Medicaid Section 1115 Substance Use Disorder (SUD) Demonstrations: Initial Impacts on Medicaid Acceptance and MOUD Provision among SUD Treatment Facilities in Five Early Implementing States

May 2025

RTI International

Introduction

Drug overdose is a leading cause of injury death in America, and opioids were involved in 75 percent of overdose deaths in 2020.[1] Factors contributing to the high number of overdose deaths include low rates of treatment for substance use disorders (SUD),[2] the stigma associated with seeking treatment,[3] and a shortage of health care professionals to treat SUD.[4] Medicaid beneficiaries face additional barriers to finding a treatment setting that meets their needs because of low participation in Medicaid by SUD treatment facilities.[5] Moreover, many SUD services are an optional benefit in Medicaid, and most states historically have not covered the full continuum of SUD services. Through section 1115 demonstrations, the Centers for Medicare & Medicaid Services (CMS) is partnering with states to test means of increasing access to the full continuum of care for SUD, including medication assisted treatment (MAT) and residential treatment, as advocated by leading treatment addiction experts.[6,7,8]

This report is part of a series of rapid cycle reports intended to share findings and insights about Medicaid section 1115 SUD demonstrations. This report summarizes exploratory analyses using data from the National Survey of Substance Abuse Treatment Services (N-SSATS) and presents initial estimates of the impact of section 1115 substance use disorder demonstrations on access to care delivered by specialty SUD treatment providers including public and private hospitals, residential facilities, outpatient facilities, and other clinics or facilities offering a SUD treatment program. Analyses focused on facilities in the five states approved under the CMS 2015 letter to State Medicaid Directors (SMDL) about the demonstration program:[6] California, Maryland, Massachusetts, Virginia, and West Virginia.

The analyses address two main questions related to demonstration objectives of ensuring provider capacity and expanding access to critical levels of care for SUD for Medicaid beneficiaries:

1. Did acceptance of Medicaid as payment for services increase among specialty SUD treatment facilities in demonstration states compared to facilities in other states?
2. Did the proportion of facilities that (1) accept Medicaid and (2) provide medication for opioid use disorder (MOUD) on-site increase in demonstration states compared to other states?

This preliminary examination was conducted as part of a meta-evaluation of the section 1115 SUD demonstrations to provide an initial assessment of demonstration effects on treatment facilities. These analyses evaluate the states' progress towards expanding provider capacity and expanding access to MOUD, demonstration strategies addressed in the 2015 SMDL and more explicitly outlined in the CMS 2017 SMDL. The results of these analyses will inform methods for subsequent analyses that will include additional states

[1] Centers for Disease Control and Prevention (CDC). (2024). *Understanding the opioid overdose epidemic*. https://www.cdc.gov/overdose-prevention/about/understanding-the-opioid-overdose-epidemic.html

[2] Substance Abuse and Mental Health Services Administration (SAMHSA). (2020). Key substance use and mental health indicators in the United States: Results from the 2019 National Survey on Drug Use and Health. HHS Publication No. PEP20-07-01-001, NSDUH Series H-55. Rockville, MD: SAMHSA, Center for Behavioral Health Statistics and Quality. https://www.samhsa.gov/data/sites/default/files/reports/rpt29393/2019NSDUHFFRPDFWHTML/2019NSDUHFFR1PDFW090120.pdf

[3] Cheetham A., Picco L., Barnett A., Lubman D.I., & Nielsen S. (2022). The impact of stigma on people with opioid use disorder, opioid treatment, and policy. *Substance Abuse Rehabilitation, 13*, 1-12. doi: 10.2147/SAR.S304566.

[4] Jones, C. M., Campopiano, M., Baldwin, G., & McCance-Katz, E. (2015). National and state treatment need and capacity for opioid agonist medication-assisted treatment. *American Journal of Public Health, 105*(8), e55–e63.

[5] MACPAC. (2018). *Access to substance use disorder treatment in Medicaid*. Chapter 4 in 2017 Report to Congress (June). MACPAC: Washington, DC.

[6] Centers for Medicare and Medicaid Services (CMS). (2015). *SMD # 15-003: New service delivery opportunities for individuals with a substance use disorder*. https://www.medicaid.gov/federal-policy-guidance/downloads/smd15003.pdf

[7] CMS. (2017). *SMD # 17-003: Strategies to address the opioid epidemic*. https://www.medicaid.gov/federal-policy-guidance/downloads/smd17003.pdf

[8] CMS, SAMHSA, National Institutes of Health. (2014). *Joint Informational Bulletin: Medication Assisted Treatment for Substance Use Disorders*. https://www.medicaid.gov/federal-policy-guidance/downloads/cib-07-11-2014.pdf

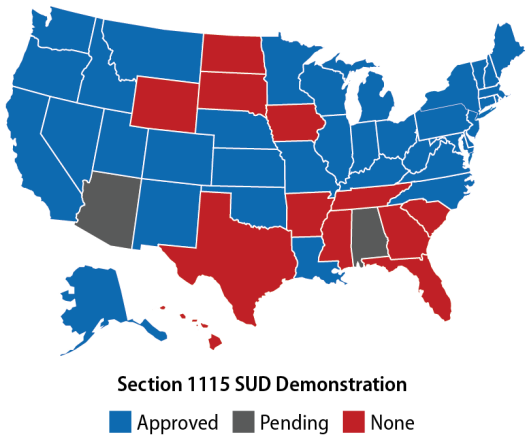
approved under the 2017 SMDL and additional years of data. In addition to providing methodological insights for the final meta-evaluation, findings in this report offer an initial look at demonstration effects on SUD treatment facilities in each of the five states.

About Section 1115 SUD Demonstrations

The goals of section 1115 SUD demonstrations include increasing access to SUD treatment and raising rates of identification, initiation, and engagement in treatment; increasing treatment adherence and retention; reducing overdose mortality; decreasing preventable or inappropriate emergency department and inpatient hospital utilization; reducing preventable or inappropriate readmissions to the same or higher level of care; and improving access to care for physical health conditions.

As of February 2024, 36 states and the District of Columbia had received approval for section 1115 SUD demonstrations; 2 other states had pending applications (**Figure 1**).

Figure 1. Section 1115 SUD demonstration status as of February 2024



Generally, to receive approval for a section 1115 SUD demonstration, states must outline their plans for expanding access to multiple levels of evidence-based care and explain how inpatient and residential SUD services will coordinate with community-based recovery services. States with approved section 1115 SUD demonstrations can receive federal financial participation (FFP) for SUD treatment services provided in residential and inpatient facilities that qualify as institutions for mental diseases (IMDs). These demonstrations generally require the state to submit and carry out implementation plans that set forth how the state will reach the following six milestones[9]:

1. Access to critical levels of care for opioid use disorder (OUD) and other SUDs.
2. Widespread use of evidence-based, SUD-specific patient placement criteria.
3. Use of nationally recognized, evidence-based SUD program standards to set residential treatment provider qualifications, including implementation of a requirement that residential treatment facilities offer MAT on-site or facilitate access off site.
4. Sufficient provider capacity at each level of care.
5. Implementation of comprehensive treatment and prevention strategies to address opioid abuse and OUD.
6. Improved care coordination and transitions between levels of care.

Overview of Findings

This analysis assessed the impact of section 1115 substance use disorder demonstrations on access to care delivered by specialty SUD treatment facilities including public and private hospitals, residential facilities, outpatient facilities, and other clinics or facilities offering a SUD treatment program. Specifically, we used descriptive statistics to assess changes in Medicaid acceptance and MOUD provision in SUD treatment facilities in five states that implemented a section 1115 SUD demonstration under the 2015 SMDL. We also used difference-in-differences (D-in-D) methods to compare the changes in these outcomes over time between SUD treatment facilities in the five early implementation states and facilities in other states. For each early implementation state, we compared outcomes in the three to four years following demonstration start for facilities in that state to a comparison group composed of facilities in all states that had not implemented a section 1115 SUD demonstration by 2020. We also incorporated qualitative data from state informant interviews to provide context for the quantitative outcomes.

The proportion of SUD treatment facilities that accepted Medicaid increased in each early implementing state after the start of the section 1115 SUD demonstration. D-in-D analyses (**Table 1)** show that, relative to the comparison group, all states experienced an increase or no statistically significant change in SUD treatment facility outcomes. Facilities' acceptance of Medicaid increased relative to the comparison group following implementation of the demonstrations in California, Virginia, and West Virginia, but showed no impact in Maryland and Massachusetts. The proportion of residential facilities accepting Medicaid and offering MOUD increased in all five states. However, analysis using D-in-D found that relative to the comparison group, the proportion of facilities that accepted Medicaid and provided on-site MOUD increased after the onset of the demonstration in Virginia but did not change in any of the other early implementing states. A potential explanation for the finding that MOUD provision did not increase in early demonstration states, which implemented the demonstration under the 2015 SMDL, is that the 2015 SMDL did not require residential SUD treatment facilities to offer or facilitate access to MOUD. This requirement was made explicit in the 2017 SMDL.

[9] While the overarching goals of the demonstration have remained consistent since its inception, these milestones were made explicit in the 2017 SMDL (https://www.medicaid.gov/sites/default/files/federal-policy-guidance/downloads/smd17003.pdf).

Table 1. Impacts on SUD treatment facilities' Medicaid acceptance and MOUD provision across early implementing states, first 3-4 years of section 1115 SUD demonstrations

Outcome	California (2017–2020)	Maryland (2017–2020)	Massachusetts (2018–2020)	Virginia (2017–2020)	West Virginia (2018–2020)
Proportion of Facilities that Accept Medicaid	↑	–	–	↑	↑
Proportion of Facilities that Accept Medicaid and Provide MOUD	–	–	–	↑	–

↑ Increased relative to the comparison group – No statistically significant difference ↓ Decreased relative to the comparison group

Mixed findings across states are likely due in large part to differences in pre-demonstration policies in place in each state and, therefore, changes adopted to comply with demonstration requirements. For example, California and Virginia added or expanded coverage for intensive outpatient, partial hospitalization, residential services, withdrawal management, and added a residential MAT requirement, while Massachusetts had many of these policies in place and only expanded coverage for residential services. Maryland and West Virginia made moderate changes in coverage as a result of the demonstration. Both states added residential services and expanded withdrawal management, and West Virginia also added methadone coverage and a residential MAT requirement.[10] In states that substantially expanded coverage of services, we expected to see a larger increase in Medicaid acceptance. In states that added MOUD requirements, we also expected to see increased provision of MOUD.

The differences in the initial demonstration effects across states could also be due to other factors, including variation in demonstration characteristics, success in implementing the demonstration, implementation timeline, and other contextual factors. For example, interviews we conducted with state agency, MCO, and provider organization informants in states with section 1115 SUD demonstrations suggest variation among states in provider and facility concerns about Medicaid's reimbursement levels, perceptions about the administrative burden associated with participating in Medicaid, and state efforts to recruit providers for Medicaid could contribute to differing impacts on Medicaid acceptance. In addition, these interviews suggest that the mixed findings in MOUD provision could be explained by variation among the states in the level of stigma around MOUD and needs for provider education about OUD and MOUD.[11,12,13] The meta-evaluation will explore the influence of factors such as these on demonstration impacts.

To examine whether effects of the demonstration differed between facilities that provide residential treatment services and those that do not, we used triple difference models.[14] While our main analysis found no significant impact of the demonstration on Medicaid acceptance in Maryland and Massachusetts, we found a positive impact for residential facilities in these states. We also found a positive effect of the demonstration on Medicaid acceptance and MOUD provision among residential facilities in West Virginia despite no overall effect. On the other hand, the triple difference estimate was negative for the Medicaid acceptance and MOUD provision outcome in Maryland, which suggests fewer improvements on that outcome in residential facilities in Maryland relative to the comparison group. However, the triple difference results for the Medicaid acceptance and MOUD provision in Maryland should be interpreted with caution due to potential violations of the parallel trends assumption.

We also used triple difference models to examine whether initial demonstration effects differed between facilities in metropolitan counties and those in non-metropolitan counties. We conducted this analysis for Virginia and West Virginia, which had a sufficient number of non-metropolitan facilities to support the analysis. In Virginia, the demonstration increased the proportion of facilities that accept Medicaid and the proportion that accept Medicaid and provide MOUD for both metropolitan and non-metropolitan facilities, relative to the comparison group. Non-metropolitan facilities showed a larger increase in Medicaid acceptance, while metropolitan facilities showed a larger increase in accepting Medicaid and offering on-site MOUD services. In West Virginia, increased Medicaid acceptance following demonstration implementation was driven by changes among metropolitan facilities. Nearly all West Virginia facilities in non-metropolitan counties already accepted Medicaid prior to the demonstration.

[10] RTI International. (2023). Medicaid section 1115 substance use disorder (SUD) demonstrations: Features of state approaches to improve Medicaid SUD treatment delivery systems. https://www.medicaid.gov/medicaid/section-1115-demonstrations/downloads/sud-1115-rcr-features.pdf

[11] RTI International. (2023). Medicaid section 1115 substance use disorder (SUD) demonstrations: Implementation challenges across states. https://www.medicaid.gov/media/150701

[12] RTI International. (2023). Medicaid section 1115 substance use disorder (SUD) demonstrations: State experiences expanding availability of medication assisted treatment for patients in residential settings. https://www.medicaid.gov/media/150691

[13] RTI International. (Under review, forthcoming). Medicaid section 1115 substance use disorder (SUD) demonstrations: Experiences of managed care and provider organizations with expansion of coverage of SUD services.

