



# HHS Public Access

Author manuscript

*Subst Abus.* Author manuscript; available in PMC 2024 July 04.

Published in final edited form as:

*Subst Abus.* 2023 July ; 44(3): 136–145. doi:10.1177/08897077231179824.

## Exploring the Association of State Policies and the Trajectories of Buprenorphine Prescriber Patient Caseloads

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### Abstract

**Background:** Increasing buprenorphine access is critical to facilitating effective opioid use disorder treatment. Buprenorphine prescriber numbers have increased substantially, but most clinicians who start prescribing buprenorphine stop within a year, and most active prescribers treat very few individuals. Little research has examined state policies' association with the evolution of buprenorphine prescribing clinicians' patient caseloads.

**Methods:** Our retrospective cohort study design derived from 2006 to 2018 national pharmacy claims identifying buprenorphine prescribers and the number of patients treated monthly. We defined persistent prescribers based on results from a  $k$ -clustering approach and were characterized by clinicians who did not quickly stop prescribing and had average monthly caseloads greater than 5 patients for much of the first 6 years after their first dispensed

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Author Contributions

BAG, IC, and BDS conceived of the study. BAG and IC performed the analysis and took the lead in writing the manuscript. All authors provided critical feedback and contributed to manuscript revisions. BDS obtained funding for the study.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Compliance, Ethical Standards, and Ethical Approval

The authors are solely responsible for the content of this article, which does not necessarily represent the official views of the US Federal Government, including the National Institute of Health, National Institute on Drug Abuse and the Department of Veterans Affairs, Veterans Health Administration.

Supplemental Material

Supplemental material for this article is available online at the SAJ website <http://journals.sagepub.com/doi/suppl/10.1177/08897077231179824>

prescription. We examined the association between persistent prescribers (dependent variable) and Medicaid coverage of buprenorphine, prior authorization requirements, and mandated counseling policies (key predictors) that were active within the first 2 years after a prescriber's first observed dispensed buprenorphine prescription. We used multivariable logistic regression analyses and entropy balancing weights to ensure better comparability of prescribers in states that did and did not implement policies.

**Results:** Medicaid coverage of buprenorphine was associated with a smaller percentage of new prescribers becoming persistent prescribers (OR = 0.72; 95% CI = 0.53, 0.97). There was no evidence that either mandatory counseling or prior authorization was associated with the odds of a clinician being a persistent prescriber with estimated ORs equal to 0.85 (95% CI = 0.63, 1.16) and 1.13 (95% CI = 0.83, 1.55), respectively.

**Conclusions:** Compared to states without coverage, states with Medicaid coverage for buprenorphine had a smaller percentage of new prescribers become persistent prescribers; there was no evidence that the other state policies were associated with changes in the rate of clinicians becoming persistent prescribers. Because buprenorphine treatment is highly concentrated among a small group of clinicians, it is imperative to increase the pool of clinicians providing care to larger numbers of patients for longer periods. Greater efforts are needed to identify and support factors associated with successful persistent prescribing.

### Keywords

buprenorphine; opioid use disorder; state policies

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### Introduction

An estimated 5.6 million individuals in the United States were estimated to have an opioid use disorder (OUD) in 2021,<sup>1</sup> and the number of opioid related overdoses has climbed to record highs.<sup>2</sup> Medication treatment for OUD (MOUD)—formulations of buprenorphine, naltrexone, and methadone—is the gold standard treatment, and methadone and buprenorphine have been shown to reduce overdose risk and improve health.<sup>3–6</sup> The substantial growth in recent years of clinicians obtaining approval to prescribe buprenorphine has exceeded growth in facilities providing methadone treatment.<sup>7–9</sup>

