The Role of Program Directors in Treatment Practices: The Case of Methadone Dose Patterns in U.S. Outpatient Opioid Agonist Treatment Programs

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Objective. To describe changes in characteristics of directors of outpatient opioid agonist treatment (OAT) programs, and to examine the association between directors' characteristics and low methadone dosage.

Data Source. Repeated cross-sectional surveys of OAT programs in the United States from 1995 to 2011.

Study Design. We used generalized linear regression models to examine associations between directors' characteristics and methadone dose, adjusting for program and patient factors.

Data Collection. Data were collected through telephone surveys of program directors.

Principal Findings. The proportion of OAT programs with an African American director declined over time, from 29 percent in 1995 to 16 percent in 2011. The median percentage of patients in each program receiving <60 mg/day declined significantly, from 48.5 percent in 1995 to 29 percent in 2005 and 23 percent in 2011. Programs with an African American director were significantly more likely to provide low methadone doses than other programs. This association was even stronger in programs with an African American director who served populations with higher percentages of African American patients.

Conclusions. Demographic characteristics of OAT program directors (e.g., their race) may play a key role in explaining variations in methadone dosage across programs and patients. Further research should investigate the causal pathways through which directors' characteristics affect treatment practices. This may lead to new, multifaceted managerial interventions to improve patient outcomes.

Key Words. Methadone dose, opioid agonist treatment, program directors, program management, racial/ethnic variations

Opioid agonist treatment (OAT) is an effective and safe method for treating opioid addiction (Amato et al. 2005; Mattick et al. 2009; Samet and Fiellin

2015). Higher doses of methadone (at least 60 mg/day) are required to achieve optimum therapeutic effects (Fareed et al. 2009; Fullerton et al. 2014). Methadone doses higher than 60 mg/day are associated with significant declines in heroin consumption (Baumeister et al. 2014) and other drug use, longer retention in treatment, and lower rates of relapse (Brady et al. 2005; Donny et al. 2005; Fareed et al. 2009, 2010; Yan-ping et al. 2009). Adherence to OAT is also associated with reductions in HIV incidence, risk of transmission and viral load, improved quality of life, and reduced mortality (Marsch 1998; Sees et al. 2000; Gerra et al. 2003; Lawrinson et al. 2008).

Despite ample evidence of the benefits of higher methadone doses, patients often receive suboptimal doses. A nationally representative study of OAT programs (henceforth, OAT refers to program offering methadone as a method of treatment) reported that 79.5 percent of patients in 1988 received doses of less than 60 mg/day (D'Aunno and Pollack 2002). In 2005, 34 percent of patients still received doses below 60 mg/day, half of whom received less than 40 mg/day (Pollack and D'Aunno 2008). The proportion of OAT program patients who received doses below 60 mg/day remained as high as 28.3 percent by 2011 (D'Aunno et al. 2014).

Among OAT programs, those with a higher percentage of racial and ethnic minority patients, specifically African Americans and Hispanics, consistently provide lower methadone doses (D'Aunno and Vaughn 1992; Pollack and D'Aunno 2008; Howard, Barrett, and Holmes 2010; D'Aunno et al. 2014). This presents a major public health concern, given that African American and Hispanic patients comprise 40 percent of all people with substance use disorders in treatment. These population groups also experience greater substance use-related consequences, including higher rates of HIV transmission and higher incidence of lethal overdose (Galea and Rudenstine 2005; Zaller et al. 2009).

Several studies have attempted to explain why OAT programs treating higher proportions of minority patients often prescribe low methadone dosage. Lack of resources or management systems to meet recommended standards (i.e., inadequate staffing and location in deprived urban areas) has been presented as a possible explanation (D'Aunno and

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Pollack 2002). Differences in treatment strategy may also be a contributing factor. OAT programs that serve higher percentages of minority patients may prefer to offer behavioral and other therapeutic interventions paired with low-dose methadone treatment (Howard 2003). Finally, some African American patients view OAT medications, such as methadone, as a form of social control and are therefore averse to accepting higher doses (Stancliff et al. 2002; Holt 2007).

While several program and patient-level factors have been assessed (D'Aunno et al. 2014), the role of program directors in explaining methadone dosage practices of the organizations they lead has seldom been investigated. This is so even though directors play an important role in defining organizational practices (Miller, Vries, and Toulouse 1982; D'Aunno 2006). Demographic characteristics of directors, in particular, have been associated with program performance. Directors' race/ethnicity has been linked with heightened awareness of the needs of vulnerable populations (Smedley et al., 2003). Similarly, directors' age influences decision making, with younger directors being more responsive to new information (Kabacoff 2002). Directors' education, as a measure of knowledge and skills, has been correlated with organizational strategy, including the provision of prevention and outreach services (Wells, Lemak, and D'Aunno 2005, 2006; Chuang et al. 2013). Finally, the managerial styles of female leaders have been shown to benefit organizational processes and performance (Burke and Collins 2001; Eagly and Johannesen-Schmidt 2001). Female directors, for example, spend more time networking with peers, a behavior that positively affects an organization's outcomes (Jacobson, Palus, and Bowling 2010). It is thus important to examine whether the characteristics of OAT treatment program directors are associated with variations in treatment practices across OAT programs.

