treatment Response: United States, 2018

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 See also Hulsey, p. S21, Cooper et al., p. S24, Hoffman, p. S28, and Friedman and Hansen, p. S30.

Objectives. To identify client- and state-level factors associated with positive treatment response among heroin and opioid treatment episodes in the United States.

Methods. We used national data from 46 states using the Treatment Episode Dataset–Discharges (2018) to identify heroin and opioid treatment episodes ($n = 162\,846$). We defined positive treatment response as a decrease in use between admission and discharge. We used multivariable regression, stratified by race/ethnicity, to identify demographic, pain-related, and state-level factors associated with positive treatment response.

Results. Lower community distress was the strongest predictor of better treatment outcomes across all racial/ethnic groups, particularly among White and American Indian/Alaska Native episodes. A primary opioid of heroin was associated with worse outcomes among White and Hispanic episodes. Legislation limiting opioid dispensing was associated with better outcomes among Hispanic episodes. Buprenorphine availability was strongly associated with better outcomes among Black episodes.

Conclusions. State-level variables, particularly community distress, had greater associations with positive treatment outcomes than client-level variables.

Public Health Implications. Changes in state-level policies and increased resources directed toward areas of high community distress have the potential to improve opioid use disorder treatment and reduce racial/ethnic disparities in treatment outcomes. (*Am J Public Health.* 2022;112(S1):S66–S76. <https://doi.org/10.2105/AJPH.2021.306503>)

The ongoing opioid epidemic has been paralleled closely by an epidemic of chronic pain and an influx of health care use for issues related to pain and drug use.¹ Chronic pain medicine has played a key role in advancing the treatment of pain and reducing the impact of pain on disability and quality of life.² At the same time, an unprecedented tide of prescription opioids has altered the medical, public health, and social landscapes to such a degree that

unpacking the multiple and intersecting factors affecting adverse opioid outcomes requires input from nearly all corners of society. Racism and racial/ethnic inequities are key strands that persist and permeate all of the pathways that connect pain medicine, opioid prescriptions and their alternatives, opioid use disorder (OUD) treatment, and treatment outcomes.^{3–6} Under this framework, we attempted to explain these complex relationships, in part by

considering social, environmental, and policy determinants of health as exposures with varying and potentially compounding effects within racial/ethnic groups, as opposed to defining race/ethnicity itself as an exposure. Pathways connecting the diagnosis and treatment of chronic pain, laws affecting the practice of chronic pain medicine, implicit biases that affect opioid prescribing patterns, and OUD treatment and outcomes are all connected and likely

differ by racial/ethnic group in both the direction and strength of effects.

Pain is a natural part of human inflammatory and healing processes, and chronic pain is broadly defined as pain that exists in the absence of tissue inflammation or persists after a healing process has resolved.⁷ Dahlhamer et al.⁸ estimated that 20% of US adults (approximately 50 million people) have chronic pain, with 8% expressing “high impact” chronic pain, which is defined as chronic pain that limited life or work activities on most days or every day during the past 6 months. Importantly, chronic pain has been shown to be closely related to opioid misuse and related morbidities and death. In 2018, the United States experienced nearly 50 000 opioid overdose deaths,⁹ but disentangling how, when, or under what conditions a chronic pain diagnosis leads to OUD and a heightened risk for overdose and death continues to challenge public health researchers.^{10,11}

One approach to reducing risk is through the implementation of Centers for Disease Control and Prevention guidelines in pain management and medical settings. The first guideline for providers about determining when to initiate or continue opioids for chronic pain states that

Nonpharmacologic therapy and non-opioid pharmacologic therapy are preferred for chronic pain. Clinicians should consider opioid therapy only if expected benefits for both pain and function are anticipated to outweigh the risks to the patient. If opioids are used, they should be combined with nonpharmacologic therapy and nonopioid pharmacologic therapy, as appropriate.^{12(p16)}

In addition, recent literature has demonstrated no benefit in the use of

opioids over nonsteroidal antiinflammatory drugs and acetaminophen for the treatment of chronic back pain and osteoarthritis.¹³ However, a recent systematic review by Busse et al.¹⁴ paints a somewhat more nuanced picture, in that opioids may have small benefits that diminish over time but are unlikely to be superior to other analgesics.