However, most individuals with OUD are still not receiving MOUD.<sup>10</sup> While the number of clinicians approved to prescribe buprenorphine had increased substantially in the years prior to the abolition of the special approval that clinicians previously needed to prescribe buprenorphine (the X-waiver),<sup>7</sup> there has not been comparable growth in the number of individuals receiving buprenorphine to treat OUD.<sup>11</sup> A 2022 federal law repealing the X-waiver<sup>12</sup> has the potential to increase the number of clinicians who start prescribing buprenorphine. However, to what extent they will increase treatment capacity is uncertain; prior research indicates that many of the clinicians who had obtained approval to prescribe buprenorphine were not actively treating patients with buprenorphine,<sup>13,14</sup> and among active buprenorphine prescribers, the majority of prescribers treated relatively few patients.<sup>13–16</sup> It also appears common for clinicians to stop prescribing buprenorphine to patients within a year of starting.<sup>17</sup> As a result, a relatively small number of prescribers who had prescribed

to more than a handful of patients and actively prescribed over a number of years have been responsible for a substantial amount of the buprenorphine care provided nationwide. One study found that fewer than 5% of active prescribers were responsible for more than half of the buprenorphine treatment delivered.<sup>15</sup>

Prior research has examined state policies associated with aggregate trends in the number of clinicians who obtained approval to prescribe buprenorphine,<sup>18,19</sup> finding that Medicaid coverage of buprenorphine and targeted state educational efforts were positively associated with more clinicians obtaining approval to prescribe buprenorphine.<sup>19</sup> However, we are unaware of studies examining how such policies are associated with the evolution of prescribing clinician patient caseloads over time. This is an important outcome because the goal of such policies is to increase buprenorphine treatment capacity, the majority of which is provided by clinicians who consistently maintain a moderate caseload of patients on buprenorphine.<sup>14,15,17</sup> To address this gap in the literature, we examined the relationship between state buprenorphine policies implemented when a prescriber began prescribing buprenorphine with the prescriber's long-term buprenorphine prescribing trajectories. We examined 3 types of policies—(1) state Medicaid coverage of buprenorphine, where Medicaid pays for at least 1 formulation of buprenorphine to treat OUD; (2) prior authorization requirements, where clinicians must obtain approval from the Medicaid agency or Medicaid managed care organization when initiating and/or continuing buprenorphine treatment; and (3) mandated counseling, which requires individuals receiving buprenorphine to also receive counseling or therapy to treat their OUD. Medicaid coverage has been shown to be associated with a greater number of clinicians who obtained permission to prescribe buprenorphine;<sup>19</sup> both prior authorization and mandated counseling are commonly considered barriers to clinicians prescribing buprenorphine.<sup>20–25</sup>

## Methods

### Overview of Methods

We examined the relationship between state buprenorphine policies and clinician prescribing trajectories using a retrospective cohort study design derived from 2006 to 2018 national pharmacy claims to identify buprenorphine prescribers and the number of buprenorphine patients treated monthly. Our policy indicators were time invariant for each prescriber and indicated whether a given policy was active in the prescriber's state within 2 years of the prescriber's first observed dispensed buprenorphine prescription. The outcome, the class of the prescriber's treatment trajectory identified using a clustering approach,<sup>17</sup> was derived based on the prescriber's monthly patient caseload over the 6 years (72 months) following the first observed dispensed prescription. This allowed us to aggregate clinician-level prescription data into profiles that could be tracked over time, allowing us to compare differences in the odds that a clinician would become a persistent prescriber in a state that implemented one of the policies versus a state that did not, controlling for other factors.

The clustering approach applied to a clinician's monthly patient caseload, described in greater detail in Cabrero et al,<sup>17</sup> allowed us to identify different types of clinician prescribing trajectories and aggregate clinician-level prescribing data into high volume, medium volume, and low volume clinician profiles.<sup>17</sup> Given the small number of prescribers

categorized as high-volume ( $n = 571$ ), for the current analysis we combined high-volume and medium volume prescribers, hereafter referred to as persistent buprenorphine prescribers. Characteristics of prescribing patterns of clinicians categorized as persistent prescribers are they did not quickly stop prescribing after their initial prescription and had average monthly patient caseloads greater than 5 patients.

We then examined the association between state policies and the odds that a clinician was a persistent prescriber, using a combination of regression adjustment and balancing weights<sup>26,27</sup> to ensure that we removed potential confounding differences between prescribers in states that implemented a policy versus states that did not.

