Published in final edited form as:

J Subst Abuse Treat. 2012 September ; 43(2): 152–160. doi:10.1016/j.jsat.2011.12.003.

Physicians in the substance abuse treatment workforce: Understanding their employment within publicly funded treatment organizations

Hannah K. Knudsen, Ph.D.^{a,*}, Carrie B. Oser, Ph.D.^b, Amanda J. Abraham, Ph.D.^c, and Paul M. Roman, Ph.D.^d

^aDepartment of Behavioral Science and Center on Drug and Alcohol Research, University of Kentucky, 109 Medical Behavioral Science Building, Lexington, KY 40536-0086, USA

^bDepartment of Sociology and Center on Drug and Alcohol Research, University of Kentucky, 1531 Patterson Office Tower, Lexington, KY 40506-0027, USA

^cInstitute for Behavioral Research and Department of Sociology, University of Georgia, 112 Barrow Hall, Athens, GA, 30602-2401, USA

^dInstitute for Behavioral Research and Department of Sociology, University of Georgia, 106 Barrow Hall, Athens, GA, 30602-2401, USA

Abstract

The employment of physicians by substance abuse treatment organizations is understudied, despite physicians' importance in implementing pharmacotherapy and integrating treatment into the broader system of medical care. Drawing on data collected from 249 publicly funded treatment organizations, this study examined organizational and environmental factors associated with the employment of physicians in these settings. A negative binomial regression model indicated greater numbers of physicians were employed when organizations offered detoxification services, were embedded in health care settings, and were larger in size. Funding barriers, including the costs of physicians and inadequate reimbursement by funders, were negatively associated with physician employment. Programs unaware that they could use state contract funding to pay for medical staff employed fewer numbers of physicians than programs aware of this type of state policy. Attempts to increase physician employment in substance abuse treatment may require attention to both organizational and environmental factors rather than simply trying to attract individuals to the field. Increasing physician employment may be challenging in the current economic climate.

1. Introduction

Recommendations for improving the quality of substance use disorder (SUD) treatment in specialty settings highlights the important roles of physicians in such change processes (Institute of Medicine, 2006). Physicians are critical in the implementation of pharmacotherapies and in the integration of SUD treatment into primary care. Little is

© 2011 Elsevier Inc. All rights reserved

*Corresponding author. Tel.: 859-323-3947; fax: 859-323-5350. hannah.knudsen@uky.edu (H.K. Knudsen)..

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

known, however, about the organizational and environmental factors associated with the employment of physicians in treatment settings. Most notably, the federal National Survey of Substance Abuse Treatment Services (N-SSATS) does not collect data regarding the presence of physicians in treatment facilities (Ducharme & Abraham, 2008; Substance Abuse and Mental Health Services Administration, 2011).

Health services research from the 1990s and early 2000s has indicated that 41–54% of SUD treatment programs had at least one physician on staff (Knudsen, Ducharme, & Roman, 2007b; McLellan, Carise, & Kleber, 2003; Vassilev, Strauss, Astone, Friedmann, & Des Jarlais, 2004). Comparative data suggest that publicly funded treatment centers are less likely to employ staff physicians than organizations that primarily rely on private sources of revenues (Knudsen, et al., 2007b). In 2004–2006, the average publicly funded organization employed less than one physician (Knudsen, Roman, & Oser, 2010). These organizations, which largely depend on the federal block grant, allocations from state and local governments, and contracts with criminal justice agencies for funding, constitute a significant segment of the treatment system and deliver the majority of specialty SUD services in the US (Cartwright & Solano, 2003; Chriqui, Terry-McElrath, McBride, & Eidson, 2008; Heinrich & Fournier, 2004). Given the size of the publicly funded treatment sector, understanding the patterns of physician employment in these types of organizations is particularly important.

The employment of physicians by SUD treatment organizations has added significance because physicians play critical roles in the implementation of evidence-based treatment practices (EBPs) and wraparound services. For example, access to physicians is an important facilitator for the adoption of medications to treat SUDs and co-occurring psychiatric conditions (Abraham, Knudsen, Rothrauff, & Roman, 2010; Knudsen, Abraham, Johnson, & Roman, 2009; Knudsen, Ducharme, & Roman, 2007a, 2007c; Knudsen, et al., 2010; Thomas, Wallack, Lee, McCarty, & Swift, 2003). The most widely endorsed barrier among programs reporting no use of medications to treat SUDs is lack of access to physicians (Knudsen, Abraham, & Oser, 2011). While earlier work relied on categorical measures of physician access (i.e., presence of any staff physicians), more recent research shows the number of physicians is positively associated with the likelihood of medication adoption in these settings (Knudsen & Abraham, in press; Knudsen, et al., 2010). In addition, the presence of physicians is positively associated with the delivery of on-site primary medical care (Friedmann, Alexander, & D'Aunno, 1999), which has been linked to improved SUD outcomes (Friedmann, Zhang, Hendrickson, Stein, & Gerstein, 2003; Mertens, Flisher, Satre, & Weisner, 2008; Saitz, Horton, Larson, Winter, & Samet, 2005). Finally, given the strong emphasis on addiction and substance dependence as medical problems with a neurobiological basis, the absence of physicians in treatment settings would seem almost remarkable, since such absence seemingly implies that treatment of these conditions does not require medical involvement.