The nature of pain is relatively subjective, and pain treatment is further complicated among racial/ethnic minority populations. In efforts to combat the wide variability in pain care and related disparities, 527 federal and state opioid-related policies were instituted between 2016 and 2018.¹⁵ A large number of these policies included mandatory continuing medical education (CME) for prescribers, but few of the policies directly addressed racial/ethnic disparities. Importantly, little research has addressed how CME may translate to differences in OUD risk and overdose or the differential impact it may have among subpopulations.

Despite the introduction of educational interventions for opioid prescribers, Mills et al.¹⁶ demonstrated that racial/ethnic minority patients were less likely than were White patients to receive an opioid for abdominal or back pain during an emergency department encounter. In addition, in a meta-analysis assessing trends in opioid prescribing, African Americans were found to be 29% less likely to be prescribed opioids for chronic pain.¹⁷ Providers' implicit bias toward racial/ethnic minority patients also increases physician talk time and verbal dominance while decreasing patient affect, patient centeredness, and ratings of interpersonal care.^{18,19} In a disease like chronic pain—in which subjective patient information is needed for diagnosis—these dynamics can have lasting impacts on

patient care and related health outcomes. For example, racial/ethnic minorities are more likely to have negative experiences with providers regarding their communication of pain.²⁰ In the context of increasing overdoses nationwide and somewhat counterintuitively, discrimination in medical settings that resulted in fewer opioid prescriptions among Blacks may have had a protective effect against—or at least delayed—the high risk for misuse and death. Lippold and Ali²¹ recognized the differences in the timing and risk factors for overdose deaths and have provided support for the existence of multiple subepidemics among racial/ethnic groups.

Underlying these subepidemics are the relationships among prescription opioid supply, heroin supply, state-level laws and policies, and patient outcomes, all of which are complex and intersect across multiple ecological levels. In addition, the nature of the epidemic has shifted over the past several decades and in different ways among racial/ethnic groups.^{21,22} For example, opioid prescribing rates vary widely by state, with some states reaching more than 1 prescription per person. In 2018, Hawaii had the lowest opioid prescribing rate (33.4 opioid prescriptions per 100 state residents), while Alabama had the highest (97.5 opioid prescriptions per 100 state residents).^{23,24}

Relatedly, preference for heroin or prescription opioids depends on multiple factors, including price and availability. A survey of patients in treatment of OUD found that 94% chose to use heroin because prescription opioids were more difficult to obtain or more expensive,²⁵ which is likely the product of changing opioid prescribing rates. African Americans saw a 480% increase in the rate of unintentional overdose deaths (per 100 000) between 2000

and 2017,²⁶ and overdose deaths involving the synthetic opioids fentanyl and tramadol—often unknowingly combined with heroin—were 18 times higher among African Americans, compared with 12 times higher among Hispanics and 9 times higher among Whites.²⁷ It remains unclear whether state-level laws and policies positively affect patient outcomes. For example, a comprehensive evaluation of opioid overdoses and characteristics of opioid therapy found no significant association between multiple opioid outcomes and implementation of prescription opioid-related laws.²⁸

A critical indicator of the direction of the ongoing opioid epidemic is OUD treatment utilization and successful treatment completion. Generally, treatment is effective at reducing and eliminating opioid use and improving health and well-being. Methadone, buprenorphine, and naltrexone are all effective medications for OUD, with buprenorphine emerging as the standard of care and most commonly covered by commercial insurance.²⁹ However, treatment uptake remains very low and is particularly low among Black populations and among populations with low socioeconomic statuses.³⁰ Administration of buprenorphine in a private office-based setting has increased substantially, but this increase has been driven nearly entirely by White clients and those who pay with private insurance or cash,³¹ highlighting the stark disparities in opioid treatment. Furthermore, the majority of American Indian/Alaska Native (AI/AN) clients in specialty treatment services do not receive the standard of care of buprenorphine or methadone maintenance.³² Among individuals who do receive opioid treatment, Black and Hispanic clients have been shown to be less likely than Whites to complete it successfully.³³ Several

factors exist that can facilitate or inhibit treatment use and outcomes. For example, Medicaid expansion has generally improved access to treatment services for underrepresented populations, but expansion alone is not sufficient, as some expansion states like Arkansas have implemented exceedingly few initiatives aimed at curbing opioid use.³⁴ Better understanding the multiple and overlapping social determinants of health—from economic security and health policy to community stressors—is critical in developing equitable access to and completion of opioid treatment.