In this study, we examine the relationship between characteristics of program directors and OAT program practices. First, we explore associations between demographic attributes of OAT program directors and methadone dose patterns. We find that patients of OAT programs with an African American program director are significantly more likely to receive low methadone doses than patients of other OAT programs. Second, we compare the characteristics of African American OAT program directors and program directors from other racial groups, and describe how these characteristics changed over time. Finally, we assess whether differences in directors' characteristics may explain some of the observed racial/ethnic variations in methadone dose levels across OAT programs and patients.

METHODS

Sampling Frame and Sample

This study uses data from four waves (1995, 2000, 2005, and 2011) of the National Drug Abuse Treatment System Survey (NDATSS), a nationally representative survey of substance use disorder treatment programs. We define an OAT program as a physical facility with resources dedicated specifically to treating opioid dependence through methadone. We obtained lists identifying all approved OAT programs offering methadone in the United States from the Substance Abuse and Mental Health Services Administration (SAMHSA). In 2007, SAMHSA reported 1,108 licensed methadone OAT programs, a number that had remained relatively stable since 1999; by 2011, there were 1,223 licensed methadone OAT programs. The response rate for each NDATSS wave exceeded 80 percent, varying from 86 percent in 1995 to 92 percent in 2000 (Adams 2005).

Data Collection, Reliability, and Validity

Program directors and clinical supervisors from participating OAT programs completed telephone surveys. Reliability and validity of the surveys were maximized using established methods, such as sending each program director a cover letter explaining the study, along with worksheets informing participants of the requested data, enabling them to consult financial and administrative records prior to the call (Groves 1988). Extensive reliability checks were performed to signal interviewers of inconsistent or infeasible responses (e.g., percentage of patients with various demographic characteristics should sum to 100 percent). Results were further scrutinized for reliability and validity by comparing reported totals (e.g., total revenue) with the sum of reported details (e.g., revenues by source); comparing responses between directors and supervisors; and comparing responses over time if an OAT program had been repeatedly included in NDATSS samples. Results from several analyses provided support for NDATSS data reliability and validity (D'Aunno and Vaughn 1995; D'Aunno and Pollack 2002; Pollack and D'Aunno 2008).

Dependent Variable

Methadone Dose. During each wave of the NDATSS, the clinical supervisors of each OAT program were asked to report what percentage of their outpatient methadone clients received less than 40 mg of methadone per day, between

40 and 59 mg/day, between 60 and 79 mg/day, and more than 80 mg/day. In reporting this information, clinical supervisors were also asked to think only of patients who had received the same methadone dose for at least 2 weeks. Therefore, the dependent variable measures the dosage of only those patients whose dose levels have stabilized. NDATSS interviewers were instructed to check that the reported information summed to 100 percent. To increase the accuracy of the reports, NDATSS interviewers encouraged clinical supervisors to check patient records and other data they may have at their disposal documenting methadone dosage. We used these reports from clinical supervisors to calculate the percentage of patients in each OAT program who received a low methadone dose, defined as less than 60 mg/day.

Predictor Variables

Director Characteristics. Directors reported their race, Hispanic ethnicity, and gender during the interview. Racial categories were grouped as White, African American, or “other”; with the last group including primarily Asians and American Indians. In preliminary analyses, however, we found limited differences in demographic characteristics and methadone dosage patterns between white and other race directors. These categories were thus grouped for the rest of the analysis. Director’s educational attainment (less than college vs. college degree vs. higher degrees), license as a substance use disorder counselor, and age were also included in the analysis.

Program Characteristics. We controlled for a number of OAT program characteristics that have been identified as important for OAT service provision. Privately owned programs may have missions different from other program types that may influence methadone dose levels. Thus, we included a categorical variable indicating whether OAT programs were private for-profit, private not-for-profit, or publicly owned. We accounted for whether OAT programs were accredited by The Joint Commission (TJC). Some accreditation bodies, including TJC, encourage provision of evidence-based services such as higher methadone doses. We also examined whether OAT programs offer buprenorphine, to determine if this approach to treatment may be associated with methadone dose practices. We also calculated the median number of patients and staff–patient ratio. We created an indicator variable taking value 1 if an OAT program had less than one staff per patient, and 0 otherwise. The geographic locations of OAT programs were categorized as one of four U.S.

census regions (Midwest, Northeast, South, and West) to account for regional variations in methadone dosing practices.

Patient Characteristics. Patient characteristics are related to methadone dose levels (D'Aunno and Pollack 2002; Pollack and D'Aunno 2008). We thus controlled for patients' race and ethnicity (percentage of patients who were Non-Hispanic African American or Hispanic) and employment status (percentage of a program's patients who are unemployed). Given that patients' age may be associated with the methadone dose prescribed, the percentage of a program's patients over the age of 40 (median age) was also calculated (Anderson and Warren 2004).

Time Trends. Practices in OAT dosing have shifted markedly across recent years (Pollack and D'Aunno 2008). To account for time effects, we generated dummy variables designating the year in which survey data were collected, with 1995 as the reference year.