Organizational characteristics may be associated with the employment of physicians, but research examining these factors is limited. In a prior analysis of the privately funded treatment sector, we compared the characteristics of treatment organizations with at least one physician on staff or contract to those lacking any employment relationships with physicians (Knudsen, Abraham, & Roman, 2011). Bivariate comparisons revealed that private treatment organizations with access to physicians were more likely to be located within a hospital and to offer more intensive levels of treatment (i.e., were less likely to only deliver outpatient services). Programs with physicians had a larger number of employees and treated a higher percentage of patients covered by Medicaid. It is important to extend these findings to determine whether such differences generalize to the publicly funded

treatment sector, whether these characteristics are associated with the *number* of physicians employed, and whether these differences remain significant in multivariate models.

The employment of physicians may also reflect the impact of the external environment on organizational decisions. Resource dependence theory (Pfeffer, 1987, 1997) suggests that the employment of physicians in SUD treatment organizations may be related to environmental factors, such as access to financial resources, state policies, and local labor market conditions. Publicly funded treatment programs rely upon relationships with external funders—such as criminal justice agencies, their Single State Agency (SSA), and local governments—for financial resources (Kubiak, Arfken, & Gibson, 2009). Staffing decisions may reflect the available financial resources of the organization, with some organizations simply being unable to afford the costs associated with employing physicians (Marinelli-Casey, Domier, & Rawson, 2002). A related, but distinct, issue is whether the funding may be allocated towards physician employment. Research on the adoption of evidence-based practices in both SUD and mental health settings has revealed how state contracts may limit how those funds can be used (Isett, et al., 2007, 2008; McCarty, Gustafson, Capoccia, & Cotter, 2009; Roman & McCarty, 2009). Finally, there may be variability in the availability of physicians with expertise in treating SUD patients in the local labor market. States vary in the availability of physicians (Cooper, Getzen, McKee, & Laud, 2002), so some treatment organizations may find it more difficult to identify and recruit physicians. While these environmental factors—funding resources, state policies, and the local labor market—may be associated with the employment of physicians, these relationships have yet to be examined.

The current study recruited a sample of 250 administrators of publicly funded treatment organizations to provide data regarding staffing, organizational characteristics, and environmental factors that may be associated with the employment of physicians. We define the employment of physicians as the number of physicians on staff plus the number who are contracted to provide services at the organization. Our research questions are twofold. First, what organizational characteristics are associated with the employment of physicians in publicly funded SUD treatment organizations? Second, is the employment of physicians associated with financial resources, state funding policies, and the local labor market?

2. Data and methods

2.1. Sample of publicly funded treatment organizations

Data were collected from a previously established US sample of publicly funded SUD treatment organizations. As part of the National Treatment Center Study (NTCS), a sample of 318 publicly funded substance abuse treatment centers was constructed in 2004–2006 using a two-stage sampling design that randomly selected US counties and organizations within the sampled counties (Knudsen et al., 2010). Organizations were screened for eligibility by telephone based on three criteria: 1) treatment services were open to the general public, meaning that services were not embedded within US military, Veterans Administration, or correctional facilities; 2) a minimum level of SUD treatment at least equivalent to or greater than structured outpatient, as defined by the American Society on Addiction Medicine, was available (Mee-Lee, Gartner, Miller, Shulman, & Wilford, 1996); and 3) at least 50% of their past-year revenues were received from government block grants/contracts or at least 50% of their patients' source of primary payment were from allocated public funds (e.g., block grants and contracts, but not public insurance). The criterion regarding level of SUD treatment excluded counselors in private practice, halfway houses/transitional housing, driving under the influence (DUI) programs, and opioid treatment programs that exclusively dispensed methadone maintenance from the sample. Trained field

interviewers traveled to these 318 organizations for face-to-face interviews with administrators (response rate of 80%). This cohort was re-contacted for the current study.

2.2. Data collection

Data collection occurred between August 2009 and June 2010. Trained interviewers attempted to call via telephone these 318 treatment organizations to determine whether they were still open and delivering SUD treatment. We found 27 organizations had ceased operations completely or no longer offered SUD treatment. The remaining 291 treatment centers were mailed a survey packet containing a study description letter, the research instrument, two informed consent forms, an honorarium payment form, and a postage-paid return envelope. If a center did not respond within 6 weeks, a second survey packet was mailed. If an organization did not respond to either survey, administrators were contacted by telephone to recruit and consent them into the study. These telephone interviews used the same measures as the mailed survey. Participating organizations received US\$50. This research design was approved by the institutional review boards (IRBs) of the University of Georgia and the University of Kentucky.