## Data and Variables

**Outcome: Persistent Prescribers.**—We used 2006 to 2018 buprenorphine pharmacy claims from the IQVIA Real World Data—Longitudinal Prescriptions to identify persistent buprenorphine prescribers.<sup>28</sup> These data capture approximately 90% of all prescriptions filled at retail pharmacies in the 50 states and District of Columbia and include information on the buprenorphine prescription, payer, and prescribing clinician’s location and specialty. We identified all clinicians with any dispensed prescription of a buprenorphine formulation for treating OUD, excluding formulations indicated for pain by the U.S. Food and Drug Administration. We included clinicians for whom we could observe at least 72 months of subsequent prescribing history, those whose first observed dispensed prescription was before January 1, 2013. We calculated each clinician’s monthly patient caseload—the number of patients with an active buprenorphine prescription from that prescriber in each month—for 72 months following the first observed prescription. We then applied *k-means* clustering using the monthly patient caseload to identify clusters of prescribers in the 6 years following the first observed filled buprenorphine prescription as detailed in our prior publication<sup>17</sup> as well as in the supplementary material.

Approximately 90% of prescribers were categorized as low-volume prescribers, who either stopped prescribing within a year of their first observed dispensed prescription or typically had monthly patient caseloads fewer than 5 patients. The remaining 10% of prescribers, hereafter defined as *persistent* prescribers, generally had patient caseloads that increased throughout the initial 20 months of prescribing and stabilized, typically at 15 or more patients monthly (see Cabrerros et al<sup>17</sup> for details of *k-means* clustering methods and findings).

**Exposures: State Policies.**—We obtained annual information on 3 state Medicaid policies—coverage of buprenorphine, prior authorization requirements for buprenorphine, and mandated counseling for individuals receiving buprenorphine—from a survey of state Medicaid officials.<sup>29</sup> We created a binary variable indicating whether the policy was active in a prescriber’s state within 2 years of the provider’s first observed dispensed buprenorphine prescription. We excluded prescribers ( $n = 7333$ ; 17.4% of prescribers) from states (CO, KS, ND, NH, NM, OK, WI) for which we were not able to verify state-level opioid policies in particular years. Supplementary Table A3 showcases how our final sample compared to those excluded. Of note, we found that excluded providers tend to come from

counties with higher median income and greater diversity; they also had a greater number of prescribers who first prescribed in 2013. Still, as shown, the prescribers included in our analysis are highly representative of the original population including all prescribers, which suggests the ability for the analysis to be representative despite the noted differences in the excluded individuals.

**Prescriber and County Characteristics.**—Our models controlled for prescriber and county characteristics found in prior research to be associated with clinicians obtaining waivers to prescribe buprenorphine or dispensed buprenorphine.<sup>30–34</sup> Clinician specialty was identified in the IQVIA data. We classified prescriber specialty as addiction specialists, including addiction medicine and addiction psychiatry physicians; adult primary care physicians (PCPs), including internists and family practice physicians; psychiatrists; pain specialists, comprising anesthesiologists/neurologists/pain specialists; emergency physicians; pediatricians; and other prescribers, comprising primarily surgeons and adult subspecialties. Using the 5-digit Federal Information Processing Standards code of the prescriber’s county, we used the Rural-Urban Continuum Codes (RUCC) from the Area Resources Files to classify counties as “metropolitan” (RUCC 1, 2, or 3) or “rural” (RUCC 4, 5, 6, 7, 8, or 9). We calculated county drug overdose rates using the per capita rate of overdose deaths drawn from the restricted multiple-cause-of-death mortality file from the Centers for Disease Control and Prevention;<sup>35</sup> we assigned counties to terciles based on the county’s rate for each year. We obtained county household income from the U.S. Census data (Small Area Income and Poverty Estimates Program) and used the average of each county’s median household income between 2006 and 2013 to assign counties to terciles. We calculated yearly total opioid volume per capita for each county by aggregating days’ supply and average daily morphine milligram equivalents (MME) for all filled opioid prescriptions from the IQVIA data, dividing by county population and then assigning counties to terciles based on the county’s total opioid volume per capita for that year. We calculated percentage of non-Hispanic white, non-Hispanic black, and Hispanic residents from the Area Health Resources File (AHRF) and assigned counties to terciles based on the county’s rate for that year. A small number of prescribers (approximately 0.3%) were in counties for which racial demographic information was unavailable. Given such low missingness, we used a single imputation strategy to handle missing covariate information. These data were imputed using a single iteration of multiple imputation by chained equations (MICE Version 3.14),<sup>36</sup> and we assessed sensitivity of our findings to use of different single imputations using MICE, finding our results were robust. The corresponding author’s IRB approved the study with a waiver of consent.