[14] Triple difference models examine outcomes across three dimensions: time (before and after the demonstration), group (facilities in demonstration or comparison states), and another characteristic that defines subgroups such as whether the facility provides residential treatment. The model is used to test the hypothesis that the effect of the demonstration does not differ across subgroups. See **Appendix A** for additional details on the approach.

Approach

This report summarizes preliminary findings for quantitative assessments of the impacts of the Medicaid section 1115 SUD demonstrations on the proportion of specialty SUD treatment facilities that (1) accept Medicaid and (2) accept Medicaid and offer MOUD on-site. The analyses focus on states approved under the 2015 State Medicaid Director Letter: California, Maryland, Massachusetts, Virginia, and West Virginia. We used difference-in-differences (D-in-D) modeling to compare changes in Medicaid acceptance and MOUD provision among SUD treatment facilities in each of these early implementing states before and after demonstration implementation with changes over the same period among a comparison set of facilities. We hypothesized that the proportion of facilities that accept Medicaid would increase in the demonstration states relative to the comparison group. We also hypothesized that the proportion of facilities that accept Medicaid and offer MOUD would increase relative to the comparison group in demonstration states that made changes related to MOUD, such as adding methadone coverage or adding or expanding MAT requirements for residential treatment providers.[15]

The five early implementing states began their demonstrations at various times in 2017; we assigned an implementation year of 2017 in states that started their demonstration before June 30 and 2018 to states that started their demonstration after June (**Table 2**). For California, the analyses only included the seven counties that started implementing the SUD demonstration by early 2018. Four of the seven California counties began implementing the SUD demonstration in 2017, so California is assigned a 2017 start date for these analyses.[16]

Table 2. Years included in analysis

State	Implementation year for analysis	Baseline period	Demonstration period
California	2017	2015–2016	2017–2020
Maryland	2017	2015–2016	2017–2020
Massachusetts	2018	2015–2017	2018–2020
Virginia	2017	2015–2016	2017–2020
West Virginia	2018	2015–2017	2018–2020

Data and Measures. The primary data sources for this analysis were the National Directories of Drug and Alcohol Abuse Treatment Facilities from 2016 through 2021.[17] The directories are populated based on the prior year's N-SSATS,[18] an annual survey of specialty SUD treatment facilities conducted by the Substance Abuse and Mental Health Services Administration (SAMHSA). All facilities in SAMHSA's Inventory of Behavioral Health Services are invited to complete the survey, and about 90 percent of facilities complete it each year.[18] Our analysis indicates that about 90 percent of facilities that respond to N-SSATS elect to be included in the public directory. The directories provide the locations and characteristics of each facility (e.g., types of services offered, acceptance of Medicaid) and specific treatments provided, including MOUD. All facilities included in the directories were included in the analysis with the following three exceptions: (1) facilities that do not provide treatment (e.g., detoxification-only facilities), (2) facilities operated by the Department of Veterans Affairs, and (3) facilities that do not accept any form of payment for their services.

Our analysis focused on two outcome measures. The first identified facilities that self-report accepting Medicaid beneficiaries, and the second identified facilities that report both accepting Medicaid beneficiaries and offering MOUD on-site. A facility was determined to offer MOUD if it provided methadone, buprenorphine, or injectable naltrexone on-site. These measures were chosen because they represent overall SUD treatment capacity for Medicaid beneficiaries and specific capacity for MOUD, both of which pertain to Milestones #3 and #4 established by CMS for the demonstrations adopted under the 2017 SMDL.

Control variables included facility characteristics from the national directories, specifically the levels of care offered at each facility (inpatient, residential, and outpatient), whether the facility was publicly or privately owned, whether the facility was accredited, and whether the facility was a SAMHSA-certified opioid treatment program (OTP), allowing it to dispense methadone. Additional control variables were defined based on the characteristics of the county in which the facility was located. A binary indicator based on the National Center for Health Statistics (NCHS) Urban-Rural Classification Scheme was used to distinguish between metropolitan and non-metropolitan (i.e., micropolitan or non-core) counties. Additional county-level variables included the proportion of the county population that was male; the proportion of the population that was non-Hispanic White, non-Hispanic Black, Hispanic, or neither White, Black, nor Hispanic; the proportion of the county population under 65 years of age enrolled in Medicaid; and the rate of opioid overdose deaths per 100,000 residents.

Comparison Group. All eligible facilities from states that did not implement a section 1115 SUD demonstration before the end of the study period were used to form the comparison group. For these analyses, available states for comparison included states that do not have an approved section 1115 SUD demonstration or whose demonstration was implemented after the end of the period covered by

[15] Only West Virginia added methadone coverage; California, Virginia, and West Virginia added residential MAT requirements.

[16] In California, implementation timing varied by county. The seven early implementing counties are Contra Costa, Los Angeles, Marin, Riverside, San Francisco, San Mateo, and Santa Clara. We set California's demonstration start to 2017 because most of the seven counties implemented their demonstrations by early July 2017, and the states' demonstration had been approved since late 2015, so facilities may have signed on to accept Medicaid prior to implementation in anticipation of the demonstration start.

[17] SAMHSA. (2021). *National directory of drug and alcohol abuse treatment facilities*. https://www.samhsa.gov/data/report/national-directory-drug-and-alcohol-abuse-treatment

[18] SAMHSA. (2021). *National Survey of Substance Abuse Treatment Services (N-SSATS): 2020, data on substance abuse treatment facilities*. https://www.samhsa.gov/data/sites/default/files/reports/rpt35313/2020_NSSATS_FINAL.pdf

the data (i.e., after 2020). We used entropy balancing to produce weights for comparison facilities such that the characteristics of those facilities (in terms of the control variables discussed previously) matched those of the facilities in each treatment state.[19] Entropy balancing is an alternative to propensity score approaches for balancing comparison groups on key characteristics. An advantage is that it directly focuses on maximizing covariate balance, which shortens the iterative process of estimating propensity score models and assessing balance. Because our data comprised repeated cross-sections, we separately estimated entropy weights for each year. To limit the relative influence of any one comparison facility in the D-in-D models, we censored entropy weights at 0.05 and 20.

Descriptive Analysis. For each early implementing state, we computed the average level of each outcome in the baseline and demonstration periods and plotted each outcome for each year during the analysis period (2015–2020). We also plotted the outcomes separately for residential facilities (i.e., those that only offer residential care or that offer both residential and outpatient levels of care) and non-residential facilities (i.e., those that offer only outpatient levels of care). We excluded facilities that provided only hospital inpatient care from the stratified descriptive plots due to low sample size. We expected larger increases for both outcomes in residential facilities compared to non-residential facilities due to fact that while the early implementing states made varying degrees of changes to outpatient service coverage, all five states added or expanded residential treatment coverage in their section 1115 SUD demonstrations.

Effect Estimation. For each early implementing state, we estimated nonlinear D-in-D models using logistic regression. The models identify the effect of the demonstration on the outcomes relative to what would have occurred in the early implementing states had the demonstrations not been implemented. The parameters of interest from the D-in-D models are interactions between the early implementing state indicator and demonstration years. These coefficients represent the effect of the demonstration in each year, and an average across those years represents the overall estimate of the effect of the demonstration for each state. Effects are reported as average marginal effects (i.e., a marginal effect of 0.1 indicates that the outcome is 10 percentage points higher with the demonstration than it would have been without it). In addition, we used triple differences models to assess whether the impact of the demonstration varied for residential versus non-residential facilities in all states, and for facilities in metropolitan versus non-metropolitan counties in Virginia and West Virginia, the two states that had enough facilities in non-metropolitan counties to allow for triple difference models. **Appendix A** details the quantitative methods used in the analysis.

To support interpretation of results, we drew on our review of state documentation and reports, state websites, and interviews conducted in 2021 and 2022 with state officials, health plans, and providers. These activities were conducted as part of our ongoing tracking and evaluation of section 1115 SUD demonstrations to provide state contextual information and insights about demonstration design and implementation experiences.

Results

The proportion of all (residential, hospital inpatient, and outpatient) SUD treatment facilities in each early implementing state that accepted Medicaid increased from before to after the section 1115 SUD demonstration. However, the early implementing states varied substantially in their starting points for Medicaid acceptance at SUD treatment facilities, from 33% (CA) to 95% (WV). **Table 3** shows baseline and demonstration Medicaid acceptance for each early implementing state, adjusting for facility- and area-level characteristics. **Figure 2** shows the unadjusted (not adjusted using covariates) trends for Medicaid acceptance in each of the five early implementing states. Additional graphs showing trends for each state and its comparison group are available in the appendix (**Figures A1a–A1e**).

The increase in Medicaid acceptance was mostly observed among facilities offering residential care (**Figure 3**). All states except for West Virginia had increases in Medicaid acceptance among residential facilities. However, almost all of West Virginia's facilities (both residential and non-residential) accepted Medicaid prior to the demonstration. Only California and Virginia had substantial increases in Medicaid acceptance among non-residential facilities.

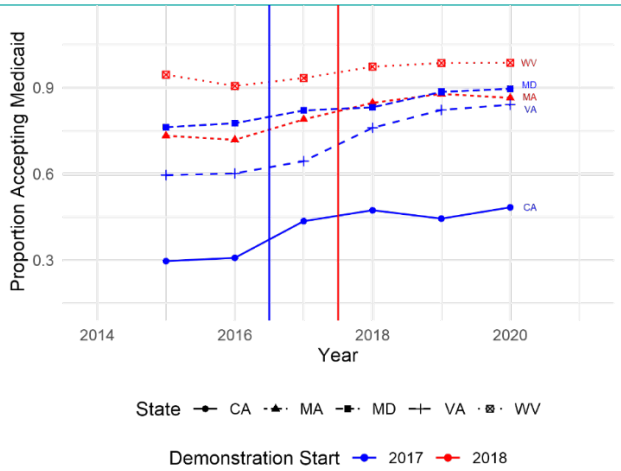
[19] We defined a different set of entropy balancing weights for each early implementing demonstration state.

Table 3. Proportion of facilities accepting Medicaid

State	Baseline Medicaid acceptance	Demonstration Medicaid acceptance
California	0.33	0.45
Maryland	0.77	0.86
Massachusetts	0.77	0.85
Virginia	0.65	0.75
West Virginia	0.95	0.97

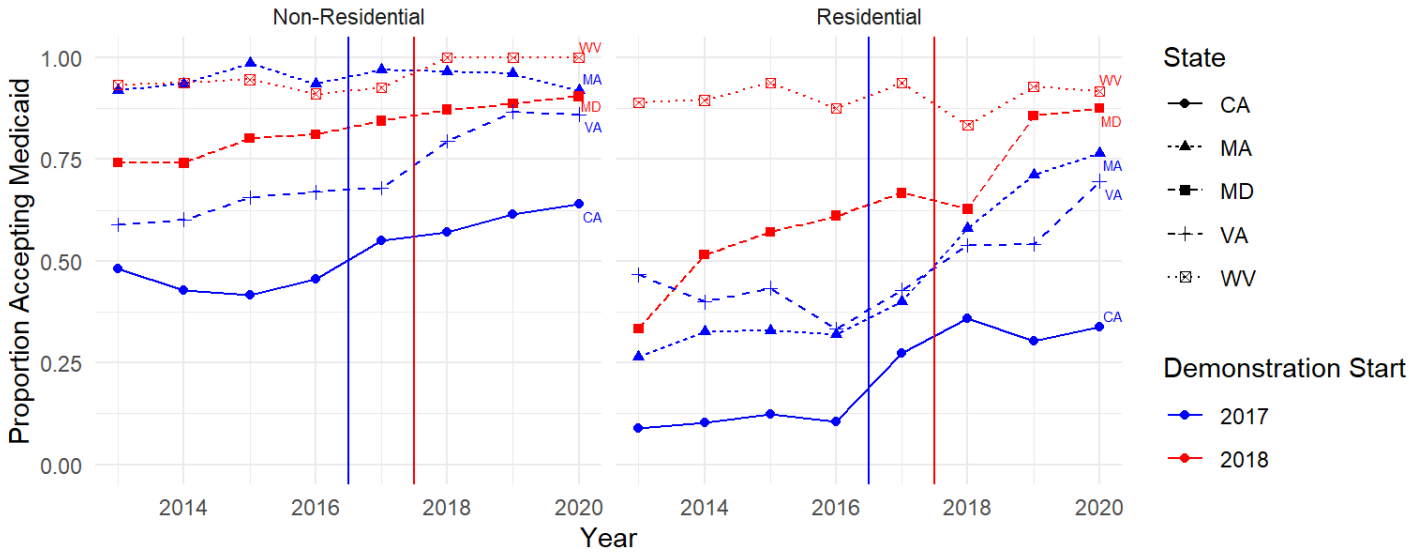
Note: Proportions adjusted for facility- and area-level characteristics. Average facilities per year is as follows: California—399, Maryland—320, Massachusetts—325, Virginia—176, and West Virginia—76.
SOURCE: National Survey of Substance Abuse Treatment Services.

Figure 2. Trends in the proportion of facilities accepting Medicaid



Note: Unadjusted trends in proportion of facilities accepting Medicaid by state. Average facilities per year is as follows: California—399, Maryland—320, Massachusetts—325, Virginia—176, and West Virginia—76.
SOURCE: National Survey of Substance Abuse Treatment Services.