Data were received from 250 of the 291 SUD treatment organizations still open at the time of the study (response rate = 86%). Drawing on previously collected data, the characteristics of participating organizations were compared to those that refused to participate (directly or by never scheduling an interview) or were closed using bivariate multinomial logistic regression models (Knudsen, Abraham, & Oser, 2011). Programs were compared on organizational size, hospital status, accreditation, treatment services, staffing, and reliance on Medicaid or other public funding. There were no significant differences between participating and refusing organizations. The only significant difference detected at $p < .05$ was a difference in ownership between participating and closed organizations. Relative to the likelihood of study participation, the odds of closure were greater for government-owned organizations than privately owned organizations.

2.3. Measures

The research instrument gathered data on staffing, structural characteristics, and the external environment. The dependent variable of employment of physicians consisted of the sum of the number of physicians employed on staff (i.e., on the center's payroll) and the number on contract. This measure was a count of individual physicians, regardless of number of hours worked per week. Given that the number of physicians was likely to be greater in larger organizations, we summed the number of counselors on staff and contract as a proxy for organizational size.

Structural characteristics included government ownership (1 = government owned, 0 = privately owned), location in a health care setting (1 = located within a hospital or community mental health center, 0 = freestanding), accreditation (1 = accredited by external organization such as Joint Commission or Commission on the Accreditation of Rehabilitation Facilities; 0 = not accredited), availability of medically supervised detoxification (1 = available, 0 = not available), and whether the organization only provided outpatient treatment (1 = outpatient-only, 0 = not outpatient-only). Three items measured the consistency between the program's philosophy and a twelve-step orientation to treatment (Kasrabada, et al., 2001), with responses ranging from 0 representing "strongly inconsistent" and 4 indicating "strongly consistent." These three items were averaged into a scale of twelve-step orientation (Cronbach's $\alpha = .78$).

Administrators reported on seven environmental factors. First, administrators were asked how difficult it was to find physicians with experience treating clients with SUDs in the

local labor market, with 0 representing “very easy” to 4 representing “very difficult.” Second, administrators rated their agreement with two statements about whether having a physician on staff or contract would exceed the center's resources (0 = strongly disagree and 4 = strongly agree). These two items were averaged into a physician costs scale (inter-item correlation = .78). Third, administrators were asked to rate their agreement with the statement, “Our primary source of funding will not adequately reimburse the costs associated with physician time” (0 = strongly disagree and 4 = strongly agree). In addition, administrators were asked, “Can treatment providers with state contracts to provide addiction treatment services use those state contract funds to pay for physician or nurse time?” with the response options of “yes,” “no,” and “don't know.” In our model, programs aware of such a policy (i.e., the “yes” group) served as the reference group. Finally, three sources of revenues were measured. Administrators were asked to report the percentage of the center's past-year revenues from 1) contracts with criminal justice agencies, 2) federal block grant funds administered by the state, and 3) public insurance (i.e., Medicaid or Medicare).

2.3. Analytic Strategy

All analyses were conducted in Stata 11.2 (StataCorp, College Station, TX). First, descriptive statistics were calculated for the study variables. Given that employment of physicians consisted of a count, negative binomial regression (NBR) was used for model estimation rather than ordinary least squares (OLS) regression (Long & Freese, 2006). As described by Beck and Tolnay (1995), count data violate at least three key assumptions of OLS regression: 1) possible values only consist of whole numbers; 2) negative counts do not exist; and 3) count data often include a substantial number of cases equaling 0 on the dependent variable, which results in a skewed distribution. NBR is advantageous in addressing these three conditions. Furthermore, the percentage change in the expected count of the dependent variable for a one-unit increase of an independent variable can be expressed by the formula: $(100)(e^b - 1)$, where b is the unstandardized coefficient (Long, 1997). Percentage changes in the expected count for a standard deviation increase in the covariates can also be calculated. Percentage changes in the expected count are not intended to imply causality, but rather can aid the interpretation of the magnitude of the associations from the statistical model.

Listwise deletion has known weaknesses (Allison, 2002), and its use would have resulted in the loss of 22.5% of cases. Prior to estimating the NBR models, multiple imputation by chained equations was utilized to address covariates with missing data. To be conservative, we excluded one case with missing data on the dependent variable (Allison, 2009). Missing values for the covariates were imputed using the “ice” command (Royston, 2005a, 2005b), an approach with stronger properties than other imputation procedures (Ambler, Omar, & Royston, 2007). We generated 20 imputed datasets, and then used the “mi estimate” command to the pool the estimates from each dataset into a single set of results (Barnard & Rubin, 1999; Royston, 2004). We began by estimating bivariate models of physician employment, and then constructed a final model with all covariates significant at the bivariate-level ($p < .05$, two-tailed tests).

3. Results

3.1. Descriptive statistics of publicly funded SUD treatment organizations

Table 1 presents descriptive statistics for the study variables. Summing the number of physicians on staff and contract yielded a mean of 1.31 (SD = 1.50), suggesting that the average publicly funded SUD treatment organization did have access to at least one physician. Numbers of physicians ranged from 0 to 12, with a median of 1 physician. About

29.3% (n = 73) of programs had no physicians on contract or staff, 40.2% (n = 100) had at least one physician on contract but none on staff, and 30.5% (n = 76) had at least one physician on staff. The majority of organizations (73.6%) indicated that it was either “somewhat difficult” or “very difficult” to find physicians in the local community with experience in treating individuals with SUDs. Similarly, about 69.3% of administrators “agreed” or “strongly agreed” that their primary funder did not adequately reimburse the costs associated with physician time.