The relationships among pain medicine, OUD, and OUD treatment are nuanced, and national reports that consider the competing roles of individual, social, and policy factors are scant. To our knowledge, no studies have combined Treatment Episode Dataset–Discharges (TEDS-D) data with external state-level clinical and policy data to examine these relationships on a national level. The purpose of this study was to use national data to investigate the association between multiple factors from across socioecological levels (pain medicine, state laws, and OUD treatment) and positive treatment response. We also stratified our findings to determine if there are differences in the direction and size of the associations by racial/ethnic group. We stratified our model by race/ethnicity primarily because racial/ethnic disparities have been observed in many of these elements individually and because the equitable evaluation of epidemiological trends must include discussion of structural barriers that are based on racial and economic oppression.³⁵

METHODS

We used the 2018 TEDS-D ($n = 1\,666\,366$) to identify outpatient treatment episodes

with heroin or other opioids indicated as primary substances of use at treatment admission and with complete data for all study variables, resulting in a final analytic sample of 162 846 treatment episodes. TEDS-D is a cross-sectional administrative data set that describes treatment and demographic characteristics of treatment episodes in the United States. Survey administration and data housing are conducted by the Center for Behavioral Health Statistics and Quality within the Substance Abuse and Mental Health Services Administration (SAMHSA). Additional information about the administrative survey questionnaire, data housing and maintenance, and public access to TEDS-D has been documented by SAMHSA.³⁶ Please note that we use the word “client” or “episode” to reflect that each record in the data is a unique admission, rather than an individual.

Variables

Our outcome of interest was a binary indicator of positive opioid treatment response between 2 time points—treatment admission and treatment discharge. Starting in 2015, SAMHSA began reporting data on several variables at both admission and discharge, including the frequency of drug use in the past month (daily use, some use, or no use). Before 2015, analyses using TEDS-D data were limited to a single variable indicating whether the treatment episode resulted in successful completion. By using the new frequency-of-use variables at 2 time points, we were able to construct a more nuanced metric for the treatment outcome of each episode. We defined a positive treatment response as (1) a reduction in use between admission and discharge (from daily to some use, from daily to no use, or from some to no use) or (2) no

use at both admission and discharge. Our inclusion of treatment clients who reported no use at both time points reflects the ongoing challenges opioid patients face and acknowledges the challenges and successes experienced on their personal paths to recovery. Conversely, no treatment response or a negative response was defined as (1) any treatment episode that increased use (from no to some use, from no to daily use, or from some to daily use) or (2) maintained the same level (some or daily use) between admission and discharge. Other studies using TEDS-D have operationalized the frequency of use variables in a similar way.^{37,38}

We considered several treatment episode- and state-level covariates, based on a priori understanding of factors that likely influence positive treatment response among clients in treatment for heroin or other opioids. Treatment episode-level demographic and clinical data sourced from TEDS-D included race/ethnicity (non-Hispanic White [referent], non-Hispanic Black, non-Hispanic AI/AN, or Hispanic of any race), age group (18–29 [referent], 30–39, 40–49, or ≥ 50 years), primary drug of choice at treatment admission (heroin or all other nonheroin opioids [referent]), and whether methadone, buprenorphine, or naltrexone was used as part of the client's treatment plan (yes or no [referent]). The age group variable combined several age ranges in TEDS-D and was designed to be a simple indicator of adults in their late teens and 20s, 30s, 40s, and older. This approach has been applied in other studies that used TEDS-D opioid data.^{39,40}