Figure 3. Trends in the proportion of facilities accepting Medicaid, by type of provider



Note: Unadjusted trends in proportion of facilities accepting Medicaid by state and type of provider. This analysis excludes hospital inpatient facilities due to small sample size. Facilities in the non-residential category offer only outpatient levels of care, while the residential category includes facilities that only offer residential care and that offer both residential and outpatient levels of care.
SOURCE: National Survey of Substance Abuse Treatment Services

The adjusted proportion of SUD facilities that accepted Medicaid and provided MOUD increased in all early implementing states over the study period (**Table 4**). These states varied in their baseline value of this outcome, from 14% (CA) to 51% (WV). **Figure 4** shows unadjusted trends in Medicaid acceptance/MOUD provision over time in the five early implementing states. Additional charts showing each state with its comparison group are available in the appendix (**Figures A2a-A2e**).

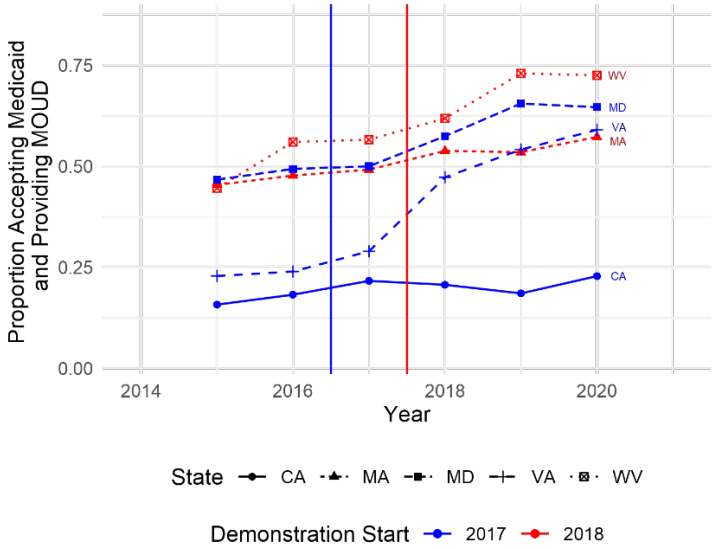
The proportion of residential facilities accepting Medicaid and offering MOUD increased in all five states (**Figure 5**). Residential facilities in Maryland, Virginia, and West Virginia showed substantial increases in MOUD provision, while residential facilities in California and Massachusetts experienced smaller increases. Virginia is the only state to show a large increase in MOUD provision for non-residential facilities during the demonstration period. This may reflect the state's increase in reimbursement rates for outpatient MOUD as part of their demonstration, which was unique among the early implementation states.

Table 4. Proportion of facilities accepting Medicaid and providing MOUD

State	Baseline Medicaid acceptance and MOUD provision	Demonstration Medicaid acceptance and MOUD provision
California	0.14	0.22
Maryland	0.39	0.64
Massachusetts	0.46	0.56
Virginia	0.26	0.46
West Virginia	0.51	0.70

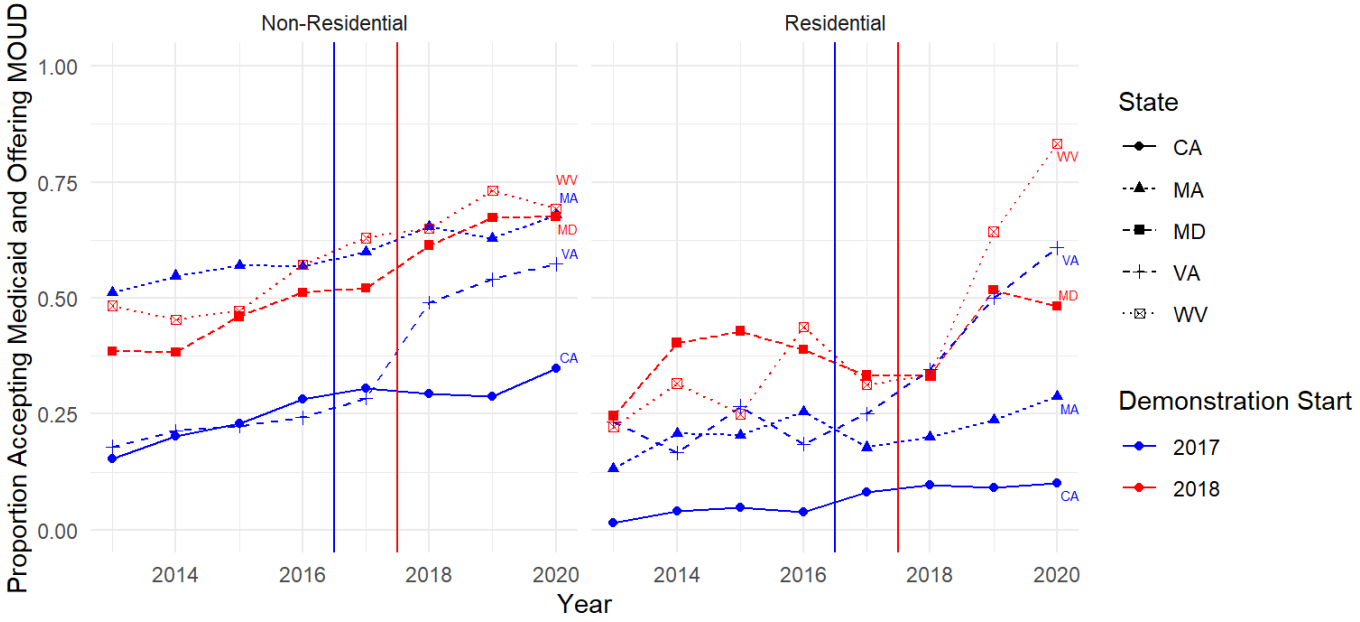
Note: Means adjusted for facility- and area-level characteristics.
SOURCE: National Survey of Substance Abuse Treatment Services. Average facilities per year is as follows: California—399, Maryland—320, Massachusetts—325, Virginia—176, and West Virginia—76.

Figure 4. Trends in the proportion of facilities accepting Medicaid and providing MOUD



Note: Unadjusted trends in proportion of facilities accepting Medicaid and providing MOUD on-site by state. Average facilities per year is as follows: California—399, Maryland—320, Massachusetts—325, Virginia—176, and West Virginia—76.
SOURCE: National Survey of Substance Abuse Treatment Services.

Figure 5. Trends in the proportion of facilities accepting Medicaid and providing MOUD, by type of provider



Note: Unadjusted trends in proportion of facilities accepting Medicaid by state and type of provider. This analysis excludes hospital inpatient facilities due to small sample size. Facilities in the non-residential category offer only outpatient levels of care, while the residential category includes facilities that only offer residential care and that offer both residential and outpatient levels of care.

SOURCE: National Survey of Substance Abuse Treatment Services

Tables 5 through **9** summarize the initial effects of the section 1115 SUD demonstration on Medicaid acceptance and Medicaid acceptance/MOUD provision in California, Maryland, Massachusetts, Virginia, and West Virginia, respectively.

CALIFORNIA

In the four years after the start of section 1115 SUD demonstration implementation, the proportion of facilities accepting Medicaid increased more among facilities in California than among facilities in the comparison group

California's demonstration implementation timing varied by county. This analysis assesses changes in the seven early implementing counties: Contra Costa, Los Angeles, Marin, Riverside, San Francisco, San Mateo, and Santa Clara relative to the comparison group. Prior to the demonstration, California's Medicaid program covered methadone services. As part of the demonstration, California added or expanded coverage of residential, intensive outpatient, partial hospitalization, and withdrawal management services, as well as added residential MAT access requirements. Because California made substantial changes to its coverage of SUD services under Medicaid, we expected that the proportion of facilities accepting Medicaid and of facilities offering MOUD would increase in the state in the four years after the start of the demonstration.

The proportion of facilities that accept Medicaid increased in both California and the comparison group, but it increased more in California than in the comparison group (**Table 5**, p=0.005). The increase compared to the comparison group was considerable, with a relative increase of 21.7% in the proportion of facilities that accept Medicaid. The proportion of facilities that accept Medicaid and offer MOUD increased after the start of the demonstration in California, but the change did not differ significantly from the comparison group.

Triple difference analyses identified increases in Medicaid acceptance for both residential and non-residential facilities but no significant difference between the two, indicating that the positive impact in our main results was not driven by changes in one level of care over another. This finding is consistent with the broad changes in coverage across levels of care under the California demonstration. The triple difference analysis found no significant differences between residential and non-residential facilities in the proportion of facilities both accepting Medicaid and offering MOUD. Additional information and results for the triple difference models are available in **Appendix B** (**Table B2**).

Table 5. Impacts on SUD facilities' Medicaid acceptance and MOUD provision, first 4 years of section 1115 SUD demonstration in California

Outcome	Change in outcome from baseline (2015-2016) to demonstration period (2017-2020)		D–in–D estimate (90% CI)	Relative difference %	p-value
	California	Comparison group			
Proportion of Facilities that Accept Medicaid	⇈	⇈	0.071 (0.030, 0.112)*	21.7	0.005
Proportion of Facilities that Accept Medicaid and Offer MOUD	⇈	⇈	0.059 (-0.023, 0.141)	40.9	0.239

⇈ Increase ⊖ No change ⇊ Decrease

Statistically significant relative decrease in outcome after implementation of the section 1115 SUD demonstration in demonstration state relative to the comparison group

*Statistically significant relative increase in outcome after implementation of the section 1115 SUD demonstration in demonstration state relative to the comparison group

CI=confidence interval; D-in-D=difference-in-differences; MOUD=medication for opioid use disorder.

Methods: A logistic regression model was used to obtain estimates for all outcomes. All models adjusted for facility-level variables (levels of care offered, ownership, and accreditation), and county-level variables (population demographics (sex and race), metropolitan indicator and percentage of adult population covered by Medicaid). The Medicaid model also adjusted for whether a facility was an opioid treatment program and the MOUD model adjusted for the rate of opioid overdose deaths per 100,000 residents. Facilities in the comparison states were balanced with facilities in the demonstration state using entropy balancing.

How to interpret the findings: A negative value for the regression-adjusted D-in-D estimate corresponds to a greater decrease or a smaller increase in an outcome after implementation of the section 1115 SUD demonstration in California relative to the comparison group. A positive value corresponds to a greater increase or a smaller decrease in an outcome in California than in the comparison group. Because the goal of the demonstration is to increase these outcomes, a positive D-in-D estimate is labeled as expected, and a negative estimate is labeled as unexpected. The relative difference is the D-in-D estimate as a percentage of California's baseline period adjusted mean.

The sample size for all models is 26,828. This represents the number of facility-year observations for California (2,395) and the comparison group (24,433). **Appendix A** details the weighting methods.

SOURCE: National Survey of Substance Abuse Treatment Services.

MARYLAND

In the four years after the start of section 1115 SUD demonstration implementation, the change in outcomes did not differ between Maryland and the comparison group.

Prior to the demonstration, Maryland's Medicaid program covered intensive outpatient, partial hospitalization, and methadone services and had residential MAT requirements in place. As part of the demonstration, Maryland added or expanded coverage for residential services and withdrawal management. In the four years after the start of the demonstration, we expected that the proportion of facilities accepting Medicaid and offering MOUD would increase in the state given the addition of coverage for services but that these changes may be modest given the range of services already covered prior to the demonstration.

The proportion of facilities accepting Medicaid and the proportion of facilities that both accepted Medicaid and offered MOUD increased in Maryland and its comparison group from the period before to the period after the beginning of the demonstration. However, the change in these outcomes in Maryland was not statistically significantly different from the comparison group (**Table 6**).

Triple difference model results indicate that the demonstration increased the likelihood of accepting Medicaid in residential facilities, while non-residential facilities did not see a significant change, with a statistically significant difference between the two. This may be due to the large changes in coverage for residential services compared to outpatient services during the demonstration. The effect for the Medicaid acceptance and MOUD outcome was negative for both residential facilities and non-residential facilities, with a significantly larger impact on residential facilities. However, this model assumes parallel trends, while the main D-in-D results (**Table 6**) employ an alternative specification that does not assume parallel trends. Additional information and results for the triple difference models are available in **Appendix B** (**Table B2**).

Table 6. Impacts on SUD facilities' Medicaid acceptance and MOUD provision, first 4 years of section 1115 SUD demonstration in Maryland

Outcome	Change in outcome from baseline (2015-2016) to demonstration period (2017-2020)		D–in–D estimate (90% CI)	Relative difference %	p-value
	Maryland	Comparison group			
Proportion of Facilities that Accept Medicaid	⇈	⇈	0.002 (-0.019, 0.023)	0.3	0.849
Proportion of Facilities that Accept Medicaid and Offer MOUD	⇈	⇈	0.029 (-0.122, 0.180)	7.4	0.754

⇈ Increase ⊖ No change ⇊ Decrease

Statistically significant relative decrease in outcome after implementation of the section 1115 SUD demonstration in demonstration state relative to the comparison group

Statistically significant relative increase in outcome after implementation of the section 1115 SUD demonstration in demonstration state relative to the comparison group

CI=confidence interval; D-in-D=difference-in-differences; MOUD=medication for opioid use disorder.