3.2. Negative binomial regression models of physician employment

We first examined the bivariate associations between each covariate and the number of physicians, as seen the first column of Table 2. There was a positive association between the number of counselors, a proxy for organizational size, and the number of physicians working at treatment centers. Programs that were located in a health care setting, were accredited, or offered detoxification services employed significantly more physicians. There were no significant differences based on program ownership, the delivery of outpatient-only services, or twelve-step orientation.

Four of the seven environmental factors were significantly associated with the number of physicians working at treatment centers. Greater endorsement of the physician costs scale was negatively associated with physician employment. Furthermore, inadequate reimbursement for physician time was negatively associated with the employment of physicians. There were significant differences based on perceptions of whether state contract funding could be used to pay for physician or nurse time. Compared to programs aware of a supportive state policy, programs either unaware (i.e., the “don't know” group) and those reporting they could not use state contract funding for this purpose employed significantly fewer physicians. However, the availability of experienced physicians in the local labor market was not significantly associated with physician employment. The only measure of revenues associated with physician employment at the bivariate-level was the percentage of past-year revenues from public insurance. The positive association indicated that organizations more reliant on public insurance also employed more physicians. Reliance on revenues from criminal justice contracts or federal block grant funding were not associated with the number of physicians.

The second column of Table 2 presents the multivariate negative binomial regression model of physician employment, including all covariates significant at the bivariate-level. Most covariates remained significant in the multivariate model. The number of physicians continued to be positively associated with organizational size, location in a health care setting, and the availability of detoxification services. Holding other variables constant, the association for organizational size was relatively modest, such that a standard deviation increase in the number of counselors ($SD = 19.6$) was only associated with a 10.3% increase in the expected count of physicians [$10.3 = (100)(e^{(.005)(19.6)} - 1)$]. Differences based on location in a health care setting and the availability of detoxification were considerably larger. The expected count of physicians was 44.6% greater for health care-based programs relative to programs in non-health care settings [$44.6 = (100)(e^{(.369)} - 1)$], after controlling for the other variables. In organizations offering detoxification, the expected count of physicians was 56.2% greater than the expected count for organizations where detoxification was not available.

Three environmental factors encompassing financial barriers remained statistically significant. A one-unit increase in the physician costs scale was associated with a 14.3% decrease in the expected count of physicians; at the maximum value of this scale, the expected number of physicians would be 46.0% lower than the scale's minimum value [$-46.0 = (100)(e^{(-.154)(4)} - 1)$]. Each unit increase in the item measuring inadequate

reimbursement of physician time by the center's primary funder was associated with an 11.0% decrease in the expected number of physicians, with the expected count of physicians estimated to be 37.1% lower at the item's maximum relative to its minimum [$-37.1 = (100)(e^{(-.116)(4)} - 1)$]. There continued to be a significant difference in physician employment between those aware of a supportive state policy that allowed contract funding to pay for physician or nurse time and those unaware of such a policy (i.e., the “don't know” group); the expected count of physicians was estimated to be 28.6% lower for the “don't know” group. However, the difference for programs reporting state contract funding could not be used for this purpose (i.e., the “no” group) and programs aware of this supportive state policy was no longer significant once other measures were taken into account. Accreditation status and the percentage of revenues from Medicaid were no longer associated with the employment of physicians once other variables were controlled.

4. Discussion

Despite the importance of physicians for the implementation of medications and delivery of medical care to patients with SUDs, this study of publicly funded SUD treatment centers represents the first attempt to identify organizational and environmental factors associated with the employment of physicians. We found factors related to the funding environment were significant in several ways. First, inadequate funding—simply in terms of quantity—was clearly associated with the employment of physicians, as evidenced by the negative relationship between a scale about costs exceeding available resources and the number of physicians working in treatment centers. In addition, the policies of funding agencies were relevant barriers. Treatment organizations indicating that their primary funder did not adequately reimburse physician time employed fewer physicians. However, when programs were aware of a supportive state funding policy, namely one that allowed the use of state contract dollars to pay for medical staff, they employed a significantly greater number of physicians than programs that did not know if such a policy existed.

In the multivariate model, the difference between those aware of a supportive state funding policy (i.e., the “yes” group) and programs reporting their state did not allow contract funding to pay for medical staff (i.e., the “no” group) was no longer significant. Additional analyses (not shown) suggest that the measure of inadequate reimbursement of physician time, which was also associated with physician employment, may have been a mediator, since the “no” group more strongly endorsed the measure of inadequate reimbursement.

These findings share some similarities with our prior work. Perhaps most notably, the average number of physicians on staff was nearly identical to data collected in 2004–2006 from this cohort (Knudsen & Roman, 2009). This similarity suggests that access to physicians has not improved in publicly funded treatment programs over the past five years. In addition, our findings at the bivariate level were somewhat similar to our prior research on privately funded treatment organizations, most notably in the positive bivariate associations between employment of physicians, reliance on public insurance revenue, location in a medical setting, and organizational size (Knudsen, Abraham, & Roman, 2011). However, the association for public insurance was no longer significant once other organizational and environmental variables were controlled in our multivariate model.