Data Analysis

We first explored whether there was an association between methadone dosage patterns at an OAT program and each of the demographic characteristics of the OAT program director listed above. To do so, we used nonparametric Kruskal–Wallis tests. We found that patients of OAT programs led by an African American director were significantly more likely to receive low methadone doses than the patients of programs led by directors from other racial groups. We then tested whether this difference was consistently observed during each survey wave using similar nonparametric tests. Second, we described differences and trends in the characteristics of African American OAT program directors versus directors from other racial groups. We tested for differences in these characteristics by director's race using chi-squared tests for categorical variables and nonparametric tests (i.e., Kruskal–Wallis test) for continuous variables. We also tested for significant trends in director's characteristics using an extension of the Kruskal–Wallis test (Cuzick 1985). Third, we estimated the association among program director, organizational and patient characteristics, and methadone dose levels using multivariate models. We pooled observations from 1995 to 2011 and used a generalized linear model with a logit link to model the reported proportion of patients receiving doses

less than 60 mg/day. We also estimated separate generalized linear models by OAT program director race to investigate whether the patterns of association between covariates and methadone dose levels varied by race of the director. In each model, we included a variable denoting year of NDATSS to control for time trends in the dose patterns in OAT programs. We report odds ratios (OR), 95 percent confidence intervals (CI), and *p*-values for each independent variable. Finally, we tested for a possible interaction between the race of an OAT program director and the proportion of African Americans among the patients of that OAT program. These analyses were designed to determine whether characteristics of program directors might account for some of the racial variations in methadone dosage observed among OAT patients. We assessed the significance of the interaction term using a Wald Test. As a small number of OAT programs were interviewed during several waves of the NDATSS between 1995 and 2011, standard errors were adjusted to account for clustering of observations within OATs. All multivariate analyses were performed with *Stata Version 14* (StataCorp 2013).

RESULTS

Differences and Trends in Methadone Dosage among OAT Patients

In exploratory analyses, we found no associations between the gender, age, and licensure of an OAT program director and the methadone dose levels received by the patients of his/her OAT programs. We found that the methadone doses dispensed at an OAT program varied with the educational level of the program director. In the pooled sample, OAT programs in which the director did not have a college degree provided the highest methadone doses. This finding, however, was not consistent across survey waves: in 2011, there were no significant differences in dose levels associated with education of the director. Furthermore, there were only few program directors who did not complete a college education (≈ 10 percent). This association may thus have been driven by low sample sizes.

On the other hand, there were significant differences in methadone dose levels between OAT programs led by African American directors and OAT programs led by directors from other racial groups (e.g., whites). In the pooled sample (i.e., combining all observations from 1995 to 2011), the median percentage of OAT patients receiving < 60 mg methadone per day was 40 percent in programs led by an African American director versus 29 percent in other OAT programs ($p = .000$, see Figure 1). The proportion of patients receiving

Figure 1: Trends in Likelihood of Low Methadone Dosage among Patients of OAT Programs, by Year and Race of the OAT Program Director

Notes. The pooled sample is constituted from observations of all survey rounds. The difference in median percent of patients receiving <60 mg/day of methadone over time is significant at p -value $\approx .000$. Within each survey round, the difference in median percent of patients receiving <60 mg/day between patients of OAT programs with with/other race versus African American directors was significant at the $p < .05$ level according to a Kruskal–Wallis nonparametric test.

less than 60 mg/day declined significantly between 1995 and 2011 in all OAT programs (Figure 1). The differences in methadone dosage patterns between OAT programs led by an African American director and other OAT programs remained throughout the study period, however.

Differences and Trends in the Characteristics of OAT Program Directors

In the pooled sample, 20.8 percent of the directors of OAT programs were African Americans. This proportion, however, declined significantly over time, from 28.7 percent in 1995 to 16.3 percent in 2011 (Figure 2).

There were significant differences in demographic characteristics between African American directors and other directors (Table 1). African Americans were less likely to be Hispanic than other directors (8.7 vs. 1.8

Figure 2: Proportion of African Americans among OAT Program Directors, by Year

percent, $p = .014$). There were also marginally significant differences in the educational levels of African American versus other directors ($p = .092$), with African American having completed slightly more schooling than other directors. However, the proportion of African American directors without a college degree appears to have increased slightly over time (from 2.9 percent in 1995 to 13.0 percent in 2011, $p = .089$). The median age of both African American directors and directors from other racial groups increased significantly between 1995 and 2011.

African American directors were more likely to lead private not-for-profit OAT programs than other directors (57.8 percent vs. 45.0 percent, $p = .033$), and they were more likely to lead OAT programs in the southern United States than other directors (32.4 percent vs. 24.4 percent, $p = .048$). But African Americans were less likely than other directors to lead poorly staffed OAT programs (57.8 percent vs. 78.3 percent, $p = .000$). African American directors and directors from other races alike increasingly worked in private for-profit OAT programs and in programs dispensing buprenorphine between 1995 and 2011. In the pooled sample, there were no differences in