We sourced several state-level variables externally and merged them to the TEDS-D data set by state. We defined state Medicaid expansion status by whether a state had adopted

expansion under the Affordable Care Act in 2018 or earlier.⁴¹ We sourced state distress levels from the Economic Innovation Group's Distressed Communities Index,⁴² which is a single metric that accounts for community levels of low education, housing vacancy, adults not working, poverty, income, changes in employment, and changes in the number of business establishments. The Distressed Communities Index ranges from 0 to 100, where 0 indicates the least distress and 100 indicates the most distress. The rate of opioid prescriptions per 100 state residents in 2018 was sourced from the National Institute on Drug Abuse.²³ We calculated the number of treatment facilities in a state that accepts Medicaid payments per 100 000 Medicaid enrollees. We identified the raw number of treatment facilities accepting Medicaid by state by using data from the 2018 National Survey of Substance Abuse Treatment Services (N-SSATS; numerator).⁴³ We sourced the number of Medicaid enrollees in July 2018 (denominator) from the Kaiser Family Foundation,⁴⁴ and it was based on analyses of data from the Centers for Medicare and Medicaid Services. We also used data from N-SSATS to calculate the percentage of treatment facilities in each state that offered buprenorphine in 2018. For ease of interpretation of continuous rates, we categorized the Distressed Communities Index, rate of opioid prescriptions, number of treatment facilities that accept Medicaid payment, and the percentage of a state's facilities that offer buprenorphine into 3 groups of low, mid, and high, based on tertile distributions for each variable.

We derived state requirements for pain management CME from a report

by the *New England Journal of Medicine's* Knowledge Plus online tool.⁴⁵ As each state has different CME requirements, we categorized states into 3 groups, including states with no CME requirements or less than 1 credit hour per year, states with a requirement of 1 CME credit per year or 5 hours 1 time, and states with more than 1 credit per year or more than 5 hours 1 time. Finally, we considered whether states had enacted any laws that limit opioid prescriptions by enacting statutory limits on the duration of the prescribed opioid supply or a limit on morphine milligram equivalents (any or no limits), derived from a report by the National Conference of State Legislatures.⁴⁶

Analysis

We used SAS software (version 9.4; SAS Institute, Cary, NC) to conduct all analyses. We reported descriptive statistics of the TEDS-D sample for each study variable for the full sample and stratified by whether treatment episodes responded positively to treatment. We used the χ^2 test of independence to assess the strength of the bivariate associations between each independent variable and our outcome. We used multivariable logistic regression to model the adjusted association between each independent variable and positive treatment response.

To assess the impact of client- and state-level variables among clients of different races/ethnicities, we stratified our models to provide estimates separately for White ($n = 128\,363$), Black ($n = 16\,961$), American Indian/Alaska Native ($n = 2084$), and Hispanic ($n = 15\,438$) clients. To account for potential clustering of treatment episodes within states, we included a CLUSTER statement in SAS at the state

level. We checked for multicollinearity between study variables by using a Pearson's correlation coefficient cutoff of a P value less than .80. Finally, because of the large sample size, very small differences in means between groups are more likely to be detected as statistically significant. Therefore, we followed steps for analyses of TEDS-D data outlined by Sahker et al.⁴⁷ to avoid misidentifying trivial significance and to account for multiple tests by adjusting the threshold of P values and odds ratios. For this study, we considered a given association to be clinically meaningful if it had a P value of less than .0001. In addition to Sahker et al., others have also recommended similar methods to help differentiate between statistical significance and clinical or practical meaningfulness.⁴⁸

Supplemental Analyses

We also conducted several descriptive and analytic supplemental analyses to complement the primary model detailed previously. First, to assess differences in frequency of use among clients of different races/ethnicities, we disaggregated our outcome variable of positive treatment response into all 9 possible combinations of opioid use at admission and at discharge, stratified by race/ethnicity. This allowed for a more nuanced evaluation of the underlying components of our outcome and whether the levels of opioid use varied depending on race/ethnicity. Second, we considered opioid problem severity as a variable in our model (dependence vs abuse [referent]). TEDS-D includes information about *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV)*; Washington, DC: American Psychiatric Association; 1994) diagnoses of abuse or dependence, but

18% of observations were missing diagnostic estimates, so we opted not to include problem severity in the primary model outlined previously. We described the distribution of opioid abuse or dependence among clients of differing racial/ethnic status, and then fit a new model adjusting for severity among clients with nonmissing information for severity ($n = 116\,241$).