A somewhat surprising finding was that the measure of physician availability in the local labor market was not associated with the number of physicians working in publicly funded treatment programs. In supplemental analyses, we considered whether our labor market variable was able to differentiate programs with any physicians from those with no physicians. However, these two groups were virtually identical in their responses to this measure of physician availability in the local labor market, with both groups' averages

translating to the “somewhat difficult” response option. It seems notable that there was such agreement about the difficulty in finding physicians in local labor markets, even though this measure was not associated with differential levels of physician employment.

We also found that twelve-step orientation was not associated with the presence of physicians, suggesting that adherence to this treatment philosophy neither hindered nor facilitated physician employment. At times, the twelve-step model has been characterized as a less medicalized approach to treating SUDs, perhaps due to its emphasis on total abstinence and inclusion of spiritual aspects in the recovery process (Saxon & McCarty, 2005; Thomas, et al., 2003). Yet, the twelve-step model has been integrated into hospital-based SUD treatment programs (Roman, Johnson, & Blum, 2000; White, 1998), suggesting that this treatment model is not completely incompatible with more medically-oriented treatment settings. Our findings regarding physician employment, taken together with recent findings that 12-step-based programs are no less likely to offer SUD medications than programs based on other models (Knudsen, et al., 2010), indicate that 12-step approaches may not be a barrier to the inclusion of medically-oriented services within publicly funded treatment programs.

Continued research on the publicly funded treatment sector is warranted, particularly given the rapidly evolving funding environment. It is not clear how the implementation of health care reform may affect these treatment programs, particularly given the resources needed to employ physicians. There is some concern that the expansion of Medicaid eligibility may have the unanticipated consequence of states placing restrictions on behavioral health services in order to limit levels of spending (Garfield, Lave, & Donohue, 2010). State budgets continue to be under pressure from the recent economic crisis, which may limit funding for SUD treatment programs in the upcoming years. Given that barriers related to financial resources were significantly associated with physician employment, these trends at the state-level may impede the ability of treatment programs to expand their employment relationships with physicians.

The data suggest several other observations. First, it seems clear from these data as well as data from the privately funded treatment sector (Knudsen, Abraham, & Roman, 2011) that the presence of physicians is not viewed by all programs as a vital, necessary ingredient of staffing, with a significant minority of programs continuing to function without medical involvement. This absence of physicians may impede public acceptance of SUDs as medical problems, and thus, “diseases like any other.” Second, while many respondents reported inadequate resources to staff their programs with physicians, this reflects strategic priorities as well as funding realities, suggesting that physician employment is not a high-priority consideration in some settings.

This study has several limitations. First, these cross-sectional data cannot be used to establish causality between organizational characteristics, environmental factors, and physician employment. While some measures were available from the previous round of data collection, several of the environmental factors were not previously been measured, so we could not conduct longitudinal analyses. Second, this sample is representative of the publicly funded treatment sector, meaning programs that are highly reliant on governmental allocations to fund their services. While representative of the largest sector of the US treatment system, our findings may not generalize to other types of organizations, such as those dependent on private funding (e.g., insurance and self-paying clients), programs embedded in the Veterans Administration system, opioid treatment programs, and corrections-based facilities. Third, all measures were self-reported by administrators, and hence, may be subject to social desirability and recall bias. For example, we did not validate whether administrators were accurate in their perceptions about state policy regarding the

use of contract funds to pay for medical staff. While we have demonstrated accuracy in administrators' perceptions regarding state policies regarding the inclusion of SUD medications on their state's Medicaid formulary (Knudsen & Abraham, in press), we were unable to conduct a similar analysis for the state policy measure regarding using contract funding to pay for medical staff. More research is needed that integrates data collected from the SSAs about the state policy environment with program-level measures like those used in the current study.

There were several other limitations related to measurement. Some measures had missing data, and while multiple imputation is a stronger method than complete case analysis (i.e., listwise deletion), this remains a limitation. Our measure of physician employment, while representing the number of physicians working within a program, cannot speak to the amount of time per week that physicians are present. The lack of measurement of physician hours was a limitation; a stronger measure might measure physician employment in terms of full-time equivalent (FTE) positions since this would capture the temporal element of physicians' presence in these settings. Finally, we did not ask administrators to describe the medical specialties of physicians employed by their programs, so it is unknown the extent to which addiction specialties are represented in these settings.

There are numerous directions for future research regarding physicians working in SUD treatment, given the current paucity of studies. Little is known about the perspectives of physicians working in these settings about models of treatment and their attitudes towards evidence-based practices. An exception is work by McCarty and colleagues (2007) who compared medical staff (inclusive of both physicians and nurses) to counselors working in programs affiliated with the National Drug Abuse Treatment Clinical Trials Network, finding that these two types of treatment professionals were similar with regard to several attitudes. Descriptive information about physicians' specific work activities as well as their interaction with the counseling staff within programs would also be valuable. Currently, data are scant regarding the interplay between these two segments of the workforce. Another direction for future research is to elucidate how physicians enter the field of substance abuse treatment, the hiring practices of treatment programs, factors that facilitate or impede their retention as part of the SUD workforce, and the implications of contractual versus standard employment relationships for both physicians and treatment programs.