Table 1: Program Director Characteristics, by Race/Ethnicity and Year

Pooled Sample				White Director/Other Race					African American Director					
White & Other Race Director		African American Director		p-value	1995	2000	2005	2011	p-value	1995	2000	2005	2011	p-value
Director characteristics														
Ethnicity														
Not Hispanic	378 (91.3)	107 (98.2)		.014	81 (93.1)	95 (94.1)	97 (89.8)	105 (89.0)	.173	34 (97.1)	29 (100.0)	21 (95.4)	23 (100.0)	.703
Hispanic	36 (8.7)	2 (1.8)			6 (6.9)	6 (5.9)	11 (10.2)	13 (11.0)		1 (2.9)	—	1 (4.6)	—	
Gender														
Female	235 (56.8)	64 (58.7)		.427	50 (57.5)	54 (53.5)	61 (56.5)	70 (59.3)	.647	24 (68.6)	13 (44.8)	14 (63.6)	13 (56.5)	.563
Male	179 (43.2)	48 (44.0)			37 (42.5)	47 (46.5)	47 (43.5)	48 (40.7)		18 (41.9)	16 (55.2)	8 (36.4)	10 (43.5)	
Education														
Less than college	61 (14.7)	10 (9.2)		.092	9 (10.3)	15 (14.9)	22 (20.4)	15 (12.7)	.422	1 (2.9)	2 (6.9)	4 (18.2)	3 (13.0)	.089
Graduated college	55 (13.3)	22 (20.2)			13 (14.9)	10 (9.9)	14 (13.0)	18 (15.3)		7 (20.0)	5 (17.2)	4 (18.2)	6 (26.1)	
Higher degree	298 (72.0)	77 (70.6)			65 (74.7)	76 (75.3)	72 (66.6)	85 (72.0)		22 (77.1)	22 (75.9)	14 (63.6)	14 (60.9)	
Licensure as SUD counselor														
No	194 (47.2)	56 (51.4)		.438	38 (43.7)	56 (56.6)	55 (50.9)	45 (38.5)	.234	22 (62.9)	14 (48.3)	10 (45.5)	10 (43.3)	.130
Yes	217 (52.8)	53 (48.6)			49 (56.3)	43 (43.4)	53 (49.1)	72 (61.5)		13 (37.1)	15 (51.7)	12 (54.5)	13 (56.5)	
Age*														
Number of years over 25	409 (49.0)	107 (48.0)		.849	86 (46.0)	100 (47.0)	106 (50.0)	117 (52.0)	.000	35 (45.0)	27 (47.0)	22 (50.0)	23 (55.0)	.001
Program characteristics														
Ownership														
Public	92 (22.4)	23 (21.1)		.033	36 (41.4)	22 (22.2)	18 (16.7)	16 (13.7)	.000	8 (22.9)	7 (24.1)	7 (31.8)	1 (4.3)	.002
Private	185 (45.0)	63 (57.8)			46 (52.9)	41 (41.4)	46 (42.6)	52 (44.4)		25 (71.4)	16 (55.2)	12 (54.6)	10 (43.5)	
not-for-profit														

Continued

Table 1. Continued

Pooled Sample			White Director/Other Race					African American Director				
White & Other Race Director	African American Director	p-value	1995	2000	2005	2011	p-value	1995	2000	2005	2011	p-value
Private for-profit	23 (21.1)		5 (5.8)	36 (36.4)	44 (40.7)	49 (41.9)		2 (5.7)	6 (20.7)	3 (13.6)	12 (52.3)	
Accreditation												
Not JCAHO	79 (73.2)	.306	61 (70.1)	76 (76.0)	65 (60.2)	79 (67.0)	.221	24 (68.6)	21 (75.0)	16 (72.7)	18 (78.3)	.462
accredited												
JCAHO	29 (26.8)		26 (29.9)	24 (24.0)	43 (39.8)	39 (33.0)		11 (31.4)	7 (25.0)	6 (27.3)	5 (21.7)	
accredited												
Buprenorphine treatment?												
No	99 (90.8)	.105	87 (100.0)	101 (100.0)	85 (78.7)	78 (66.1)	.000	35 (100.0)	29 (100.0)	20 (90.9)	15 (65.2)	.000
Yes	10 (9.2)		—	—	23 (21.3)	40 (33.9)		—	—	2 (9.1)	8 (34.8)	
Number of patients*												
Median	414 (299.0)	.553	87 (270.0)	101 (250.0)	108 (281.0)	118 (359.0)	.002	35 (368.0)	29 (235.0)	22 (347.0)	23 (250.0)	.487
number per year												
Human resources												
<1 staff for	63 (57.8)	.000	68 (78.2)	81 (80.2)	88 (81.5)	87 (73.7)	.443	20 (57.1)	16 (55.2)	14 (63.6)	13 (56.5)	.874
20 patients												
≥1 staff for	46 (42.2)		19 (21.8)	20 (19.8)	20 (18.5)	31 (26.3)		15 (42.9)	13 (44.8)	8 (36.4)	10 (43.5)	
20 patients												