RESULTS

Among 162 846 heroin and opioid treatment episodes, we identified 80 900 (49.7%) that demonstrated a positive treatment response. In univariate analyses, worse treatment outcomes were most strongly associated with non-Hispanic Black race/ethnicity. At the state level, worse treatment outcomes were most strongly associated with residence in non-Medicaid-expansion states, high community distress, mid opioid prescription rates, and mid availability of buprenorphine (Table 1). In our supplemental assessment of the frequency of opioid use at admission and discharge, we identified that Black clients were the most likely to report daily use at both admission and discharge (45%) compared with White (33%), AI/AN (33%), and Hispanic (28%) clients (Table A, available as a supplement to the online version of this article at <http://www.ajph.org>). We additionally see that Black clients (18%) were nearly half as likely to be admitted with "no use" relative to White clients (33%) or AI/AN clients (31%). White clients were also the most likely to have a more severe diagnosis of dependence (80%), compared with Black (78%), AI/AN (66%), and Hispanic (63%) clients (Table B, available as a supplement to the online version of this article at <http://www.ajph.org>).

The direction and magnitude of associations varied between racial/ethnic groups in our adjusted models (Table 2). The primary opioid of heroin (vs all other opioids) was associated with worse treatment outcomes among White (adjusted odds ratio [AOR] = 0.78; 95% confidence interval [CI] = 0.68, 0.90; $P < .0001$) and Hispanic (AOR = 0.69; 95% CI = 0.61, 0.78; $P < .0001$) episodes. Lower community distress was strongly associated with positive treatment response across all groups, particularly among White and AI/AN clients. Of note, AI/AN treatment episodes in low-distress states had nearly 5 times the odds of positive treatment response compared with AI/AN episodes in states with high distress (AOR = 4.58; 95% CI = 2.77, 7.54; $P < .0001$). High buprenorphine availability (vs low availability) was only positively associated with treatment response among Black episodes (AOR = 2.24; 95% CI = 1.19, 4.18; $P < .0001$). In our sensitivity analysis that included severity as a covariate, we identified a modest negative association between a more severe diagnosis of opioid dependence (vs abuse) and treatment response among White and Black clients (Table C, available as a supplement to the online version of this article at <http://www.ajph.org>).

DISCUSSION

The pathways connecting chronic pain, OUD, and treatment outcomes are critical pieces to address as the opioid epidemic continues to grow and burden communities. It is also incumbent upon researchers to consider differential associations by race/ethnicity to more equitably design public health programs and policies. We used a comprehensive set of variables from multiple axes of influence to identify whether predictors

TABLE 1— Outpatient Heroin and Opioid Treatment Episode Characteristics: Treatment Episode Dataset-Discharges, United States, 2018

Variables	Total (n = 162 846), %	Positive Treatment Response (n = 80 900 [49.68%]), %	No or Negative Treatment Response (n = 81 946 [50.32%]), %	χ^2	<i>p</i> ^a
Demographic characteristics					
Race/ethnicity				1 437.67	< .0001
Non-Hispanic White	78.82	80.03	77.63		
Non-Hispanic Black	10.42	7.78	13.02		
Non-Hispanic American Indian/Alaska Native	1.28	1.30	1.26		
Hispanic, any race	9.48	10.89	8.09		
Age group, y				184.15	< .0001
18–29	32.57	33.34	31.82		
30–39	37.00	37.79	36.22		
40–49	17.00	16.17	17.83		
≥ 50	13.43	12.71	14.14		
Primary drug of choice at admission				66.10	< .0001
Heroin	67.35	68.30	66.41		
All other nonheroin opioids	32.65	31.70	33.59		
Other drugs or alcohol reported at admission				676.52	< .0001
Yes	66.29	69.36	63.27		
No	33.71	30.64	36.73		
Medication for opioid use disorder was part of treatment plan				136.19	< .0001
Yes	47.85	49.30	46.41		
No	52.15	50.70	53.59		
State-level characteristics					
Treatment episode resides in a Medicaid expansion state				10 590.19	< .0001
Yes	71.96	83.49	60.58		
No	28.04	16.51	39.42		
Community distress level				12 674.46	< .0001
Low	21.18	26.84	15.60		
Mid	44.00	51.61	36.48		
High	34.82	21.55	47.92		
Opioid prescriptions per 100 state residents				10 235.09	< .0001
Low	33.67	44.02	23.45		
Mid	44.06	32.36	55.60		
High	22.27	23.61	20.95		
No. of treatment facilities in a state that accept Medicaid payment (per 100 000 Medicaid enrollees)				7 336.69	< .0001
Low	33.73	41.58	25.97		
Mid	27.19	29.34	25.06		
High	39.09	29.08	48.97		