Physicians are an understudied element in the SUD treatment workforce. These data from the publicly funded treatment programs indicate that several environmental factors are associated with the employment of physicians, even after organizational characteristics are taken into account. In the current funding environment, it seems unlikely that the quantity of financial resources will increase, but these findings suggest a need for additional scrutiny regarding how state policies may serve as barriers to the employment of physicians. About a third of the sample did not know whether state contract funding could be used to pay for medical staff, pointing to a need for greater dissemination about the content of state policies, but also highlighting the passivity of some program leadership in understanding aspects of their external environment that impinge on the quality of their services. Continued research is needed, both to determine whether the current findings can be replicated in other types of treatment settings and to examine whether the shifting funding environment affects the ability of publicly funded SUD treatment programs to employ physicians.

Acknowledgments

The authors gratefully acknowledge research support from the Robert Wood Johnson Foundation's Substance Abuse Policy Research Program (Grant No. 65111, PI: Dr. Hannah Knudsen), which supported data collection and manuscript development. The sample of treatment programs was originally constructed through research support from the National Institute on Drug Abuse (R01DA014482, PI: Dr. Paul M. Roman, University of Georgia). Dr.

Carrie Oser received additional support from the National Institute on Drug Abuse (K01DA021309). These sources of funding did not influence the design or conduct of the study, nor the interpretation of the data. Opinions expressed in this manuscript are those of the authors and are not intended to reflect the official positions of the funding agencies.

References

- Abraham AJ, Knudsen HK, Rothrauff TC, Roman PM. The adoption and implementation of alcohol pharmacotherapies in the Clinical Trials Network: The influence of research network participation. *Journal of Substance Abuse Treatment*. 2010; 38:275–283. [PubMed: 20117908]
- Allison, PD. Missing Data. Sage; Thousand Oaks, CA: 2002.
- Allison, PD. Missing data. In: Millsap, RE.; Maydeu-Olivares, A., editors. *The SAGE Handbook of Quantitative Methods in Psychology*. Sage; Thousand Oaks, CA: 2009. p. 72-89.
- Ambler G, Omar RZ, Royston P. A comparison of imputation techniques for handling missing predictor values in a risk model with a binary outcome. *Statistical Methods in Medical Research*. 2007; 16:277–298. [PubMed: 17621472]
- Barnard J, Rubin DR. Small sample degrees of freedom with multiple imputation. *Biometrika*. 1999; 86:948–955.
- Beck EM, Tolnay SE. Analyzing historical count data: Poisson and negative binomial regression models. *Historical Methods*. 1995; 28:125–131.
- Cartwright WS, Solano PL. The economics of public health: Financing drug abuse treatment services. *Health Policy*. 2003; 66:247–260. [PubMed: 14637010]
- Chriqui JF, Terry-McElrath Y, McBride DC, Eidson SS. State policies matter: The case of outpatient drug treatment program practices. *Journal of Substance Abuse Treatment*. 2008; 35:13–21. [PubMed: 17936550]
- Cooper RA, Getzen TE, McKee HJ, Laud P. Economic and demographic trends signal an impending physician shortage. *Health Affairs*. 2002; 21:140–154. [PubMed: 11900066]
- Ducharme LJ, Abraham AJ. State policy influence on the early diffusion of buprenorphine in community treatment programs. *Substance Abuse Treatment, Prevention, and Policy*. 2008; 3:17.
- Friedmann PD, Alexander JA, D'Aunno TA. Organizational correlates of access to primary care and mental health services in drug abuse treatment units. *Journal of Substance Abuse Treatment*. 1999; 16:71–80. [PubMed: 9888124]
- Friedmann PD, Zhang Z, Hendrickson J, Stein MD, Gerstein DR. Effect of primary medical care on addiction and medical severity in substance abuse treatment programs. *Journal of General Internal Medicine*. 2003; 18:1–8. [PubMed: 12534757]
- Garfield RL, Lave JR, Donohue JM. Health reform and the scope of benefits for mental health and substance use disorder services. *Psychiatric Services*. 2010; 61:1081–1086. [PubMed: 21041345]
- Heinrich CJ, Fournier E. Dimensions of publicness and performance in substance abuse treatment organizations. *Journal of Policy Analysis and Management*. 2004; 23:49–70. [PubMed: 14976993]
- Institute of Medicine. Improving the quality of health care for mental and substance-use conditions. National Academies Press; Washington, DC: 2006.
- Isett KR, Burnam MA, Coleman-Beattie B, Hyde PS, Morrissey JP, Magnabosco JL, et al. The state policy context of implementation issues for evidence-based practices in mental health. *Psychiatric Services*. 2007; 58:914–921. [PubMed: 17602006]
- Isett KR, Burnam MA, Coleman-Beattie B, Hyde PS, Morrissey JP, Magnabosco JL, et al. The role of state mental health authorities in managing change for the implementation of evidence-based practices. *Community Mental Health Journal*. 2008; 44:195–211. [PubMed: 17924189]
- Kasarabada ND, Hser YI, Parker L, Hall E, Anglin MD, Chang E. A self-administered instrument for assessing therapeutic approaches of drug-user treatment counselors. *Substance Use and Misuse*. 2001; 36:273–299. [PubMed: 11325167]
- Knudsen HK, Abraham AJ. Perceptions of the state policy environment and adoption of medications in substance use disorder treatment. *Psychiatric Services*. in press.