Continued

Table 1. Continued

Pooled Sample			White Director/Other Race					African American Director				
White & Other Race Director	African American Director	p-value	1995	2000	2005	2011	p-value	1995	2000	2005	2011	p-value
Geographic location												
Northeast	143 (34.5)	36 (33.3)	.048	36 (41.4)	36 (35.6)	37 (34.3)	34 (28.8)	.437	14 (41.2)	12 (41.4)	5 (22.7)	.069
Midwest	66 (15.9)	22 (20.4)		10 (11.5)	14 (13.9)	17 (15.7)	25 (21.2)		6 (17.6)	6 (20.7)	4 (18.2)	
South	101 (24.4)	35 (32.4)		20 (23.0)	22 (21.8)	28 (25.9)	31 (26.3)		11 (32.4)	8 (27.6)	8 (36.4)	
West	104 (25.1)	15 (13.9)		21 (24.1)	29 (28.7)	26 (24.1)	28 (23.7)		3 (8.8)	3 (10.3)	5 (22.7)	
Patient characteristics												
Employment status*												
% unemployed	412 (48.0)	109 (57.0)	.000	87 (50.0)	99 (47.0)	108 (40.0)	118 (50.0)	.736	35 (65.0)	29 (50.0)	22 (60.0)	.228
Age*												
% above age 40	404 (40.0)	107 (51.0)	.000	85 (36.0)	96 (38.0)	108 (45.0)	115 (45.0)	.001	33 (40.0)	29 (41.0)	22 (57.5)	.000
Race/ethnicity*												
% African American	407 (10.0)	108 (50.0)	.000	86 (19.0)	95 (17.0)	108 (13.5)	118 (5.0)	.000	35 (50.0)	29 (48.0)	22 (23.5)	.091
% Hispanic	409 (10.0)	109 (6.0)	.108	87 (6.0)	96 (10.0)	108 (10.0)	118 (7.5)	.157	35 (5.0)	29 (10.0)	22 (6.0)	.763

Notes. Numbers in the table are counts of observations in a specific category, except for variables indicated by an asterisk (i.e., continuous variables), where they are numbers of observations with nonmissing values. Numbers in parentheses are column percentages, except for continuous variables indicated by an asterisk, where they are median values. In the pooled sample, tests of the difference in characteristic between OAT program with African American versus other directors are based on a chi-square test for categorical variables, and a Kruskal–Wallis for continuous variables. In the repeated cross-section samples, the *p*-values are derived from nonparametric tests of trends.

the median size (i.e., annual number of clients) of OAT programs led by white directors and directors from other races, versus OAT programs led by African American directors (299 vs. 280 patients, $p = .553$). The median size of OAT programs led by African American directors did not increase significantly between 1995 and 2011 ($p = .487$), whereas the median size of OAT programs led by white directors and directors from other races increased from 270 to 359 patients during that timeframe ($p = .002$) 1995 and 2011.

African American directors served patient populations who were significantly more likely to be unemployed (57.0 percent vs. 48.0 percent, $p = .000$) and older (51.0 percent vs. 40.0 percent, $p = .000$) than the populations served by other directors (Table 1). Similarly, the populations served by OAT programs with African American directors were significantly more likely to include a high proportion of African American patients than other OAT programs (50 percent vs. 10 percent, $p = .000$). Over time, the proportion of OAT patients above age 40 increased significantly, whereas the proportion of African American clients declined. This was the case both in OAT programs directed by African Americans and in other OAT programs.

Correlates of Low Methadone Dose among OAT Patients

Table 2 describes multivariate regression results for the pooled 1995–2011 data. Controlling for patient and organizational covariates, we found that OAT programs with an African American director ($aOR = 1.420$, $p = .002$) remained more likely to provide low methadone doses to their patients, relative to programs with directors from other racial groups. The results also suggest that patients of OAT programs with a director who did not have a college degree ($aOR = 0.618$, $p = .001$) were less likely to receive low methadone doses than patients of programs whose director had a college degree. OAT programs serving older patient populations were less likely to dispense lower methadone doses ($aOR = 0.994$, $p = .014$). On the other hand, OAT programs that served higher proportions of African American ($aOR = 1.010$, $p = .000$) and Hispanic ($aOR = 1.006$, $p = .014$) patients were more likely to dispense lower methadone doses.

There were limited differences in the association of covariates and methadone dosage between OAT programs with an African American director and programs with directors from other racial groups. Among OAT program led by an African American director, those with JCAHO certification were less likely to dispense lower methadone doses to their patients ($aOR = 0.638$, $p = .044$). This was not the case among other OAT programs.

Table 2: Generalized Linear Models of the Probability of Receiving a Low Methadone Dose (i.e., <60 mg/day) by Pooled Sample and by Director Race

	All OAT Programs			White Director/Other Race			African American Director		
	aOR	95% CI	p-value	aOR	95% CI	p-value	aOR	95% CI	p-value
Director characteristics									
Race									
White	Ref	–	–	Ref	–	–	–	–	–
African American	1.420	1.133, 1.781	.002	–	–	–	–	–	–
Ethnicity									
Not Hispanic	Ref	–	–	Ref	–	–	Ref	–	–
Hispanic	1.003	0.698, 1.442	.986	1.003	0.696, 1.447	.985	0.939	0.305, 2.888	.912
Gender									
Female	Ref	–	–	Ref	–	–	Ref	–	–
Male	0.944	0.804, 1.109	.482	0.994	0.830, 1.190	.947	0.731	0.481, 1.110	.141
Education									
Graduated college	Ref	–	–	Ref	–	–	Ref	–	–
Less than college	0.618	0.465, 0.817	.001	0.642	0.473, 0.872	.005	0.289	0.119, 0.704	.006
Higher degrees	0.888	0.715, 1.106	.290	0.877	0.681, 1.130	.311	0.800	0.519, 1.233	.312
Director licensed as SUD counselor									
No	Ref	–	–	Ref	–	–	Ref	–	–
Yes	0.967	0.823, 1.135	.681	0.947	0.792, 1.131	.547	1.147	0.800, 1.646	.455
Age									
Number of years	0.994	0.985, 1.002	.145	0.995	0.986, 1.004	.324	0.988	0.969, 1.006	.183