Continued

TABLE 1— Continued

Variables	Total (n = 162 846), %	Positive Treatment Response (n = 80 900 [49.68%]), %	No or Negative Treatment Response (n = 81 946 [50.32%]), %	χ^2	P ^a
Percentage of a state's treatment facilities that offer buprenorphine				13 281.02	<.0001
Low	33.22	35.39	31.08		
Mid	33.30	20.63	45.81		
High	33.48	43.98	23.11		
State pain management CME requirements				1 444.16	<.0001
No requirement or < 1 hour per year	16.16	18.94	13.42		
1 hour per year or 5 hours 1 time	55.70	51.38	59.97		
> 1 hour per year or > 5 hours 1 time	28.13	29.68	26.61		
State has any legislation governing statutory limits on opioid prescriptions				44.76	<.0001
Yes	81.57	80.93	82.21		
No	18.43	19.07	17.79		

Note. CME = continuing medical education. The total sample size was 162 846.

^aWe considered a given association to be clinically meaningful if it had a $P < .0001$.

of positive treatment response were different among racial/ethnic groups. Notably, economic and community distress was the strongest inhibitor of treatment success across all racial/ethnic groups. This finding helps to reiterate the importance of social and structural determinants of health and their influence on health outcomes, and our findings align with others about the importance of considering socioeconomic status and exposure to economic determinants in studies addressing the opioid crisis.^{49,50} In addition, it is important to understand the distribution of populations in mid- and high-distress areas. For example, 20% of treatment episodes in mid- and high-distress areas were Black and 3% were AI/AN (results not shown), compared with the overall Black and AI/AN populations making up 13% and 1.5% of the US population, respectively. This unbalanced distribution suggests that, while all groups were impacted by high levels

of community distress, racial/ethnic minority populations are at a higher risk of adverse treatment outcomes resulting from geographic, environmental, and structural barriers.

We found that buprenorphine access was a strong predictor of treatment success only among Black treatment episodes. This finding aligns with other research that identified a strong relationship between receipt of medication for OUD and positive treatment response among Black men and women.³⁸ This is an important asset-based characteristic to highlight and broadly points to supportive mechanisms underlying OUD treatment experiences among Black clients. However, the vast majority of Black individuals with a treatment need do not initiate treatment,³⁰ which underscores the importance of screening and referral to treatment among high-risk and historically underserved populations. While buprenorphine access appears

particularly beneficial to Black communities, the overlapping experience of disproportionate distress may also undermine initiatives aimed at strengthening buprenorphine services. Furthermore, Black treatment episodes were overrepresented in states with low or mid access to buprenorphine (results not shown).

One in 5 treatment episodes were in a state that had no statutory limits on opioid prescribing, and racial/ethnic minority groups were disproportionately represented in these states. However, we found a moderate increase in the likelihood of positive treatment response for AI/AN and Hispanic episodes in states with any laws that require limits. Pletcher et al. found that Hispanic individuals were less likely than White individuals to be prescribed opioids for pain-related emergency department visits.¹⁷ Our study adds to this literature by accounting for other general health care setting and policy-

TABLE 2— Multivariable Regression Modeling Positive Treatment Response Among Outpatient Heroin and Opioid Treatment Episodes: Treatment Episode Dataset–Discharges, United States, 2018