## Analysis

We first performed bivariate analyses of persistent buprenorphine prescribers and state-level buprenorphine policies to assess the unadjusted associations between the state-level policies and persistent prescribing. Then controlling for clinician and county characteristics, we conducted a series of multivariable logistic regression analyses to explore the association between state policies and persistent prescribing with persistent prescribing as our dependent variable.

**Balancing Weights.**—For each regression, we used entropy balancing weights to ensure better comparability between groups of prescribers within states that did or did not implement the policy of interest.<sup>37,38</sup> Since the goal of the analysis was to examine the association between state policies and the odds of being a persistent prescriber, we needed to ensure that groups of prescribers in states implementing policies and states not implementing policies were well balanced (comparable) across the full distributions of prescriber and county characteristics that could confound the association. We estimated 3 different sets of balancing weights: balancing prescribers in states with and without Medicaid coverage, balancing prescribers in states with and without mandated counseling, and balancing prescribers in states with and without prior authorization. The weights include the clinician and county characteristics described above.

We assessed the quality of the entropy balancing weights by computing standardized mean differences (SMDs), which are traditionally used to assess comparability of groups by displaying on an effect-size scale how the means of all the control covariates compare between group of prescribers in states with a policy versus states without a policy. Ideally, after weighting, all absolute SMDs should be below 0.1, suggesting minimal to no differences between the groups.<sup>39–41</sup> We denote when differences were greater than 0.1 using \* in our balance tables and provide the detailed SMDs for each policy variable using Love Plots shown in our Supplemental Material.

**Outcome Models.**—To estimate the association between state policies and the odds that a clinician was a persistent prescriber, we fitted multivariable logistic regression models to our indicators of persistent prescribing for each state policy separately (eg, buprenorphine coverage, prior authorization, and mandated counseling), weighted by the associated entropy balancing weight. This resulted in *doubly robust* estimation of the association: our final outcome models were weighted by the balancing weight while also controlling for the main effects of the key confounders used in the weight.<sup>27,42</sup> This included prescriber type, year of initial buprenorphine prescription, and county median income, fatal overdose rate, MME rates, urbanicity, and race/ethnicity measures. All regressions accounted for state-level clustering and were performed in R (version 4.1.2) using the `svyglm` command;<sup>43</sup> entropy balancing weights were estimated using the `entbal` command.<sup>44</sup> For regressions examining associations between counseling and prior authorization policies, we subsetted our data to include prescribers in states with coverage.

## Results

Of the 34734 buprenorphine prescribers, 10.6% (n = 3673) were persistent prescribers, and the remaining 89.4% (n = 31 061) were low-volume prescribers. The majority of prescribers were not in states that required prior authorization for buprenorphine or mandatory counseling in the first 2 years after their initial observed buprenorphine prescription; the majority of prescribers were in states with Medicaid coverage of buprenorphine. Persistent prescribers were more likely than non-persistent prescribers to start prescribing buprenorphine in years during which states did not have Medicaid coverage of buprenorphine (Table 1). Specifically, a smaller percentage of buprenorphine prescribers were persistent prescribers in states with Medicaid coverage of buprenorphine than in states



without coverage (10.1% vs 15.5%, respectively). In contrast, the percentage of persistent prescribers was comparable in states that did and did not have mandated counseling (9.6% vs 11.0%) and states that did and did not require prior authorization (11.1% vs 10.3%)

Table 2 illustrates how prescribers in states with Medicaid coverage of buprenorphine compare to prescribers in states without coverage on both county and prescriber-level characteristics, before and after using the balancing weights. Before weighting, buprenorphine prescribers in states with Medicaid coverage tended to be located in counties with higher median household income (absolute SMD = 0.37), lower fatal overdose rates (absolute SMD = 0.32), higher volumes of opioid analgesics dispensed per capita (absolute SMD = 0.16), and a lower percentage of racial/ethnic minority residents (absolute SMDs range from 0.23 to 0.51). They were also less likely to be in remote rural areas (absolute SMD = 0.27).