Continued

Table 2. Continued

	All OAT Programs			White Director/Other Race			African American Director		
	aOR	95% CI	p-value	aOR	95% CI	p-value	aOR	95% CI	p-value
Program characteristics									
Ownership									
Public	Ref	—	—	Ref	—	—	Ref	—	—
Private not-for-profit	1.016	0.811, 1.274	.890	0.979	0.773, 1.241	.863	1.010	0.538, 1.895	.976
Private for-profit	1.006	0.764, 1.325	.963	1.068	0.800, 1.425	.655	0.961	0.442, 2.091	.921
Accreditation									
Not JCAHO accredited	Ref	—	—	Ref	—	—	Ref	—	—
JCAHO accredited	0.964	0.777, 1.197	.743	1.081	0.863, 1.354	.499	0.638	0.412, 0.988	.044
Buprenorphine treatment available?									
No	Ref	—	—	Ref	—	—	Ref	—	—
Yes	0.904	0.716, 1.142	.399	0.908	0.693, 1.189	.483	0.914	0.507, 1.646	.764
Number of patients									
Median number of patients per year	1.000	0.999, 1.000	.779	1.000	0.999, 1.000	.462	0.999	0.998, 1.00	.142
Human resources									
≥1 staff for 20 patients	Ref	—	—	Ref	—	—	Ref	—	—
<1 staff for 20 patients	1.013	0.841, 1.220	.889	0.972	0.785, 1.202	.792	1.218	0.881, 1.684	.233
Region									
Northeast	Ref	—	—	Ref	—	—	Ref	—	—
Midwest	1.085	0.818, 1.439	.571	0.904	0.678, 1.205	.469	1.935	1.121, 3.339	.018
South	1.015	0.803, 1.283	.902	0.936	0.707, 1.238	.648	1.197	0.648, 2.211	.566
West	1.204	0.924, 1.570	.170	1.087	0.821, 1.439	.560	2.356	1.193, 4.653	.014

Continued

Table 2. Continued

	All OAT Programs			White Director/Other Race			African American Director		
	aOR	95% CI	p-value	aOR	95% CI	p-value	aOR	95% CI	p-value
Patient characteristics									
Employment status									
% unemployed	0.998	0.994, 1.002	.264	0.998	0.994, 1.003	.429	0.994	0.984, 1.004	.272
Age									
% over age 40	0.994	0.990, 0.999	.014	0.995	0.990, 0.999	.035	0.994	0.985, 1.004	.225
Race/ethnicity									
% African American	1.010	1.006, 1.014	.000	1.008	1.003, 1.013	.001	1.015	1.007, 1.023	.000
% Hispanic	1.006	1.001, 1.010	.014	1.006	1.002, 1.011	.009	1.010	0.997, 1.023	.138
Time trend									
1995	Ref	—	—	Ref	—	—	Ref	—	—
2000	0.546	0.439, 0.680	.000	0.550	0.427, 0.709	.000	0.497	0.327, 0.755	.001
2005	0.480	0.381, 0.605	.000	0.492	0.377, 0.642	.000	0.372	0.213, 0.649	.001
2011	0.396	0.309, 0.507	.000	0.416	0.311, 0.555	.000	0.276	0.146, 0.521	.000
N	474			375			99		

Notes. The results presented in this table are obtained from a generalized linear model with the proportion of patients receiving less than 60 mg as the dependent variable. The GLM uses a logit link function. Standard errors are adjusted for the clustering of observations within OATs. aOR, adjusted odds ratio; 95% CI, 95% confidence interval.

Similarly, there were significant regional differences in methadone dosage patterns among OAT programs with an African American director, whereas this was not the case for OAT programs with directors from other racial groups. In particular, OAT programs with an African American director located in the Midwest or in the West were more likely to dispense low doses of methadone to their patients than similar programs located in the Northeast.

Interactions between Characteristics of OAT Program Directors and Patient Characteristics

Finally, we tested whether the association between the race/ethnicity of OAT program directors and methadone dosage differed by characteristics of the patient population. In Figure 3, we thus show a statistically significant interaction ($p = .039$) between directors' race and the percentage of African American patients among the patients of an OAT program. The increased likelihood of low methadone dosage in OAT programs with an African American director was further compounded when those programs served patient populations with higher percentages of African American patients. For example, in OAT programs with ≈ 20 percent African American patients, the difference in predicted percentage of patients receiving low methadone dose between OAT programs with a white versus African American director was ≈ 5 percentage points. This difference increased to close to 20 percentage points in programs with ≈ 80 percent of African American patients (Figure 3). There was no interaction between Hispanic ethnicity of patients and directors' racial or ethnic group (results not shown). There were no interactions between other characteristics of program directors (e.g., gender, education, age) and the racial/ethnic composition of the patient population.