Variables	White (n = 128 363), AOR (95% CI)	Black (n = 16 961), AOR (95% CI)	American Indian/Alaska Native (n = 2084), AOR (95% CI)	Hispanic (n = 15 438), AOR (95% CI)
Demographic characteristics				
Age group, y (Ref = 18–29)				
30–39	1.03 (0.97, 1.09)	1.04 (0.77, 1.39)	1.01 (0.75, 1.34)	0.91 (0.82, 1.00)
40–49	0.99 (0.89, 1.10)	0.83 (0.67, 1.03)	1.47 (0.92, 2.33)	0.91 (0.75, 1.11)
≥ 50	1.03 (0.93, 1.14)	0.84 (0.65, 1.07)	1.08 (0.81, 1.43)	1.00 (0.75, 1.32)
Primary drug of choice at admission (Ref = all other nonheroin opioids)				
Heroin	0.78 (0.68, 0.90)*	0.84 (0.61, 1.14)	0.77 (0.62, 0.97)	0.69 (0.61, 0.78)*
Other drugs or alcohol reported at admission (Ref = no)				
Yes	1.00 (0.94, 1.07)	1.03 (0.82, 1.28)	1.04 (0.81, 1.34)	1.05 (0.92, 1.20)
Medication for opioid use disorder was part of treatment plan (Ref = no)				
Yes	0.80 (0.66, 0.98)	1.12 (0.80, 1.57)	0.79 (0.60, 1.04)	0.83 (0.58, 1.19)
State-level characteristics				
Treatment episode resides in a Medicaid expansion state (Ref = no)				
Yes	1.01 (0.63, 1.61)	0.83 (0.41, 1.69)	0.84 (0.53, 1.32)	0.50 (0.22, 1.13)
Community distress level (Ref = high)				
Low	4.17 (2.15, 8.08)*	3.29 (1.29, 8.39)	4.36 (2.65, 7.21)*	5.56 (1.60, 19.36)
Mid	4.14 (2.12, 8.11)*	2.96 (1.11, 7.92)	4.58 (2.77, 7.54)*	3.38 (1.25, 9.15)
Opioid prescriptions per 100 state residents (Ref = low)				
Mid	0.80 (0.47, 1.36)	0.51 (0.23, 1.14)	0.95 (0.59, 1.52)	1.10 (0.45, 2.61)
High	1.21 (0.83, 1.77)	1.29 (0.82, 2.03)	1.48 (0.99, 2.24)	1.51 (0.78, 2.91)
No. of treatment facilities in a state that accept Medicaid payment (per 100 000 Medicaid enrollees; Ref = low)				
Mid	0.81 (0.46, 1.42)	0.72 (0.35, 1.49)	0.71 (0.43, 1.17)	0.61 (0.30, 1.22)
High	1.12 (0.54, 2.34)	1.12 (0.47, 2.71)	0.88 (0.51, 1.52)	0.51 (0.14, 1.76)
Percentage of a state's treatment facilities that offer buprenorphine (Ref = low)				
Mid	0.48 (0.25, 0.93)	0.88 (0.29, 2.62)	0.31 (0.20, 0.46)*	0.22 (0.09, 0.58)
High	1.09 (1.03, 1.15)	2.24 (1.19, 4.18)*	0.80 (0.48, 1.34)	0.79 (0.32, 1.95)
State pain management CME requirements (Ref = no requirement or < 1 hour per year)				
1 hour per year or 5 hours 1 time	0.90 (0.45, 1.82)	1.06 (0.49, 2.28)	0.76 (0.47, 1.23)	1.10 (0.36, 3.34)
> 1 hour per year or > 5 hours 1 time	1.03 (0.61, 1.75)	1.68 (0.70, 4.04)	0.95 (0.65, 1.39)	2.46 (0.82, 7.36)
State has any legislation governing statutory limits on opioid prescriptions (Ref = no)				
Yes	1.51 (0.96, 2.35)	1.48 (0.81, 2.69)	1.92 (1.21, 3.05)	3.32 (1.34, 8.19)

Note. AOR = adjusted odds ratio; CI = confidence interval; CME = continuing medical education. The total sample size was 162 846. Standard errors clustered at the state level.

*Clinically meaningful at $P < .0001$.

level covariates like legislation governing prescription limits.