Methods: A logistic regression model was used to obtain estimates for all outcomes. All models adjusted for facility-level variables (levels of care offered, ownership, and accreditation), and county-level variables (population demographics (sex and race), metropolitan indicator and percentage of adult population covered by Medicaid). The Medicaid model also adjusted for whether a facility was an opioid treatment program and the MOUD model adjusted for the rate of opioid overdose deaths per 100,000 residents. Facilities in the comparison states were balanced with facilities in the demonstration state using entropy balancing.

How to interpret the findings: A negative value for the regression-adjusted D-in-D estimate corresponds to a greater decrease or a smaller increase in an outcome after implementation of the section 1115 SUD demonstration in Maryland relative to the comparison group. A positive value corresponds to a greater increase or a smaller decrease in an outcome in Maryland than in the comparison group. Because the goal of the demonstration is to increase these outcomes, a positive D-in-D estimate is labeled as expected, and a negative estimate is labeled as unexpected. The relative difference is the D-in-D estimate as a percentage of Maryland's baseline period adjusted mean.

The sample size for all models is 26,354. This represents the number of facility-year observations for Maryland (1,921) and the comparison group (24,433). **Appendix A** details the weighting methods.

SOURCE: National Survey of Substance Abuse Treatment Services.

MASSACHUSETTS

In the three years after the start of section 1115 SUD demonstration implementation, the change in outcomes did not differ between Massachusetts and the comparison group.

Prior to the demonstration, Massachusetts' Medicaid program covered intensive outpatient, partial hospitalization, withdrawal management, and methadone services and had residential MAT requirements in place. As part of the demonstration, Massachusetts expanded or added coverage for residential services. In the three years after the start of the demonstration, we expected that the proportion of facilities accepting Medicaid and offering MOUD would increase in the state but that these changes may be modest because Massachusetts made fewer changes to its covered SUD services. In the three years after the start of the demonstration, both outcomes increased over time for Massachusetts and its comparison group. However, there were no statistically significant effects on the two outcomes in Massachusetts relative to the comparison group (**Table 7**).

Triple difference model results indicate that, relative to the comparison group, the demonstration increased the likelihood of accepting Medicaid in residential facilities, while non-residential facilities saw a decreased likelihood. The difference in effects between residential and non-residential settings was statistically significant. Many outpatient services were already covered in Massachusetts prior to the start of the demonstration, with major demonstration changes impacting residential facilities. The difference in effect for the Medicaid acceptance and MOUD outcome was not significant, which may be the result of Massachusetts' previously existing MAT requirement for residential facilities. Additional information and results for the triple difference models are available in **Appendix B** (**Table B2**).

Table 7. Impacts on SUD facilities' Medicaid acceptance and MOUD provision, first 3 years of section 1115 SUD demonstration in Massachusetts

Outcome	Change in outcome from baseline (2015-2017) to demonstration period (2018-2020)		D–in–D estimate (90% CI)	Relative difference %	p-value
	Massachusetts	Comparison group			
Proportion of Facilities that Accept Medicaid	⇈	⇈	0.012 (-0.014, 0.038)	1.6	0.454
Proportion of Facilities that Accept Medicaid and Offer MOUD	⇈	⇈	-0.012 (-0.061, 0.037)	-2.6	0.682

⇈ Increase — − No change — ⇊ Decrease

Statistically significant relative decrease in outcome after implementation of the section 1115 SUD demonstration in demonstration state relative to the comparison group

Statistically significant relative increase in outcome after implementation of the section 1115 SUD demonstration in demonstration state relative to the comparison group

CI=confidence interval; D-in-D=difference-in-differences; MOUD=medication for opioid use disorder.

Methods: A logistic regression model was used to obtain estimates for all outcomes. All models adjusted for facility-level variables (levels of care offered, ownership, and accreditation), and county-level variables (population demographics (sex and race), metropolitan indicator and percentage of adult population covered by Medicaid). The Medicaid model also adjusted for whether a facility was an opioid treatment program and the MOUD model adjusted for the rate of opioid overdose deaths per 100,000 residents. Facilities in the comparison states were balanced with facilities in the demonstration state using entropy balancing.

How to interpret the findings: A negative value for the regression-adjusted D-in-D estimate corresponds to a greater decrease or a smaller increase in an outcome after implementation of the section 1115 SUD demonstration in Massachusetts relative to the comparison group. A positive value corresponds to a greater increase or a smaller decrease in an outcome in Massachusetts than in the comparison group. Because the goal of the demonstration is to increase these outcomes, a positive D-in-D estimate is labeled as expected, and a negative estimate is labeled as unexpected. The relative difference is the D-in-D estimate as a percentage of Massachusetts's baseline period adjusted mean.

The sample size for all models is 26,383. This represents the number of facility-year observations for Massachusetts (1,950) and the comparison group (24,433). **Appendix A** details the weighting methods.

SOURCE: National Survey of Substance Abuse Treatment Services.

VIRGINIA

In the four years after the start of section 1115 SUD demonstration implementation, both outcomes increased more among facilities in Virginia than among facilities in the comparison group.

Prior to the demonstration, Virginia's Medicaid program covered methadone services. Under the demonstration, the state expanded or added coverage for intensive outpatient, partial hospitalization, residential, and withdrawal management services, as well as added residential MAT access requirements. Additionally, Virginia substantially increased reimbursement rates to SUD treatment facilities as part of its demonstration. Because Virginia made substantial changes to its coverage of SUD services under Medicaid, we expected that the proportion of facilities accepting Medicaid and of facilities offering MOUD would increase in the state in the four years after the start of the demonstration.

The proportion of facilities that accept Medicaid as well as those that accept Medicaid and provide MOUD increased in both Virginia and the comparison group, but it increased more in Virginia than in the comparison group (**Table 8**, p=0.004, p<0.001). The increase in Virginia on both measures was considerable compared to the comparison group, with a relative increase of 27.1% and 31.2% in the proportion of facilities that accept Medicaid and accept Medicaid/provide MOUD, respectively. It is important to note that Virginia also expanded Medicaid shortly after the demonstration, so some providers might have decided to accept Medicaid due to the increase in demand for Medicaid services alongside increases in outpatient reimbursement.

Triple difference analysis reveals that Virginia experienced increases for both residential and non-residential facilities in the proportion accepting Medicaid and the proportion accepting Medicaid and offering MOUD relative to the comparison group. Virginia was the only state to see positive impacts for both residential and non-residential facilities for both outcomes. A possible explanation for the positive impact on non-residential facilities is the 400% increase in reimbursement for outpatient levels of care under the demonstration, which may have encouraged facilities to accept Medicaid. Additionally, the demonstration significantly increased the likelihood of accepting Medicaid as well as accepting Medicaid and providing MOUD in both metropolitan and non-metropolitan facilities. For Medicaid acceptance, the effect was significantly larger in non-metropolitan facilities, while the effect for the Medicaid acceptance and MOUD provision was significantly larger in metropolitan facilities. Additional information and results for the triple difference models are available in **Appendix B** (**Tables B2** and **B3**).

Table 8. Impacts on SUD facilities' Medicaid acceptance and MOUD provision, first 4 years of section 1115 SUD demonstration in Virginia

Outcome	Change in outcome from baseline (2015-2016) to demonstration period (2017-2020)		D–in–D estimate (90% CI)	Relative difference %	p-value
	Virginia	Comparison group			
Proportion of Facilities that Accept Medicaid	⇈	⇈	0.175 (0.077, 0.273)*	27.1	0.004
Proportion of Facilities that Accept Medicaid and Offer MOUD	⇈	⇈	0.082 (0.048, 0.116)*	31.2	<0.001

⇈ Increase ⊖ No change ⇊ Decrease

Statistically significant relative decrease in outcome after implementation of the section 1115 SUD demonstration in demonstration state relative to the comparison group

*Statistically significant relative increase in outcome after implementation of the section 1115 SUD demonstration in demonstration state relative to the comparison group

CI=confidence interval; D-in-D=difference-in-differences; MOUD=medication for opioid use disorder.

Methods: A logistic regression model was used to obtain estimates for all outcomes. All models adjusted for facility-level variables (levels of care offered, ownership, and accreditation), and county-level variables (population demographics (sex and race), metropolitan indicator and percentage of adult population covered by Medicaid). The Medicaid model also adjusted for whether a facility was an opioid treatment program and the MOUD model adjusted for the rate of opioid overdose deaths per 100,000 residents. Facilities in the comparison states were balanced with facilities in the demonstration state using entropy balancing.

How to interpret the findings: A negative value for the regression-adjusted D-in-D estimate corresponds to a greater decrease or a smaller increase in an outcome after implementation of the section 1115 SUD demonstration in Virginia relative to the comparison group. A positive value corresponds to a greater increase or a smaller decrease in an outcome in Virginia than in the comparison group. Because the goal of the demonstration is to increase these outcomes, a positive D-in-D estimate is labeled as expected, and a negative estimate is labeled as unexpected. The relative difference is the D-in-D estimate as a percentage of Virginia's baseline period adjusted mean.

The sample size for all models is 25,487. This represents the number of facility-year observations for Virginia (1,054) and the comparison group (24,433). **Appendix A** details the weighting methods.

SOURCE: National Survey of Substance Abuse Treatment Services.

WEST VIRGINIA

In the three years after the start of section 1115 SUD demonstration implementation, the proportion of facilities that accepted Medicaid increased more in West Virginia relative to the comparison group.

Prior to the demonstration, West Virginia's Medicaid program covered intensive outpatient and partial hospitalization SUD services. Under the demonstration, the state expanded or added coverage for residential, methadone, and withdrawal management services, as well as added residential MAT access requirements. In the three years after the start of the demonstration, we expected that the proportion of facilities accepting Medicaid and offering MOUD would increase in the state but that these changes may be modest given the range of services already covered prior to the demonstration.

The results show that the proportion of facilities that accept Medicaid increased in both West Virginia and the comparison group over the first three years of the section 1115 SUD demonstration, but the increase was larger in West Virginia (**Table 9**, p<0.001). The effect of the demonstration in West Virginia amounted to an increase of 5 percentage points in the proportion of facilities that accept Medicaid.

The proportion of facilities that accept Medicaid and offer MOUD increased after the start of the demonstration in West Virginia, but the change did not differ from the comparison group, indicating that the demonstration did not have an initial effect on this outcome in West Virginia. This could be because although West Virginia's demonstration made important changes related to MOUD, it had the highest proportion of facilities that accepted Medicaid and offered MOUD on-site prior to the demonstration among the early implementing states.

Triple difference analysis found no significant difference between residential and non-residential facilities in the impact of the demonstration on Medicaid acceptance. Analysis of differences in Medicaid acceptance and MOUD provision between residential and non-residential facilities found a significant difference between the two, with a positive impact in residential facilities and negative impact in non-residential facilities, relative to the comparison group. This suggests that the positive effect among residential facilities was offset by relative decreases among non-residential facilities.

Additionally, triple difference model results indicate that the effect of the demonstration on Medicaid acceptance was driven by changes in metropolitan counties, primarily because nearly 100% of facilities in non-metropolitan areas already accepted Medicaid. No significant effect of the demonstration on Medicaid acceptance and MOUD provision was detected in either metropolitan or non-metropolitan facilities. Additional information and results for the triple difference models are available in **Appendix B** (**Tables B2 and B3**).

Table 9. Impacts on SUD facilities' Medicaid acceptance and MOUD provision, first 3 years of section 1115 SUD demonstration in West Virginia

Outcome	Change in outcome from baseline (2015-2017) to demonstration period (2018-2020)		D–in–D estimate (90% CI)	Relative difference %	p-value
	West Virginia	Comparison group			
Proportion of Facilities that Accept Medicaid	⇈	⇈	0.049 (0.026, 0.072)*	5.2	<0.001
Proportion of Facilities that Accept Medicaid and Offer MOUD	⇈	⇈	-0.024 (-0.083, 0.035)	-4.7	0.493

⇈ Increase ⊖ No change ⇊ Decrease

■ Statistically significant relative decrease in outcome after implementation of the section 1115 SUD demonstration in demonstration state relative to the comparison group

■ *Statistically significant relative increase in outcome after implementation of the section 1115 SUD demonstration in demonstration state relative to the comparison group

CI=confidence interval; D-in-D=difference-in-differences; MOUD=medication for opioid use disorder.

Methods: A logistic regression model was used to obtain estimates for all outcomes. All models adjusted for facility-level variables (levels of care offered, ownership, and accreditation), and county-level variables (population demographics (sex and race), metropolitan indicator and percentage of adult population covered by Medicaid). The Medicaid model also adjusted for whether a facility was an opioid treatment program and the MOUD model adjusted for the rate of opioid overdose deaths per 100,000 residents. Facilities in the comparison states were balanced with facilities in the demonstration state using entropy balancing.

How to interpret the findings: A negative value for the regression-adjusted D-in-D estimate corresponds to a greater decrease or a smaller increase in an outcome after implementation of the section 1115 SUD demonstration in West Virginia relative to the comparison group. A positive value corresponds to a greater increase or a smaller decrease in an outcome in West Virginia than in the comparison group. Because the goal of the demonstration is to increase these outcomes, a positive D-in-D estimate is labeled as expected, and a negative estimate is labeled as unexpected. The relative difference is the D-in-D estimate as a percentage of West Virginia's baseline period adjusted mean.

The sample size for all models is 24,888. This represents the number of facility-year observations for West Virginia (455) and the comparison group (24,433). **Appendix A** details the weighting methods.