DISCUSSION

Despite significant declines in the proportion of patients receiving low methadone doses in OAT programs since 1995, a considerable proportion of programs still did not provide the recommended minimal dose of ≥ 60 mg/day to (some of) their patients in 2011. We found that (1) the likelihood of low methadone dosage was greater in programs with an African American program director, (2) programs with a higher proportion of minorities (i.e., African American and/or Hispanic) among their patients were more likely to provide low methadone doses, and (3) patients in programs with a high proportion of

Figure 3: Predicted Proportions of Patients Receiving Low Methadone Dosage, by Director's Race and Racial Composition of Patient Population

Notes. The proportions are obtained from a generalized linear model similar to the model presented in Table 2, which also includes an interaction between the race of the director and the composition of the population of patients of an OAT. The odds ratio (OR) for the interaction terms was 1.007 and significant at $p = .039$. The shaded areas around each line represent the 95 percent confidence interval derived from the generalized linear model.

African American patients were even more likely to receive low methadone doses in programs managed by an African American director.

There are several reasons that may explain the association between the racial group of an OAT director and methadone doses dispensed by the program s/he leads. This may be the case because African American directors have different characteristics than their counterparts from other racial groups. We found, however, that most of the demographic and professional attributes of directors did not differ by race (e.g., gender, age, licensure). African American program directors had slightly higher degrees than other directors. As programs in which directors did not have a college degree were less likely to dispense low methadone doses than other programs, educational differences between directors may explain part of our findings. Nonetheless, the differences in methadone dosage patterns between programs with African

American directors and other programs remained even after controlling for education in multivariate analyses.

The difference in methadone doses between OAT programs may also be due to systematic differences in the characteristics of OAT programs led by African American directors versus other racial groups (e.g., ownership, certification, patient population). African Americans, thus, more frequently directed private not-for-profit OAT programs (Table 1). Similarly, the OAT programs directed by African Americans often served more disadvantaged patient populations (e.g., more unemployed patients). However, such characteristics of the OAT programs or the patient populations they serve were not associated with methadone dose levels. On the other hand, African American directors led programs that treated patient populations with a significantly larger proportion of African Americans. As the likelihood of receiving low methadone doses was also much larger in such populations, this is likely the key factor in explaining differences in methadone dosage patterns associated with the race of the OAT program director.

There may be a number of other factors contributing to differences in methadone dosage between OAT programs, such as attitudes and beliefs about methadone as an approach to treatment. Various directors' attitudes toward methadone have been associated with provision of low methadone doses (Pollack and D'Aunno 2008). If such attitudes are more prevalent among African American directors than among directors from other racial groups, then they may account for part of the differences in methadone dosage between OAT programs associated with director's race. These attitudes include, for example, support of abstinence orientation or opposition to syringe exchange. In addition, programs with directors who believe African American patients need treatment from staff who are either African American or educated in the history of African Americans (i.e., culturally competent treatment programs) are more likely to provide lower doses (Howard, Barrett, and Holmes 2010). Concerns about methadone treatment as a substitute of one addiction for another, especially among African Americans, may influence dosing patterns in programs managed by African American directors (Stancliff et al. 2002). Unfortunately, the NDATA did not elicit the attitudes of directors toward methadone and other substance abuse treatment practices. There is thus a need to investigate racial differences in leadership beliefs and attitudes about methadone use, dosing guidelines, and how these perceptions may adversely affect care practices.

The methadone dosage patterns observed in OAT programs with African American directors may also be linked to dynamics among treatment program

staff, particularly in organizations in which directors manage a racially diverse workforce. Unfortunately, the NDATSS also did not consistently measure the racial/ethnic composition of the staff of an OAT program. We thus could not investigate this pathway directly. Management research, however, suggests that increasing workplace diversity elicits a complex array of organizational processes (Williams and O'Reilly 1998; Mannix and Neale 2005). Within the context of our findings, a more diverse managerial and clinical workforce may allow more interactions between staff from several racial/ethnic groups. During these interactions, and through observation, staff may gain a heightened awareness of variations in their treatment practices. They may ultimately develop more empirically informed or practice recommended approaches of providing care. On the other hand, a more diverse workforce may also lead to more conflicts and less cooperation between staff (Williams and O'Reilly 1998; Jackson, Joshi, and Erhardt 2003; Bell et al. 2011). Staff members may be less likely to share information and both clinical and administrative decision making may become fragmented. Organizational dysfunction accentuates the uncertainty associated with clinical decisions and increases the likelihood that providers will rely on stereotypes when making treatment choices (van Ryn and Fu 2003). This may subsequently lead to lower than recommended methadone dosage, particularly for racial and ethnic minority patients. Although the IOM recommends increasing workplace diversity to improve the health of minority patients, the effects of this recommendation depend on the organizational processes that may unfold in increasingly diverse health care organizations (Phillips and Loyd 2006; van Knippenberg and Schippers 2007). Further research is needed to examine the influence of staff diversity in health care organizations on treatment practices and outcomes.