Limits on prescriptions likely reduced the quantity of opioids available for diverting to illicit sales, simultaneously driving the street price of prescription pills upward. Limits on prescriptions likely facilitated a change in the preferred opioid of choice from prescription opioids to heroin, especially among poor and minority communities flooded with cheaper heroin. Our study identified worse treatment outcomes for primary heroin users among Whites and Hispanics. In addition, in a subanalysis of our TEDS-D sample, we found that Hispanic treatment episodes demonstrated the highest proportion of heroin as a drug of choice (Hispanic = 84%; Black = 81%; White = 63%; AI/AN = 58%). This is partially aligned with previous findings that limited supply and higher street prices for prescription opioids has resulted in a surge in cheaper heroin.^{25,51} Thus, clearly articulating the pathway between opioid prescribing legislation, subsequent transition to heroin, and treatment outcomes among Hispanic treatment episodes is challenging and warrants further investigation. Importantly, strengthening prescribing legislation could be a relatively actionable goal, and more research is needed to inform policy decisions aimed at equitable health-related programming.

Limitations

This study has several limitations that come from the use of the TEDS-D administrative data. First, our definition of positive treatment response is a unique adaptation of newly available SAMHSA variables. While this metric is

not a validated tool for clinical decision-making, it is a novel use of the TEDS-D data that can aid in research evaluating a complex disease. While comprehensive clinical notes and medical diagnoses are typically unavailable in national administrative data sets, future research may confirm our findings of racial/ethnic differences using a more conventional definition of treatment success.

TEDS-D includes observations from all treatment service providers that receive federal funding; many private, office-based treatment settings may not be included in the TEDS-D population. TEDS-D also does not include data on treatment provided through federal agencies, including the Veterans Administration, the Department of Defense, or the Bureau of Prisons. In addition, not all states report treatment services data to SAMHSA. In 2018, Georgia, Oregon, Washington, and West Virginia did not report data to SAMHSA, and they are not included in the analytic sample.

The severity of an OUD is an important covariate to consider in treatment outcome studies. TEDS-D does have a variable that indicates *DSM-IV* diagnoses of abuse and dependence, but 18% of treatment episodes have missing values, which ranged from 16% missing among White clients, followed by Black (19%), AI/AN (30%), and Hispanic (34%) clients. We opted to keep these observations in our primary analysis and not use the available severity data. However, we assessed this relationship among episodes in which severity data were available in our sensitivity analysis.

Public Health Implications

The continuum of health care for individuals with chronic pain and OUD is

complex, and multiple individual-, community-, and policy-level factors compete to influence treatment outcomes. Connecting multiple fragmented systems is a challenge for epidemiological research, as data systems often lack information across the spectrum of care. We used national data merged with several other state-level resources to illustrate how multiple factors influence heroin and opioid treatment success. Community distress, which broadly encompasses poverty, struggling educational systems, unemployment, and insufficient income, was associated with negative treatment response among all racial/ethnic groups. Critically, racial/ethnic minority treatment episodes were disproportionately represented in the most distressed states. Social determinants of health must be embedded within all research and public health practice that addresses any one of the many points along the chronic pain and OUD treatment spectrum of care. While identifying risk factors is important in disease surveillance, the identification of differential associations by racial/ethnic group can help to highlight community assets like buprenorphine availability, as opposed to the conventional focus on community deficits. [JPH](#)

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CONTRIBUTORS

G. Pro conceptualized the study, conducted analyses, and organized the drafting of the article. C. Hayes, C. C. Brown, J. Goree, and N. Zaller all provided substantial input into the concept and design of the study, made decisions around methodological and analysis considerations, interpreted results, and wrote article sections. All authors agreed to the final submission.

CONFLICTS OF INTEREST

All authors report no conflicts of interest.

HUMAN PARTICIPANT PROTECTION

This study used secondary, administrative data housed by the Substance Abuse and Mental Health Services Administration (SAMHSA). The Treatment Episode Dataset–Discharges data set is de-identified client-level information and available for free to download through SAMHSA. As this was a secondary analysis of pre-existing administrative data, no human participants were involved in this study.

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