SOURCE: National Survey of Substance Abuse Treatment Services.

Conclusions

Results of these exploratory analyses demonstrated the impact of the section 1115 SUD demonstration on substance use treatment facilities. Increased access to evidence-based SUD treatment for Medicaid beneficiaries is a key mechanism through which the demonstrations can increase treatment adherence and retention, reduce overdose mortality, and decrease preventable or inappropriate health care utilization and expenditures. These analyses also provided an opportunity to refine methods for subsequent analyses of the section 1115 SUD demonstrations.

The analyses indicate that the impact of the section 1115 SUD demonstrations on SUD treatment facilities' decisions to accept Medicaid and offer MOUD on-site varied across early implementation states. We found the demonstration increased the proportion of facilities that accept Medicaid in California and West Virginia and both the proportion of facilities that accept Medicaid and the proportion that accept Medicaid and offer MOUD in Virginia. We found no statistically significant effects in Maryland or Massachusetts for either of the outcomes analyzed.

Triple difference models examined the difference in effect between facilities that offer residential services and those that do not. These models revealed that in some cases increases in Medicaid acceptance (Maryland and Massachusetts) or Medicaid acceptance and MOUD provision (West Virginia) were largest in residential facilities. To the contrary, triple difference results from Maryland indicate less improvement on the Medicaid acceptance/MOUD provision outcome among residential facilities relative to the comparison group. However, the triple difference results for this outcome in Maryland should be interpreted with caution due to potential violations of the parallel trends assumption.

Triple difference models also examined differences in effects between facilities in metropolitan and non-metropolitan counties. In Virginia, the considerable effect of the demonstration was experienced in both metropolitan and non-metropolitan areas, although the effects were larger for the Medicaid acceptance outcome in non-metropolitan areas and for the Medicaid acceptance and MOUD provision outcome in metropolitan areas. The difference between these outcomes in the effect by metropolitan status is not easily explained and requires further examination. In West Virginia, where nearly all facilities in non-metropolitan areas accepted Medicaid prior to the demonstration, the overall effect on Medicaid acceptance was driven by facilities in metropolitan counties.

The differences in the effect of the demonstrations across these states highlight the importance of accounting for differences in pre-demonstration policies in place in each state and the differences in the extent of change brought about by the demonstration. For example, California and Virginia made the most substantial changes to SUD service coverage among the five states and had large and significant increases in Medicaid acceptance relative to the comparison group. These states also had greater increases in Medicaid participation among non-residential facilities, which is consistent with the addition or expansion of intensive outpatient and partial hospitalization coverage in those states. By contrast, Massachusetts made relatively few changes to SUD service coverage, and Medicaid acceptance in facilities in that state did not increase relative to the comparison group. In addition, states varied in terms of policies related to MOUD provision. California, Virginia, and West Virginia added MAT requirements for residential providers; Massachusetts and Maryland had existing MAT requirements in place. Only West Virginia added methadone coverage, and four of the five states (excluding Massachusetts) either added or expanded withdrawal management coverage. Although West Virginia made the largest number of changes related to MOUD provision, their facilities also had the highest rate of on-site provision prior to the demonstration, which might have limited their capacity to increase relative to the comparison group. The results showed that provision of MOUD only increased significantly relative to the comparison group in Virginia. Furthermore, while the 2015 and 2017 SMDLs shared common goal of increasing access to SUD treatment, the 2017 SMDL included greater specificity about the milestones and metrics toward this goal. Most relevant to this analysis, the 2017 SMDL required residential facilities to either provide MAT on-site or facilitate access to it elsewhere. Without this requirement, states that implemented the demonstration under the 2015 SMDL may have focused less on providing MOUD than states implementing under the 2017 SMDL. We will gain a better understanding of differences in early and later implementing demonstrations in future analyses.

In addition to variation in states' existing policies prior to the demonstration, insights from interviews we conducted with state Medicaid, MCO, and provider organization informants suggest that variation among the states in provider and facility concerns about Medicaid's reimbursement levels, perceptions about the administrative burdens associated with participating in Medicaid, and state and MCO efforts to recruit providers for Medicaid might contribute to differences in the impact of demonstrations across states. These interviews also suggest that variation in the level of stigma around MOUD and needs for provider education about OUD and MOUD between states may need to be considered when interpreting the impact of the demonstration.[20,21,22]

[20] RTI International. (2023). Medicaid section 1115 substance use disorder (SUD) demonstrations: Implementation challenges across states. https://www.medicaid.gov/media/150701

[21] RTI International. (2023). Medicaid section 1115 substance use disorder (SUD) demonstrations: State experiences expanding availability of medication assisted treatment for patients in residential settings. https://www.medicaid.gov/media/150691

[22] RTI International. (Under review, forthcoming). Medicaid section 1115 substance use disorder (SUD) demonstrations: Experiences of managed care and provider organizations with expansion of coverage of SUD services.

Some limitations in our analyses must be noted. Our approach used D-in-D models to estimate the effects of the demonstrations. D-in-D relies on the assumption that the comparison group represents a valid counterfactual for how the outcomes would have evolved in the demonstration states without the demonstration. That assumption cannot be directly tested, but it is common to provide context for that assumption by examining trends in the baseline period. We found evidence of divergent trends between demonstration and comparison facilities for some analyses, most notably for California and Maryland for the Medicaid acceptance/MOUD provision outcome. To address potential violations of this "parallel trends" assumption, we used an alternative specification that relies on an equally strong assumption that trend differences observed in the baseline period would have persisted into the demonstration period without the demonstration. These two specifications provide effect estimates under two extreme assumptions, and findings should be interpreted with caution when the two specifications yield considerably different findings (i.e., in California and Maryland for the Medicaid acceptance/MOUD provision outcome). However, our findings of an increase in Medicaid acceptance due to the demonstrations in California, Virginia, and West Virginia is consistent across both specifications (**Appendix Table B1a**). Related to the parallel trends assumption, we note that the triple difference models assume parallel trends and thus do not use the alternative specification. As a result, estimated effects within subgroups (e.g., for residential and non-residential facilities, respectively) should be compared to D-in-D results based on an assumption of parallel trends (i.e., the first set of results in **Appendix Table B1a** and **B1b**).

Additionally, our data are repeated cross-sections, not longitudinal. Thus, some facilities might move in or out of the sample from year to year. If this churn changes the composition of the sample over time, it can bias the results of D-in-D analysis. In most early implementing states and among comparison states, we generally observe a gradual increase in facilities over time. However, California had a large increase in facilities from 2018 to 2019, suggesting that the N-SSATS sampling frame may have changed to incorporate additional facilities. While cross-sectional data prevents identification of the new facilities, if they are qualitatively different from facilities in the baseline years, it could impact the estimates of the demonstration effects in California. Additional discussion of limitations is found in **Appendix A**.

The findings in this report are based on preliminary analyses of the impact of section 1115 SUD demonstrations in five states. As we move forward, we will continue to refine our approach to estimating the effects of the demonstration. We will also explore potential explanations for differences in demonstration effects across states by taking into account data collected through document review and interviews. Future reports will also include states that implemented their SUD demonstrations in later years, as well as include additional years of data to assess whether impacts are sustained or change over time. We will use these findings to complement and provide context for study outcomes being analyzed through analyses of Medicaid claims.

Authors and Acknowledgments

This rapid cycle report was authored by William Dowd, PhD; Leah Sussman, MPH; Anna Sommers, PhD; Amanda Honeycutt, PhD; Donna Spencer, PhD; Lauren Mittman; Susan Haber, ScD; and Anupa Bir, ScD. The authors would like to acknowledge Jesse Hinde, and Joshua Clemson, both formerly of RTI International, for assistance with conceptualization and data acquisition, and Nathan Yates for editorial assistance. The authors also acknowledge the contribution of CMS staff who reviewed drafts of this report: Kirsten Beronio, Danielle Daly, Teresa DeCaro, Allen Ma, and Deborah Steinbach.

The Federal Meta-Analysis Support Contract

In 2018, the Centers for Medicare & Medicaid Services (CMS) commissioned the Federal Meta-Analysis Support contract (HHSM-500-2014-00037I) to learn from each Medicaid section 1115 demonstration and the groups of such demonstrations with similar features. Under this contract, RTI International is conducting meta-evaluations of selected groups of Medicaid section 1115 demonstrations.

Rapid cycle reporting is central to the Federal Meta-Analysis Support contract, providing CMS with timely, practical findings, and supporting dissemination of findings to key stakeholder audiences. This report is one of several rapid cycle reports prepared by RTI International under the contract.

Appendix A: Data, Methods, and Limitations

Data

National Survey on Substance Abuse Treatment Services (N-SSATS). We used N-SSATS as our main source of data for this analysis. N-SSATS is an annual census of specialty SUD treatment facilities conducted by SAMHSA. Participating facilities include public and private hospitals, residential facilities, outpatient facilities, and other clinics and facilities offering a SUD treatment program. N-SSATS captures information on the characteristics of each facility (e.g., levels of care, acceptance of Medicaid) and specific services provided, including the provision of MOUD. N-SSATS receives completed surveys from about 90% of identified facilities each year.[23] Deidentified N-SSATS data are disseminated in a public use data file, but that file cannot be used to identify facility location below the state level. To allow the analysis to account for within-state differences, we obtained data from directories of treatment facilities published using N-SSATS data. The directories identify the location of each facility and provide code corresponding to facility characteristics and services rendered.

The key advantage of the use of the directories over the public use files is that the location of facilities can be identified below the state level. For this analysis, we used mapping software to assign each facility to a county based on the address, which allowed us to use other county-level data in the analysis. There are two important limitations of the directory data. First, facilities that respond to N-SSATS can opt out of being placed in the directory (and in SAMHSA's treatment locator); however, our analysis of the counts of facilities in the public use data file (which includes opt-outs because it does not include information to identify facilities) against the directories suggest that about 90% of respondents opt in. There were no substantial differences in characteristics between facilities that opted in and those that opted out. Second, although the extent of facility information included in the directories has increased over time, it is limited compared to the public use file. To mitigate this, we selected 2015 through 2020 as our study period (comprising directories dated 2016–2021). This allowed us to include several important facility characteristics that were added to the directories in 2016 (i.e., accreditation and ownership status) while maintaining a sufficiently long baseline period.

American Community Survey (ACS) Public Use Microdata Sample (PUMS). We used ACS PUMS data to obtain county-level demographic data on and counts of Medicaid beneficiaries. PUMS data are collected and published by the U.S. Census Bureau and contain an anonymized sample of individual and household records from the ACS, enabling custom estimates using over 30 household-level variables and over 30 person-level variables. To generate county-level, year-specific estimates, we used 1-year ACS PUMS data to tabulate estimates for Public Use Micro Areas (PUMAs) and apportioned these estimates to counties.

2013 National Center for Health Statistics (NCHS) Urban-Rural Classification Scheme for Counties. We used the 2013 NCHS Urban-Rural Classification Scheme for Counties to define a binary urbanicity variable for all U.S. counties set to 1 for metropolitan counties and 0 for micropolitan and non-core counties.

National Vital Statistics System (NVSS). We used the restricted-use NVSS data from the NCHS to obtain county-level rates of OUD-related deaths per 100,000 population aged 12–64. The NVSS data are based on information obtained from death certificates for U.S. residents; the data were aggregated by county of residence for the decedent. Each death includes one underlying cause of death (UCD) and may include up to 20 additional multiple causes of death (MCDs). International Classification of Disease Tenth Revision (ICD-10) codes are used to code UCD and MCDs. Selected causes of death are grouped into categories based on intent, substances, and other factors. Overdose deaths from opioids were identified as deaths coded as a drug overdose in the UCD and then specific opioid substances in the MCDs (e.g., opium, heroin, other synthetic narcotics).

Sample Selection

The primary data sources for this analysis were the National Directories of Drug and Alcohol Abuse Treatment Facilities from 2016 through 2021.[24] The directories are populated based on the prior year's N-SSATS.[23] All facilities in SAMHSA's Inventory of Behavioral Health Services are invited to complete the survey, and about 90 percent of facilities complete the survey each year.[23] Our analysis indicates that about 90 percent of facilities that respond to N-SSATS elect to be included in the public directory. The directories provide the locations and characteristics of each facility (e.g., types of services offered, acceptance of Medicaid) and specific treatments provided, including MOUD. All facilities included in the directories were included in the analysis with three exceptions: (1) facilities that do not provide treatment (e.g., detoxification-only facilities), (2) facilities operated by the Department of Veterans Affairs, and (3) facilities that do not accept any form of payment for their services.

Measures

Our analysis focused on two outcome measures. The first identified facilities that accept Medicaid beneficiaries, and the second identified facilities that both accepted Medicaid beneficiaries and offered MOUD on-site. A facility was determined to offer MOUD if it

[23] SAMHSA. (2021). *National Survey of Substance Abuse Treatment Services (N-SSATS): 2020, data on substance abuse treatment facilities*. https://www.samhsa.gov/data/sites/default/files/reports/rpt35313/2020_NSSATS_FINAL.pdf

[24] SAMHSA. (2021). *National directory of drug and alcohol abuse treatment facilities*. https://www.samhsa.gov/data/report/national-directory-drug-and-alcohol-abuse-treatment

provided methadone, buprenorphine, or injectable naltrexone on-site. These measures were chosen because they represent overall SUD treatment capacity for Medicaid beneficiaries and specific capacity for MOUD, both of which pertain to Milestone #4 established by CMS for the demonstration.