- Knudsen HK, Abraham AJ, Johnson JA, Roman PM. Buprenorphine adoption in the National Drug Abuse Treatment Clinical Trials Network. *Journal of Substance Abuse Treatment*. 2009; 37:307–312. [PubMed: 19577406]
- Knudsen HK, Abraham AJ, Oser CB. Barriers to the implementation of medication-assisted treatment for substance use disorders: The importance of funding policies and medical infrastructure. *Evaluation & Program Planning*. 2011; 34:375–381. [PubMed: 21371752]
- Knudsen HK, Abraham AJ, Roman PM. Adoption and implementation of medications in addiction treatment programs. *Journal of Addiction Medicine*. 2011; 5:21–27. [PubMed: 21359109]
- Knudsen HK, Ducharme LJ, Roman PM. Racial and ethnic disparities in SSRI availability in substance abuse treatment. *Psychiatric Services*. 2007a; 58:55–62. [PubMed: 17215413]
- Knudsen HK, Ducharme LJ, Roman PM. The adoption of medications in substance abuse treatment: Associations with organizational characteristics and technology clusters. *Drug and Alcohol Dependence*. 2007b; 87:164–174. [PubMed: 16971059]
- Knudsen HK, Ducharme LJ, Roman PM. The use of antidepressant medications in substance abuse treatment: The public-private distinction, organizational compatibility, and the environment. *Journal of Health and Social Behavior*. 2007c; 48:195–210. [PubMed: 17583274]
- Knudsen HK, Roman PM. Racial and ethnic composition as a correlate of medication availability within addiction treatment organizations. *Sociological Focus*. 2009; 42:133–151. [PubMed: 20414366]
- Knudsen HK, Roman PM, Oser CB. Facilitating factors and barriers to the use of medications in publicly funded addiction treatment organizations. *Journal of Addiction Medicine*. 2010; 4:99–107. [PubMed: 20835350]
- Kubiak SP, Arfken CL, Gibson ES. Departments of corrections as purchasers of community-based treatment: A national study. *Journal of Substance Abuse Treatment*. 2009; 36:420–427. [PubMed: 19004602]
- Long, JS. *Regression Models for Categorical and Limited Dependent Variables*. Sage; Thousand Oaks, CA: 1997.
- Long, JS.; Freese, J. *Regression Models for Categorical Dependent Variables Using Stata*. 2nd edition. StataCorp; College Station, TX: 2006.
- Marinelli-Casey P, Domier CP, Rawson RA. The gap between research and practice in substance abuse treatment. *Psychiatric Services*. 2002; 53:984–987. [PubMed: 12161673]
- McCarty D, Fuller BE, Arfken C, Miller M, Nunes EV, Edmundson E, et al. Direct care workers in the National Drug Abuse Treatment Clinical Trials Network: Characteristics, opinions, and beliefs. *Psychiatric Services*. 2007; 58:181–190. [PubMed: 17287373]
- McCarty D, Gustafson D, Capoccia VA, Cotter F. Improving care for the treatment of alcohol and drug disorders. *Journal of Behavioral Health Services & Research*. 2009; 36:52–60. [PubMed: 18259871]
- McLellan AT, Carise D, Kleber HD. Can the national addiction treatment infrastructure support the public's demand for quality care? *Journal of Substance Abuse Treatment*. 2003; 25:117–121. [PubMed: 14680015]
- Mee-Lee, D.; Gartner, L.; Miller, MM.; Shulman, GR.; Wilford, BB. *Patient Placement Criteria for the Treatment of Substance-Related Disorders*. 2nd ed.. American Society of Addiction Medicine; Chevy Chase, MD: 1996.
- Mertens JR, Flisher AJ, Satre DD, Weisner C. The role of medical conditions and primary care services in five-year substance use outcomes among chemical dependency treatment patients. *Drug and Alcohol Dependence*. 2008; 98:45–53. [PubMed: 18571875]
- Pfeffer, J. A resource dependence perspective on intercorporate relations. In: Mizruchi, MS.; Schwartz, M., editors. *Intercorporate Relations: The Structural Analysis of Business*. Cambridge University Press; Cambridge, England: 1987. p. 25-55.
- Pfeffer, J. *New Directions for Organization Theory: Problems and Prospects*. Oxford University Press; New York: 1997.
- Roman PM, Johnson JA, Blum TC. The transformation of private alcohol problem treatment: Results from a national study. *Advances in Medical Sociology*. 2000; 7:321–342.