After weighting, the groups of prescribers in states with or without coverage were well matched on both county and prescriber-level covariates (absolute SMD = 0.00 for virtually all covariates). For example, before weighting, 60% of prescribers in states with Medicaid coverage of buprenorphine came from counties with the highest rates of Hispanic residents while only 48% of prescribers in states without coverage lived in counties with the highest rates of Hispanic residents. After weighting, prescribers from both types of states were equally matched: 59% of prescribers came from counties with the highest rates of Hispanic residents. Supplemental Appendix Tables A1 and A2 provide additional information regarding how the balancing weights improved the comparability between, respectively, prescribers within states with and without mandated counseling and with and without prior authorization. Additionally, Love plots are shown in the Supplemental Appendix to highlight more detailed information on the SMDs before and after weighting for each of our policy indicators.

Table 3 summarizes the results of multivariable regressions that included provider- and county-level control covariates. In our primary regression, we found that coverage was associated with an odds ratio of persistent prescribing 0.72 (95% CI = 0.52, 0.97), suggesting that Medicaid coverage is associated with a lower odds of active prescribers being persistent prescribers. In contrast, our second set of regressions examining the subset of states with coverage showed no evidence that either mandatory counseling or prior authorization was associated with the odds of a clinician being a persistent prescriber (OR = 0.85; 95% CI = 0.63, 1.16 and OR = 1.13; 95% CI = 0.83, 1.55, respectively).

## Discussion

Increasing access to buprenorphine treatment continues to play a critical role in our nation's response to the opioid crisis. However, federal and state efforts to increase the number of buprenorphine prescribers and allow them to treat more patients have not reduced the gap between the number of individuals needing treatment and the number receiving it,<sup>10</sup> and while the abolition of the X-waiver requirement as part of the Consolidated Appropriations Act removes 1 barrier to clinicians prescribing,<sup>12</sup> it is unclear to what extent it will increase buprenorphine treatment capacity. Many clinicians approved to prescribe buprenorphine

historically have not actively prescribed, and many active prescribers have treated very few individuals. One potential way to increase buprenorphine treatment capacity is to identify state policies associated with increasing the percentage of authorized prescribers who actively prescribe it to more patients for longer periods.<sup>45</sup> However, our analysis of 3 state policies thought to be associated with buprenorphine prescribing behavior—Medicaid coverage for buprenorphine, prior authorization, and mandated counseling—were not associated with an increase in the percentage of persistent buprenorphine prescribers.

Medicaid coverage of buprenorphine has been associated with an increase in the number of prescribers who obtained approval to prescribe buprenorphine.<sup>19</sup> However, we found a negative association between such coverage and the percentage of buprenorphine prescribing clinicians who became persistent prescribers. This pattern could occur if Medicaid coverage served as an incentive for clinicians to obtain permission to prescribe buprenorphine and start prescribing, but fewer of these new prescribers became persistent prescribers, compared to states without Medicaid coverage. In such a situation, the policy would be associated with a decrease in the percentage of persistent prescribers: the total number of prescribers might increase without a corresponding increase in the number of persistent prescribers. Such a result is consistent with studies of the effects of Medicaid expansion. It was associated with a significant increase in the number of clinicians who obtained permission to prescribe buprenorphine,<sup>18,46</sup> but it was not associated with an overall increase in the number of dispensed buprenorphine prescriptions or individuals filling buprenorphine prescriptions.<sup>47,48</sup> These findings of no change in the number of buprenorphine prescriptions or individuals filling prescriptions in states experiencing Medicaid expansion and increase in the number of buprenorphine prescribers in those states suggests that the average number of prescriptions filled and patients treated by buprenorphine prescribers was less after Medicaid expansion than before Medicaid expansion. Surveys of buprenorphine prescribers suggest that factors influencing clinicians to begin prescribing buprenorphine were often different from those that influence ongoing prescribing,<sup>49,50</sup> and our study suggests the same may be true of the influence of state policies.