Control variables included facility characteristics from the national directories, specifically the level(s) of care offered at each facility (inpatient, residential, and outpatient), whether the facility was publicly or privately owned, whether the facility was accredited, and whether the facility was a SAMHSA-certified opioid treatment program (OTP), allowing it to dispense methadone. Additional control variables were defined based on the characteristics of the county in which the facility was located. A binary indicator based on the NCHS Urban-Rural Classification Scheme was used to distinguish between metropolitan and non-metropolitan (i.e., micropolitan or non-core) counties. Additional county-level variables included the proportion of the county population that was male; the proportion of the population that was non-Hispanic White, non-Hispanic Black, Hispanic, or neither White, Black, nor Hispanic; the proportion of the county population under 65 years of age enrolled in Medicaid; and the rate of opioid overdose deaths per 100,000 residents.

Comparison Group Development

The validity of effect estimates from D-in-D models relies on the assumption that the evolution of the outcome in the comparison group represents a counterfactual for what would have occurred for facilities exposed to the section 1115 SUD demonstration had the demonstration not taken effect. Because we used the same pool of comparison facilities for each early implementing state, we used entropy balancing to weight the group of comparison facilities so that its characteristics resemble those of the facilities in the demonstration state as closely as possible.

Entropy balancing is an alternative to propensity score weighting that helps balance model covariates across groups. Unlike propensity score weighting, which derives weights based on predicted probabilities of being treated from a regression, entropy balancing is an optimization approach that finds the most uniform set of weights that satisfies balance constraints (i.e., covariates to be balanced across groups). Entropy balancing is described as a generalization of the propensity score weighting approach in which weights are directly computed rather than derived from a model specification.

We used entropy balancing for each early intervention state and each year. Balance constraints comprised a set of covariates for which we wanted equal means between facilities in the early implementing state and comparison facilities.[25] The entropy balancing algorithm solved for weights to be applied to the comparison facilities that were as similar as possible and that satisfied the balance constraints. The set of balance constraints (i.e., covariates to be balanced) varied slightly across outcomes and across states (see **Table A1**). Balance constraints differed across outcomes because it was not appropriate to equate means of facilities that were OTPs when analyzing on-site MOUD provision because all OTPs offer MOUD. Thus, that constraint was excluded when computing weights for the analysis of the effect of the demonstration on facilities that accept Medicaid and offer MOUD on-site. Similarly, county-level opioid overdose death rates were not used to construct weights for the Medicaid outcome because the association between overdose death rates and facilities' acceptance of Medicaid is expected to be weak. Differences across states stemmed from the absence of a solution to the entropy balancing algorithm that satisfied the full set of balance constraints in some state-years. An example of this is that no solution was found that could balance the full set of race/ethnicity variables for West Virginia. As a result, the full set of constraints was replaced with one that produced the same average proportion of non-White residents in West Virginia and its comparison group, but did not distinguish between Black, Hispanic, and other race/ethnicities residents.

Following the estimation of initial entropy balancing weights, we applied a minimum of 0.5 and a maximum of 20. Importantly, this modification of entropy balancing weights detracts from covariate balance by placing a minimum weight on many facilities with very low (<0.5) weights. However, it ensures that no comparison facility is overly influential in the effect estimates. Balance was assessed using standardized differences, a measure that summarizes the difference between group means. Covariates with standardized differences less than 10 are generally considered to be balanced.[26] Means and standardized differences with and without the adjusted weights[27] are shown in **Tables A2a–A2e** for the acceptance of Medicaid outcome and in **Tables A3a–A3e** for the acceptance of Medicaid and provision of MOUD outcome. Although weights were computed for each state-year, we present tables for the year immediately prior to demonstration implementation for each state. Results are very similar in other years. As the tables show, the application of entropy balancing weights produces a comparison set that much more closely resembles the facilities in each early implementation state. To address residual imbalance caused by the exclusion of a covariate from the set of balance constraints or by the application of the 0.5/20 weight adjustment, controls were also included in D-in-D models.

[25] As with propensity score-based approaches, balance constraints in the entropy balancing algorithm should be chosen to improve balance among covariates that could be confounders (i.e., are related to the treatment or the outcome). In this case, "treatment" means being located in a state that participates in the demonstration. Because facility and county-level variables likely had little influence on the demonstration decision made at the state level, our focus was on identifying variables related to the outcomes (whether facilities [1] accepted Medicaid or [2] accepted Medicaid and offered MOUD on-site).

[26] Austin, P. C., & Stuart, E. A. (2015). Moving towards best practice when using inverse probability of treatment weighting (IPTW) using the propensity score to estimate causal treatment effects in observational studies. *Statistics in Medicine, 34*(28), 3661-3679.

[27] The denominator for standardized differences calculations for continuous variables is a pooled standard deviation using the unweighted sample for the comparison group.

Table A1. Balance constraints by outcome and state

Constraint	P (Accept Medicaid)					P (Accept Medicaid and offer MOUD)				
	CA	MA	MD	VA	WV	CA	MA	MD	VA	WV
Facility Levels of Care (Inpatient, Outpatient, Residential)	•	•	•	•	•	•	•	•	•	•
Facility Ownership	•	•	•	•	•	•	•	•	•	•
Facility is Accredited	•	•	•	•	•	•	•	•	•	•
Facility is a SAMHSA-certified Opioid Treatment Program (OTP)	•	•	•	•	•					
County Metropolitan	•	•	•	•	•	•	•	•	•	•
County % Male	•	•	•	•	•	•	•	•	•	•
County % Non-White					•					•
County % Black, Non-Hispanic	•	•	•	•		•	•	•	•	
County % Hispanic	•	•	•	•		•	•	•	•	
County % Non-White, Non-Black, Non-Hispanic	•	•	•	•		•	•	•	•	
County % Medicaid Beneficiary (under age 65)	•	•	•	•	•	•	•	•	•	•
County Rate of Opioid Overdose Deaths per 100,000 Residents						•	•	•	•	
Indicator for Opioid Overdose Death Rate in Top Tercile										•

Table A2a. Acceptance of Medicaid outcome covariate balance: California, 2017

Covariate	California (N=2,395)		Comparison Unweighted (N=24,433)		Comparison Weighted (N=3,211)		Std. Diff	
	Mean	SD	Mean	SD	Mean	SD	Unweighted	Weighted
Facility Levels of Care: Residential Services	0.41		0.24		0.36		30.25	9.60
Facility Levels of Care: Outpatient Services	0.68		0.84		0.73		29.52	9.14
Facility Levels of Care: Inpatient Services	0.02		0.06		0.03		18.50	7.65
Facility Ownership: Privately Owned	0.96		0.92		0.94		13.37	5.33
Facility is Accredited	0.57		0.53		0.56		6.25	1.63
Facility is a SAMHSA-certified Opioid Treatment Program (OTP)	0.16		0.13		0.15		7.44	2.92
County Metropolitan	1.00		0.77		0.91		77.52	44.59
County % Male	0.49	0.01	0.49	0.01	0.49	0.01	23.80	6.74
County % Non-White	0.31	0.09	0.64	0.21	0.41	0.27	206.88	62.73
County % Black, Non-Hispanic	0.07	0.02	0.11	0.12	0.08	0.11	55.08	18.22
County % Hispanic	0.41	0.12	0.16	0.15	0.33	0.28	184.63	58.74
County % Non-White, Non-Black, Non-Hispanic	0.21	0.09	0.08	0.09	0.17	0.24	143.03	40.62
County % Medicaid Beneficiary (under age 65)	0.26	0.06	0.22	0.07	0.25	0.10	61.80	19.49

Table A2b. Acceptance of Medicaid outcome covariate balance: Maryland, 2016

Covariate	Maryland (N=1,921)		Comparison Unweighted (N=24,433)		Comparison Weighted (N=2,716)		Std. Diff	
	Mean	SD	Mean	SD	Mean	SD	Unweighted	Weighted
Facility Levels of Care: Residential Services	0.17		0.24		0.20		14.71	6.55
Facility Levels of Care: Outpatient Services	0.91		0.83		0.88		19.91	7.95
Facility Levels of Care: Inpatient Services	0.02		0.06		0.04		18.62	8.64
Facility Ownership: Privately Owned	0.88		0.91		0.89		7.70	2.95
Facility is Accredited	0.46		0.52		0.50		10.71	6.24
Facility is a SAMHSA-certified Opioid Treatment Program (OTP)	0.25		0.14		0.21		21.86	6.69
County Metropolitan	0.94		0.78		0.87		43.35	20.75
County % Male	0.48	0.01	0.49	0.01	0.49	0.01	64.00	21.03
County % Non-White	0.54	0.24	0.64	0.21	0.57	0.20	44.04	10.67
County % Black, Non-Hispanic	0.32	0.23	0.12	0.13	0.26	0.20	108.44	32.91
County % Hispanic	0.07	0.05	0.16	0.15	0.10	0.12	84.54	32.31
County % Non-White, Non-Black, Non-Hispanic	0.07	0.04	0.08	0.09	0.07	0.09	12.34	1.94
County % Medicaid Beneficiary (under age 65)	0.23	0.09	0.23	0.07	0.23	0.07	6.14	0.09

Table A2c: Acceptance of Medicaid outcome covariate balance: Massachusetts, 2017

Covariate	Massachusetts (N=1,950)		Comparison Unweighted (N=24,433)		Comparison Weighted (N=2,638)		Std. Diff	
	Mean	SD	Mean	SD	Mean	SD	Unweighted	Weighted
Facility Levels of Care: Residential Services	0.32		0.24		0.29		14.22	4.63
Facility Levels of Care: Outpatient Services	0.68		0.84		0.74		29.84	10.37
Facility Levels of Care: Inpatient Services	0.08		0.06		0.07		5.06	1.23
Facility Ownership: Privately Owned	0.98		0.92		0.96		28.40	13.63
Facility is Accredited	0.64		0.53		0.60		17.64	6.61
Facility is a SAMHSA-certified Opioid Treatment Program (OTP)	0.22		0.13		0.19		19.10	6.72
County Metropolitan	0.97		0.77		0.89		58.80	30.17
County % Male	0.49	0.00	0.49	0.01	0.49	0.01	69.20	29.70
County % Non-White	0.69	0.14	0.64	0.21	0.68	0.22	28.30	10.32
County % Black, Non-Hispanic	0.08	0.07	0.11	0.12	0.10	0.11	32.75	12.92
County % Hispanic	0.13	0.08	0.16	0.15	0.15	0.14	23.25	9.49
County % Non-White, Non-Black, Non-Hispanic	0.09	0.04	0.08	0.09	0.08	0.09	15.05	8.61
County % Medicaid Beneficiary (under age 65)	0.27	0.06	0.22	0.07	0.25	0.08	74.44	28.47

Table A2d. Acceptance of Medicaid outcome covariate balance: Virginia, 2016

Covariate	Virginia (N=1,054)		Comparison Unweighted (N=24,433)		Comparison Weighted (N=2,039)		Std. Diff	
	Mean	SD	Mean	SD	Mean	SD	Unweighted	Weighted
Facility Levels of Care: Residential Services	0.16		0.24		0.21		16.61	9.55
Facility Levels of Care: Outpatient Services	0.87		0.83		0.85		7.41	4.08
Facility Levels of Care: Inpatient Services	0.05		0.06		0.05		4.66	2.96
Facility Ownership: Privately Owned	0.51		0.91		0.72		73.66	35.13
Facility is Accredited	0.36		0.52		0.45		28.11	15.09
Facility is a SAMHSA-certified Opioid Treatment Program (OTP)	0.20		0.14		0.17		13.19	6.88
County Metropolitan	0.81		0.78		0.80		6.60	3.39
County % Male	0.49	0.01	0.49	0.01	0.49	0.01	2.82	2.40
County % Non-White	0.66	0.16	0.64	0.21	0.65	0.20	8.09	5.01
County % Black, Non-Hispanic	0.18	0.14	0.12	0.13	0.15	0.16	48.96	26.95
County % Hispanic	0.08	0.06	0.16	0.15	0.12	0.13	74.20	41.54
County % Non-White, Non-Black, Non-Hispanic	0.08	0.06	0.08	0.09	0.08	0.09	5.97	2.94
County % Medicaid Beneficiary (under age 65)	0.14	0.07	0.23	0.07	0.19	0.08	123.23	67.06

Table A2e. Acceptance of Medicaid outcome covariate balance: West Virginia, 2017

Covariate	West Virginia (N=455)		Comparison Unweighted (N=24,433)		Comparison Weighted (N=1,628)		Std. Diff	
	Mean	SD	Mean	SD	Mean	SD	Unweighted	Weighted
Facility Levels of Care: Residential Services	0.24		0.24		0.24		0.44	0.03
Facility Levels of Care: Outpatient Services	0.78		0.84		0.82		12.60	9.23
Facility Levels of Care: Inpatient Services	0.08		0.06		0.07		6.10	3.87
Facility Ownership: Privately Owned	0.99		0.92		0.94		30.70	24.59
Facility is Accredited	0.30		0.53		0.47		39.99	29.26
Facility is a SAMHSA-certified Opioid Treatment Program (OTP)	0.13		0.13		0.13		0.72	0.30
County Metropolitan	0.58		0.77		0.73		32.95	24.98
County % Male	0.49	0.01	0.49	0.01	0.49	0.01	10.99	8.43
County % Non-White	0.92	0.03	0.64	0.21	0.72	0.22	187.86	139.05
County % Black, Non-Hispanic	0.04	0.02	0.11	0.12	0.09	0.12	84.06	54.00
County % Hispanic	0.01	0.01	0.16	0.15	0.13	0.14	144.92	112.72
County % Non-White, Non-Black, Non-Hispanic	0.03	0.01	0.08	0.09	0.07	0.08	87.39	67.40
County % Medicaid Beneficiary (under age 65)	0.32	0.07	0.22	0.07	0.25	0.08	145.11	105.49