- Roman, PM.; McCarty, D. Assessment of project development in cohort one of Advancing Recovery: A multi-method approach. 2009. Retrieved January 4, 2011, from <http://www.uga.edu/ntcs/AREV.htm>
- Royston P. Multiple imputation of missing values. *The Stata Journal*. 2004; 4:227–241.
- Royston P. Multiple imputation of missing values: Update. *The Stata Journal*. 2005a; 5:188–201.
- Royston P. Multiple imputation of missing values: Update of ice. *The Stata Journal*. 2005b; 5:527–536.
- Saitz R, Horton NJ, Larson MJ, Winter M, Samet JH. Primary medical care and reductions in addiction severity: A prospective cohort study. *Addiction*. 2005; 100:70–78. [PubMed: 15598194]
- Saxon AJ, McCarty D. Challenges in the adoption of new pharmacotherapeutics for addiction to alcohol and other drugs. *Pharmacology and Therapeutics*. 2005; 108:119–128. [PubMed: 16055196]
- Substance Abuse and Mental Health Services Administration. National Survey of Substance Abuse Treatment Services: 2011 N-SSATS Questionnaire. 2011. Retrieved July 1, 2011, from http://www.dasis.samhsa.gov/dasis2/nssats/nssats_2011_q.pdf
- Thomas CP, Wallack SS, Lee S, McCarty D, Swift R. Research to practice: Adoption of naltrexone in alcoholism treatment. *Journal of Substance Abuse Treatment*. 2003; 24:1–11. [PubMed: 12646325]
- Vassilev ZP, Strauss SM, Astone JM, Friedmann PD, Des Jarlais DC. Provision of on-site medical care to patients with hepatitis C in drug treatment units. *Journal of Health Care for the Poor and Underserved*. 2004; 15:663–671. [PubMed: 15531822]
- White, W. *Slaying the Dragon: The History of Addiction Treatment and Recovery in America*. Chestnut Health Systems; Bloomington, IL: 1998.

Table 1

Descriptive statistics of publicly funded substance use disorders treatment organizations (n = 249)

	Mean (SD) or % (N)	Available N
<i>Organizational Characteristics</i>		
Number of physicians on staff	0.45 (0.81)	249
Number of physicians on contract	0.86 (1.19)	249
Sum of physicians on staff and on contract	1.31 (1.50)	249
Organizational size (number of counselors)	13.32 (19.60)	247
Government ownership	17.4% (43)	247
Location in a health care setting	17.7% (44)	248
Accredited (e.g., Joint Commission, CARF)	51.0% (125)	245
Detoxification is available	20.0% (49)	245
Outpatient-only SUD treatment	46.4% (115)	248
Twelve-step orientation (ranges from 0 to 4)	2.31 (1.01)	245
<i>Environmental Factors</i>		
Difficulty in finding physicians experienced in treating patients with SUDs (ranges from 0 to 4)	2.85 (1.13)	239
Cost of physicians exceeds financial resources (ranges from 0 to 4)	2.54 (1.30)	239
Primary funder does not adequately reimburse costs associated with physician time	2.89 (1.28)	241
State contract funding can be used to pay for medical staff		246
Yes	49.6% (122)	
No	16.3% (40)	
Don't know	34.1% (84)	
Percentage of past-year revenues from criminal justice contracts	10.11 (19.51)	232
Percentage of past-year revenues from federal block grant funding	33.93 (32.55)	225
Percentage of past-year revenues from public insurance	12.81 (21.04)	225

Note: Available data for each variable prior to multiple imputation are presented.

Table 2

Negative binomial regression models of number of physicians working in publicly funded SUD treatment organizations

	Bivariate Models: Unstandardized coefficient (Standard error)	Multivariate Model: Unstandardized coefficient (Standard error)
<i>Organizational Characteristics</i>		
Organizational size	.010 *** (.002)	.005 ** (.002)
Government ownership (vs. privately owned)	.322 (.165)	---
Health care setting (vs. non-health care setting)	.619 *** (.152)	.369 * (.143)
Accredited (vs. not accredited)	.280 * (.135)	-.065 (.127)
Detoxification is available (vs. not available)	.860 *** (.136)	.446 ** (.142)
Outpatient-only treatment (vs. not outpatient-only)	-.262 (.136)	---
12-step orientation	-.072 (.067)	---
<i>Environmental Factors</i>		
Difficulty in finding physicians experienced in treating patients with SUDs	-.035 (.061)	---
Cost of physicians exceeds financial resources	-.296 *** (.051)	-.154 ** (.059)
Primary funder does not adequately reimburse costs associated with physician time	-.269 *** (.048)	-.116 * (.055)
State contract funding can be used to pay for medical staff		
Yes	Reference	Reference
No	-.411 * (.194)	-.095 (.180)
Don't know	-.574 *** (.154)	-.337 * (.143)
Percentage of past-year revenues from criminal justice contracts	-.003 (.004)	---
Percentage of past-year revenues from federal block grant funding	-.001 (.002)	---
Percentage of past-year revenues from public insurance	.008 ** (.003)	.002 (.003)

Note:

*
 $p < .05$,

**
 $p < .01$,

 $p < .001$ (two-tailed tests).