All state Medicaid programs now cover at least 1 formulation of buprenorphine on their formulary.<sup>51</sup> However, our findings are a relevant reminder that simply covering buprenorphine is often not sufficient to increase buprenorphine treatment capacity. To be effective, such efforts must focus not only on increasing the number of buprenorphine prescribers but also on identifying and expanding the use of policies and interventions that encourage prescribers to continue prescribing and potentially to increase the number of patients they can safely and effectively treat. Adequate reimbursement is likely necessary but not sufficient, and policymakers should consider additional efforts to enhance the knowledge, skill, and comfort of active buprenorphine prescribers such as additional education, access to buprenorphine prescribing experts and consultants, and increasing the availability of therapists and mental health clinicians to provide ongoing counseling and address co-morbid mental health disorders.<sup>52–54</sup>

We observed no evidence of an association between the odds of being a persistent prescriber and Medicaid prior authorization policies or policies mandating counseling for individuals receiving buprenorphine for OUD. Given that both policies could increase the work involved



in treating patients with buprenorphine—either by requiring the prescriber to ensure a patient is receiving counseling or by obtaining a prior authorization for buprenorphine—we speculate that either policy might be associated with fewer prescribers becoming persistent prescribers. It may be that clinicians who become persistent prescribers develop efficient processes related to these activities, reducing their influence on prescribing behavior over time, or it may be that such policies are more likely to influence just a clinician's initial decision to become a buprenorphine prescriber. Further research is needed to examine how such policies affect clinician behavior over time.

We used balancing weights to minimize the potential impact of bias from observed confounders used in the analysis. Before weighting, there were clear differences in both county- and prescriber-level characteristics that could influence our unadjusted findings about differences between prescribers in states with and without the policies of interest. However, after weighting, we found no notable differences. Using balancing weights along with covariate adjustment is a robust way to control for the impact of observed confounders.<sup>27,42</sup> Still, as in most non-experimental studies, there is a potential that unobserved confounders, such as community perceptions regarding MOUD, that are driving our results, and future work should explore potential sensitivity to such unobserved factors.

Our findings must be considered within the context of the study's limitations. We restricted our analyses to buprenorphine formulations indicated for OUD treatment, but we cannot identify prescriptions of those formulations being prescribed off label for other reasons, such as pain management. We did not have information regarding the clinical status of patients filling buprenorphine prescriptions or the clinical setting in which prescriptions were written, nor to what extent patients discontinuing treatment was influencing prescriber monthly patient census. So that we could examine 6-year prescribing trajectories, we did not include clinicians who wrote their first filled buprenorphine prescription after 2013. In the 10 years since then, the opioid crisis has become more severe, and the discipline of clinicians able to prescribe, the requirement to obtain a waiver to prescribe buprenorphine, and state and federal policies related to buprenorphine prescribing have also changed. As a result, we did not know if our results would generalize to clinicians who first began prescribing buprenorphine in 2014 or subsequently. Research is needed to examine policies affecting the trajectories of prescribers who began prescribing more recently. We also only examined the policy environment in the 2 years after the first observed prescription; prior research indicates that prescribing practices remain relatively stable after that window, but we did not know how subsequent policy changes might affect clinician behavior. We were also unable to consider potential time-varying effects of the policies which might be occurring but are not identified by our current analytic approach and should be explored in future work.

## Conclusion

Policies that expand the buprenorphine prescriber workforce have been intended to increase treatment access, but these policies may not be sufficient on their own. Because buprenorphine treatment is highly concentrated among a small group of clinicians, it is imperative to increase the size of the clinician workforce who can and will provide care

to larger numbers of patients for longer periods of time. Our analysis indicates that several policies that could influence buprenorphine prescribing are not accomplishing this goal. Greater attention should be given to identifying the characteristics of successful high-volume practices (eg, staffing models, referral practices, and care coordination), and policies should focus specifically on creating incentives or supports to replicate these practices.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

## Acknowledgments

The authors thank Mary Vaiana, PhD and Hilary Peterson, BA, both of the RAND Corporation, for their feedback and editorial assistance on earlier versions of the manuscript.

## Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by the National Institute on Drug Abuse (NIDA) through R01DA045800-01 R01 (Stein, PI), K01DA042139 (Saloner) 1UG1DA049444 (Greater Intermountain Node, Gordon), and P50DA046351 (Stein, PI), and the Department of Veteran's Affairs (CIN 13-414; Gordon).

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**Table 1.**  
Distribution of Persistent Prescribers Among Prescribers in States With Different Types of Buprenorphine Policies.

	N	Low-volume prescriber	Persistent prescriber
	<b>34 374</b>	<b>31 061</b>	<b>3673</b>
Medicaid coverage of buprenorphine			
No	3236	84.5%	15.5%
Yes	31498	89.9%	10.1%
Mandatory counseling			
No	24525	89.0%	11.0%
Yes	10209	90.4%	9.6%
Prior authorization requirement			
No	21985	89.7%	10.3%
Yes	12749	88.9%	11.1%



**Table 2.**

Mean Proportions for Prescriber Specialty and County Characteristics Before and After Use of Entropy Balancing Weights on Covered vs Uncovered Populations.

Variable	Unweighted proportion		Weighted proportion	
	Medicaid coverage of buprenorphine	No Medicaid coverage	Medicaid coverage of buprenorphine	No Medicaid coverage
Prescriber (ref = adult primary care provider)				
Addiction specialist	0.01	0.02	0.01	0.01
Pediatrician/child specialist	0.03	0.03	0.03	0.03
Emergency physician	0.04	0.03	0.04	0.04
Psychiatrist	0.16	0.17	0.16	0.16
Pain specialist	0.08	0.08	0.08	0.08
Other prescriber	0.15	0.13	0.14	0.14
County median income (ref = high income)				
Low income	0.08	0.2 *	0.09	0.09
Medium income	0.21	0.22	0.21	0.21
County fatal overdose rate (ref = low overdose)				
Medium overdose	0.06	0.14 *	0.07	0.07
High overdose	0.92	0.81	0.91	0.91
MME (ref = low MME)				
High MME	0.58	0.61	0.58	0.58
Medium MME	0.37	0.3 *	0.37	0.37
Urbanicity (ref = urban)				
Rural adjacent	0.06	0.08	0.07	0.07
Rural remote	0.03	0.1 *	0.04	0.04
County race/ethnicity (refs = lowest tercile)				
Medium black tercile	0.37	0.15 *	0.35	0.35
High black tercile	0.5	0.64 *	0.51	0.51
Medium white tercile	0.27	0.32 *	0.27	0.27
High white tercile	0.11	0.1	0.11	0.11
Medium Hispanic tercile	0.28	0.3	0.28	0.28

Variable	Unweighted proportion		Weighted proportion	
	Medicaid coverage of buprenorphine	No Medicaid coverage	Medicaid coverage of buprenorphine	No Medicaid coverage
High Hispanic tercile	0.6	0.48*	0.59	0.59
Year of initial buprenorphine prescription (ref = 2006)				
2007	0.15	0.12*	0.15	0.15
2008	0.17	0.13*	0.16	0.16
2009	0.15	0.12*	0.15	0.15
2010	0.13	0.1*	0.13	0.13
2011	0.12	0.07*	0.12	0.12
2012	0.12	0*	0.11	0.11
2013	0.01	0*	0.01	0*

\* Standardized differences of absolute value greater than 0.1 between population in enacting states vs those who do not enact the policy. A detailed Love plot is available in the Supplemental Material. We note the sample sizes before weighting were 3236 prescribers in states without coverage and 31 498 in the states with coverage while effective sample sizes after entropy balancing weighting were 31 064 and 161, respectively.

**Table 3.**

Association Between State Policies and Persistent Prescribing.

Policy	Odds ratio	S E	95% CI
Medicaid coverage of buprenorphine	0.72	0.10	(0.53, 0.97)
Mandatory counseling	0.85	0.12	(0.63, 1.16)
Prior authorization	1.13	0.17	(0.83, 1.55)