Our finding that OAT programs serving high proportions of minority patients dispense lower methadone doses is in line with extensive literature on variations in access to and quality of care in the U.S. health care system (Smedley, Stith, and Nelson 2003; National Healthcare Quality & Disparities Reports 2014). Although African Americans and Hispanics are disproportionately affected by substance use disorders, they often receive substandard health care and have worse outcomes relative to whites (Arndt, Acion, and White 2013). OAT programs in predominately minority communities tend to offer lower quality and fewer treatment services (Acevedo et al. 2012). Minority patients are less likely to receive care that matches their need (Schmidt et al., 2007; Marsh et al. 2009). Other correlates of variation in the treatment of substance use disorders by race/ethnicity include geographic access and health insurance status (Cummings

et al. 2013). There are also persistent negative perceptions of methadone among racial and ethnic minority injection drug users, including beliefs that methadone has considerable negative health consequences and that patients should prioritize the discontinuation of methadone (Zaller et al. 2009). African Americans perceived physical effects of methadone (i.e., brittle bones and dependence on methadone) might be a deterrent for methadone (Schwartz et al. 2008). Shame and stigma associated with methadone treatment among some Hispanic patients has also been shown to influence attitudes toward methadone for treatment (Reynoso-Vallejo et al. 2008). Minority patients with less favorable perceptions of methadone may hence be less likely to accept methadone, especially at higher doses. Interventions that increase patient awareness and acceptability of OAT, especially among minorities, may thus be important to addressing racial and ethnic variations in methadone dose patterns.

Improving on prior studies, we also found that the likelihood of African American patients receiving low methadone doses was compounded by the program director being of African American race. The pathways through which such an interaction between directors' race and the racial composition of the patient population emerges are likely multifarious. Perhaps director race/ethnicity is a proxy for other unobserved socioeconomic factors, such as characteristics of the neighborhood where the treatment center is located. It may also reflect other attributes of the patient population. On the other hand, director race/ethnicity may be a distinct construct and predisposes the director to specific perceptions regarding African American patients. These perceptions may consequently influence decision making about treatment practices. African American directors may provide lower methadone doses to African American patients because they perceive that a different approach to treatment may be more beneficial for this population group. In such cases, lower doses are provided in combination with other treatment modalities (e.g., behavioral and other therapeutic interventions) (Howard 2003). However, these directors may also provide lower doses to African American patients because of negative perceptions concerning black patients (Holt 2007). Additional studies are needed to better understand why methadone dosage is particularly low in OAT programs that serve a high percentage of African American patients and whose director is also African American. Qualitative methods, in particular, could help shed some light on the complex mechanisms underlying the relationships among race of client, race of director, and methadone dose levels.

LIMITATIONS

We have already mentioned several of the limitations that affect our analysis, for example, lack of data on directors' attitudes and on staff racial/ethnic diversity. There are several additional limitations. First, there may be a number of other factors, such as director's experience in addiction health services or sources of information about effective practices and treatment recommendations, which can influence dose levels. Patient involvement in treatment decisions, patient mix, and dose levels based on patient need may also have a role. Unfortunately, these factors were not systematically documented by the NDATSS. Second, even though we found variations in methadone dosage associated with the race of director and the racial composition of the patient population, our results do not address whether there are racial/ethnic disparities at the individual level within an OAT treatment program. Such investigation would help understand the mechanisms through which the association between director's race and methadone dose levels emerges. It would, however, require patient-level data, which are not collected by the NDATSS. Third, our analyses were limited by low sample size. For example, we could not investigate whether there were significant time trends in the association between organizational practices and the race of the OAT program director. Similarly, we could not assess the impact of some demographic characteristics of directors such as their educational level in more detail. Future research should use more recent data and a larger sample size to examine a broader range of managerial, patient, and external factors (e.g., state policies, treatment regulations) that may influence dose levels provided by OAT programs. Fourth, our analyses only documented methadone dosage patterns, without considering patient outcomes such as treatment completion. Finally, we could not make any causal inferences about the effects of directors' race on patient outcomes from this analysis. This is so because our data are drawn from repeated cross-sections and only include a limited number of OAT programs that were followed over time. We, thus, could not ascertain whether recruiting a director of a specific racial group led to subsequent changes in treatment practices and methadone dosage levels. Future research on the impact of managerial factors should be based on more detailed panel datasets. They should also explore the use of randomized trials to evaluate the effectiveness of managerial interventions to improve patient outcomes. Such interventions may include, for example, improved access to sources of information about evidence-based practices in

OAT programs, as well as changes in recruitment and training practices for OAT program directors.

CONCLUSION

Few studies have examined associations between the characteristics of the director and treatment practices of a health care organization. We showed that in OAT programs, the race of the program director was significantly associated with the adoption of suboptimal treatment practices (i.e., low methadone dosage), particularly in programs that serve a large proportion of minority patients. Further research should investigate the causal pathways through which race and other characteristics of OAT program directors affect methadone dosage. This could then lead to new managerial interventions designed to improve treatment practices and patient outcomes in OAT programs.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:

Appendix SA1: Author Matrix.