Table A3a. Acceptance of Medicaid and provision of MOUD outcome covariate balance: California, 2017

Covariate	California (N=2,395)		Comparison Unweighted (N=24,433)		Comparison Weighted (N=3,208)		Std. Diff	
	Mean	SD	Mean	SD	Mean	SD	Unweighted	Weighted
Facility Levels of Care: Residential Services	0.41		0.24		0.36		30.25	8.64
Facility Levels of Care: Outpatient Services	0.68		0.84		0.73		29.52	8.08
Facility Levels of Care: Inpatient Services	0.02		0.06		0.03		18.50	7.38
Facility Ownership: Privately Owned	0.96		0.92		0.94		13.37	4.46
Facility is Accredited	0.57		0.53		0.56		6.25	1.38
County Metropolitan	1.00		0.77		0.91		77.52	44.64
County % Male	0.49	0.01	0.49	0.01	0.49	0.01	23.80	3.11
County % Non-White	0.31	0.09	0.64	0.21	0.42	0.28	206.88	63.85
County % Black, Non-Hispanic	0.07	0.02	0.11	0.12	0.08	0.11	55.08	12.46
County % Hispanic	0.41	0.12	0.16	0.15	0.34	0.31	184.63	56.29
County % Non-White, Non-Black, Non-Hispanic	0.21	0.09	0.08	0.09	0.17	0.24	143.03	40.75
County % Medicaid Beneficiary (under age 65)	0.26	0.06	0.22	0.07	0.25	0.09	61.80	18.85
County Rate of Opioid Overdose Deaths per 100,000 Residents	6.53	2.08	18.72	13.71	10.65	11.58	124.37	42.07

Table A3b. Acceptance of Medicaid and provision of MOUD outcome covariate balance: Maryland, 2016

Covariate	Maryland (N=1,921)		Comparison Unweighted (N=24,433)		Comparison Weighted (N=3,018)		Std. Diff	
	Mean	SD	Mean	SD	Mean	SD	Unweighted	Weighted
Facility Levels of Care: Residential Services	0.17		0.24		0.20		14.71	5.64
Facility Levels of Care: Outpatient Services	0.91		0.83		0.88		19.91	7.25
Facility Levels of Care: Inpatient Services	0.02		0.06		0.03		18.62	8.13
Facility Ownership: Privately Owned	0.88		0.91		0.89		7.70	2.36
Facility is Accredited	0.46		0.52		0.48		10.71	4.32
County Metropolitan	0.94		0.78		0.88		43.35	19.55
County % Male	0.48	0.01	0.49	0.01	0.49	0.01	64.00	26.52
County % Non-White	0.54	0.24	0.64	0.21	0.58	0.20	44.04	17.66
County % Black, Non-Hispanic	0.32	0.23	0.12	0.13	0.25	0.19	108.44	39.44
County % Hispanic	0.07	0.05	0.16	0.15	0.10	0.13	84.54	28.57
County % Non-White, Non-Black, Non-Hispanic	0.07	0.04	0.08	0.09	0.07	0.07	12.34	2.64
County % Medicaid Beneficiary (under age 65)	0.23	0.09	0.23	0.07	0.23	0.07	6.14	4.39
County Rate of Opioid Overdose Deaths per 100,000 Residents	59.62	29.65	17.40	12.68	44.46	29.45	185.19	66.51

Table A3c. Acceptance of Medicaid and provision of MOUD outcome covariate balance: Massachusetts, 2017

Covariate	Massachusetts (N=1,950)		Comparison Unweighted (N=24,433)		Comparison Weighted (N=2,963)		Std. Diff	
	Mean	SD	Mean	SD	Mean	SD	Unweighted	Weighted
Facility Levels of Care: Residential Services	0.32		0.24		0.29		14.22	5.31
Facility Levels of Care: Outpatient Services	0.68		0.84		0.74		29.84	11.13
Facility Levels of Care: Inpatient Services	0.08		0.06		0.07		5.06	1.98
Facility Ownership: Privately Owned	0.98		0.92		0.96		28.40	13.11
Facility is Accredited	0.64		0.53		0.60		17.64	6.80
County Metropolitan	0.97		0.77		0.89		58.80	28.93
County % Male	0.49	0.00	0.49	0.01	0.49	0.01	69.20	28.54
County % Non-White	0.69	0.14	0.64	0.21	0.68	0.24	28.30	9.34
County % Black, Non-Hispanic	0.08	0.07	0.11	0.12	0.09	0.11	32.75	11.72
County % Hispanic	0.13	0.08	0.16	0.15	0.14	0.15	23.25	8.56
County % Non-White, Non-Black, Non-Hispanic	0.09	0.04	0.08	0.09	0.08	0.12	15.05	7.81
County % Medicaid Beneficiary (under age 65)	0.27	0.06	0.22	0.07	0.25	0.09	74.44	30.07
County Rate of Opioid Overdose Deaths per 100,000 Residents	38.76	11.02	18.72	13.71	30.82	17.31	161.13	63.86

Table A3d. Acceptance of Medicaid and provision of MOUD outcome covariate balance: Virginia, 2016

Covariate	Virginia (N=1,054)		Comparison Unweighted (N=24,433)		Comparison Weighted (N=2,071)		Std. Diff	
	Mean	SD	Mean	SD	Mean	SD	Unweighted	Weighted
Facility Levels of Care: Residential Services	0.16		0.24		0.21		16.61	9.16
Facility Levels of Care: Outpatient Services	0.87		0.83		0.85		7.41	4.20
Facility Levels of Care: Inpatient Services	0.05		0.06		0.05		4.66	2.82
Facility Ownership: Privately Owned	0.51		0.91		0.73		73.66	35.70
Facility is Accredited	0.36		0.52		0.45		28.11	15.48
County Metropolitan	0.81		0.78		0.80		6.60	3.63
County % Male	0.49	0.01	0.49	0.01	0.49	0.01	2.82	1.82
County % Non-White	0.66	0.16	0.64	0.21	0.65	0.20	8.09	5.01
County % Black, Non-Hispanic	0.18	0.14	0.12	0.13	0.15	0.15	48.96	26.18
County % Hispanic	0.08	0.06	0.16	0.15	0.12	0.13	74.20	40.68
County % Non-White, Non-Black, Non-Hispanic	0.08	0.06	0.08	0.09	0.08	0.09	5.97	2.95
County % Medicaid Beneficiary (under age 65)	0.14	0.07	0.23	0.07	0.19	0.08	123.23	67.04
County Rate of Opioid Overdose Deaths per 100,000 Residents	19.40	13.89	17.40	12.68	18.31	15.39	15.08	8.19

Table A3e. Acceptance of Medicaid and provision of MOUD outcome covariate balance: West Virginia, 2017

Covariate	West Virginia (N=455)		Comparison Unweighted (N=24,433)		Comparison Weighted (N=1,620)		Std. Diff	
	Mean	SD	Mean	SD	Mean	SD	Unweighted	Weighted
Facility Levels of Care: Residential Services	0.24		0.24		0.24		0.44	0.08
Facility Levels of Care: Outpatient Services	0.78		0.84		0.82		12.60	9.30
Facility Levels of Care: Inpatient Services	0.08		0.06		0.07		6.10	3.86
Facility Ownership: Privately Owned	0.99		0.92		0.94		30.70	24.71
Facility is Accredited	0.30		0.53		0.47		39.99	29.36
County Metropolitan	0.58		0.77		0.73		32.95	25.54
County % Male	0.49	0.01	0.49	0.01	0.49	0.01	10.99	8.42
County % Non-White	0.92	0.03	0.64	0.21	0.72	0.22	187.86	140.07
County % Black, Non-Hispanic	0.04	0.02	0.11	0.12	0.09	0.12	84.06	54.56
County % Hispanic	0.01	0.01	0.16	0.15	0.13	0.14	144.92	113.50
County % Non-White, Non-Black, Non-Hispanic	0.03	0.01	0.08	0.09	0.07	0.08	87.39	67.74
County % Medicaid Beneficiary (under age 65)	0.32	0.07	0.22	0.07	0.25	0.08	145.11	105.58
County Rate of Opioid Overdose Deaths per 100,000 Residents	72.39	56.11	18.72	13.71	19.69	13.06	131.40	129.03

Effect Estimation

Assessing the Parallel Trends Assumption

D-in-D analysis relies on the assumption that the trend in the outcome in the comparison group represents what the trend in the outcome would have been for the treatment group in the absence of the intervention (i.e., the section 1115 SUD demonstration). This "parallel trends" assumption cannot be directly tested because the counterfactual trend in the treatment group is not observed, but it is customary to examine trends in the baseline period as the best available evidence to support the parallel trends assumption.

We examined trends for both outcomes by state both visually and empirically. **Figures A1a–A1e** present the proportion of facilities that accept Medicaid for each early intervention state and its comparison set with and without entropy balancing weights. The vertical line on the chart shows the date of demonstration implementation in the early intervention state. **Figures A2a–A2e** present similar charts, but for the proportion of facilities that both accept Medicaid and provide MOUD on-site.

Figures A1a–A1e and **A2a–A2e** show that the trends in outcomes between the facilities in demonstration counties and comparison facilities appear to be generally parallel, in that the trends for both outcomes gradually increased over the study period. Based on visual inspection, the exception to this general statement is in Maryland for the Medicaid/MOUD outcome (**Figure A2b**).

Figure A1a. Trends in SUD facilities' acceptance of Medicaid in California

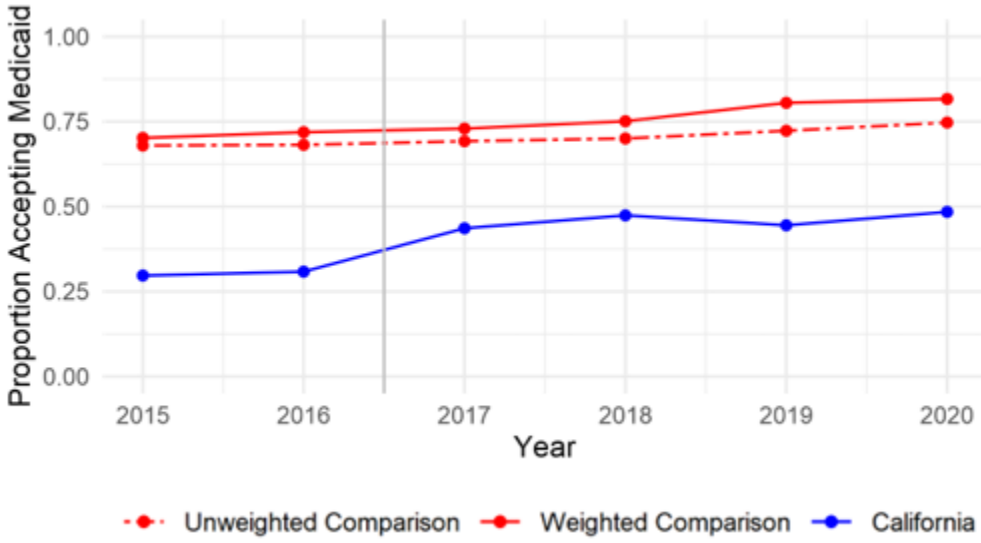


Figure A1b. Trends in SUD facilities' acceptance of Medicaid in Maryland

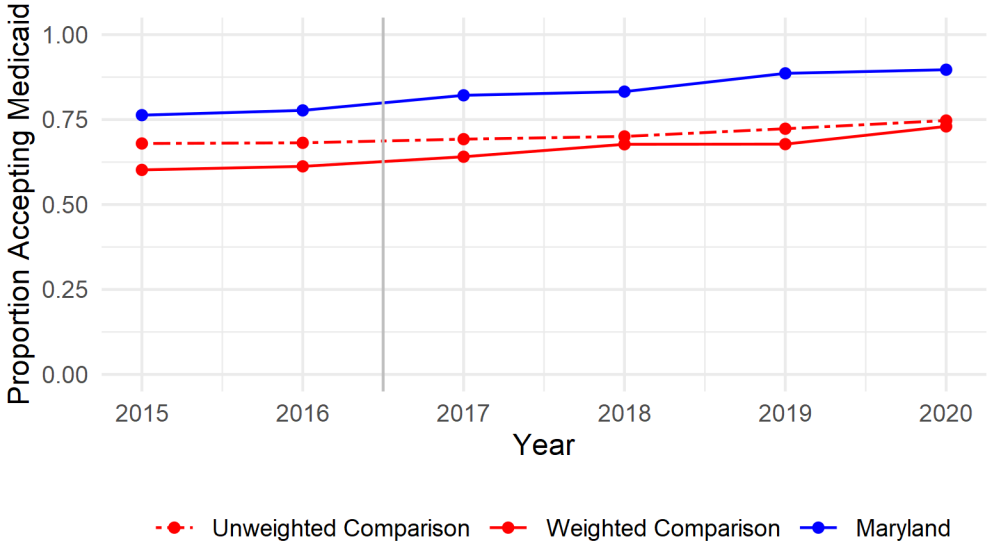


Figure A1c. Trends in SUD facilities' acceptance of Medicaid in Massachusetts

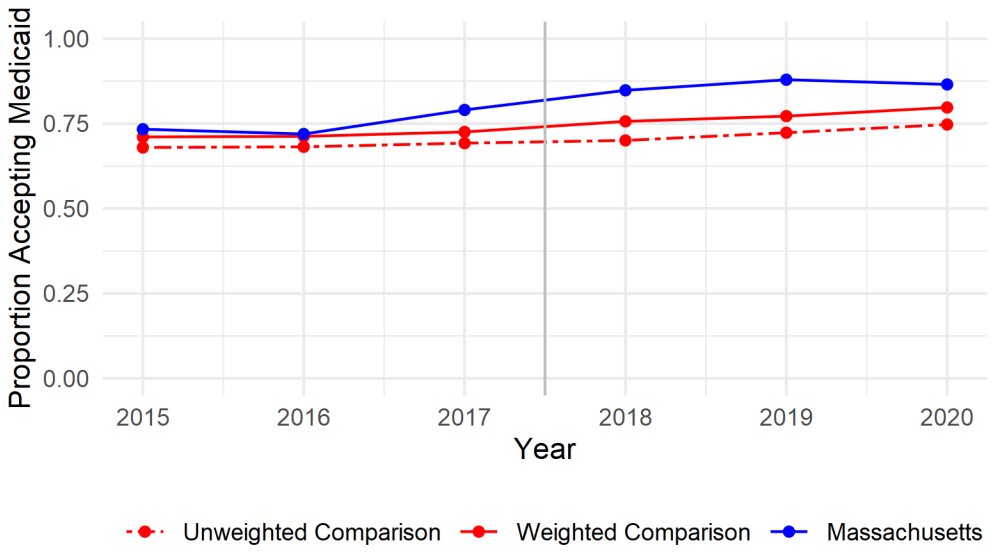


Figure A1d. Trends in SUD facilities' acceptance of Medicaid in Virginia

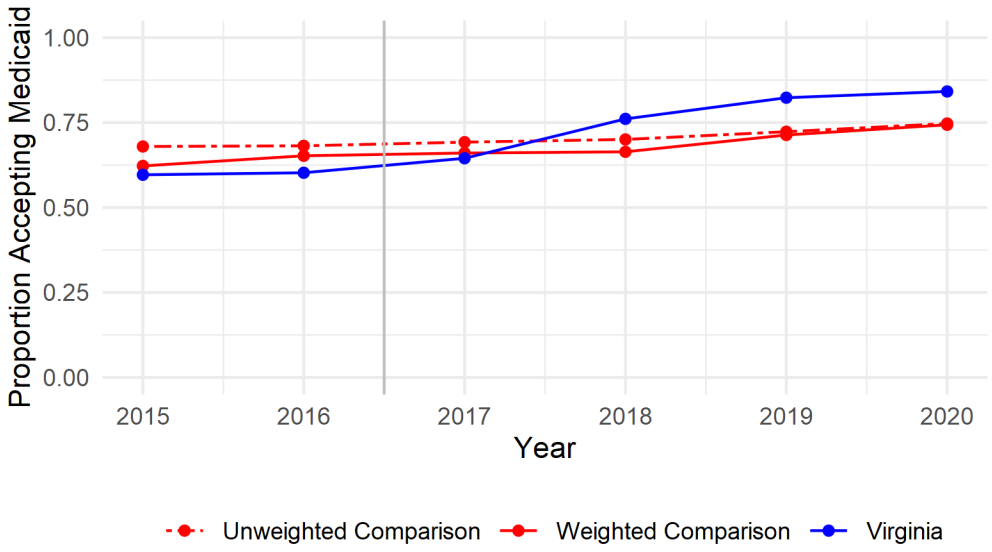


Figure A1e. Trends in SUD facilities' acceptance of Medicaid in West Virginia

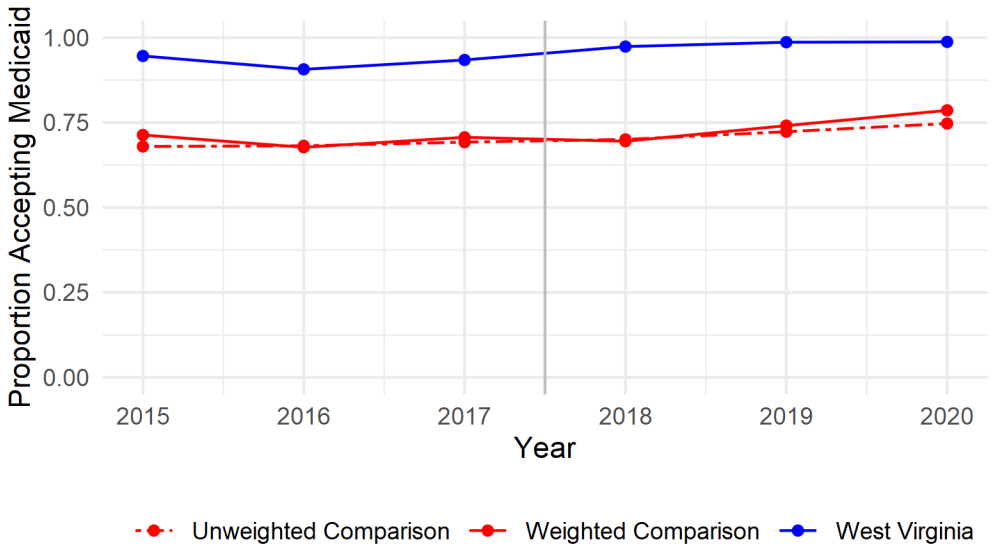


Figure A2a. Trends in SUD facilities' acceptance of Medicaid and provision of MOUD in California

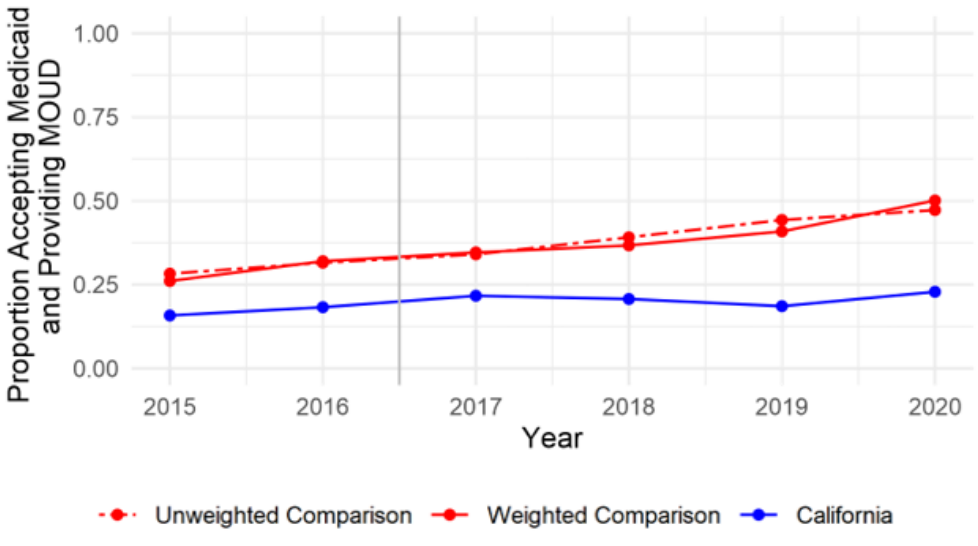


Figure A2b. Trends in SUD facilities' acceptance of Medicaid and provision of MOUD in Maryland

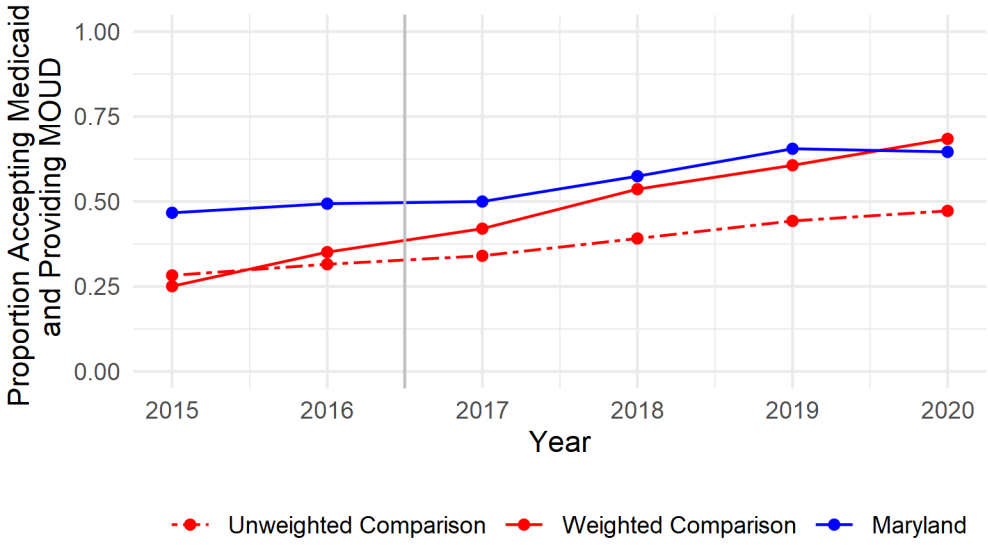


Figure A2c. Trends in SUD facilities' acceptance of Medicaid and provision of MOUD in Massachusetts

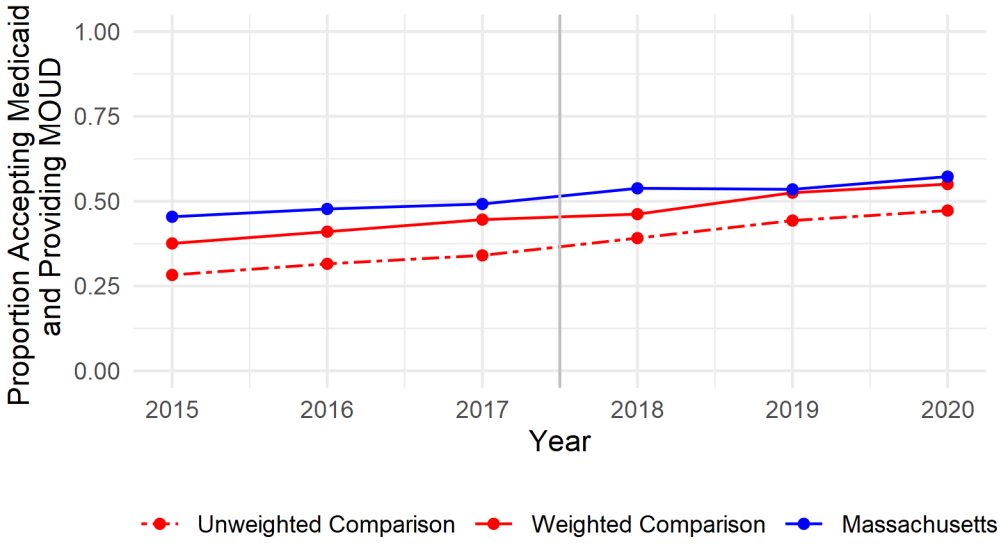


Figure A2d. Trends in SUD facilities' acceptance of Medicaid and provision of MOUD in Virginia

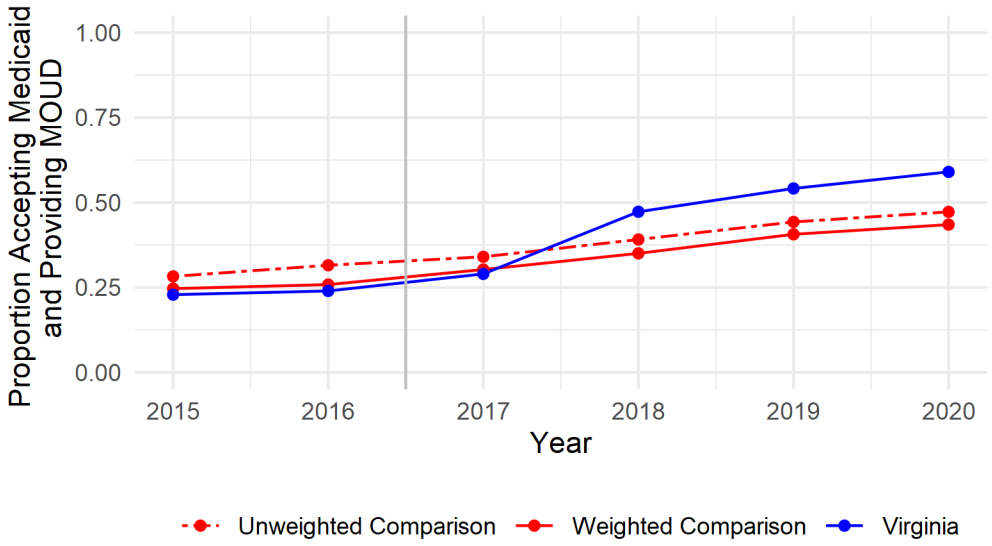
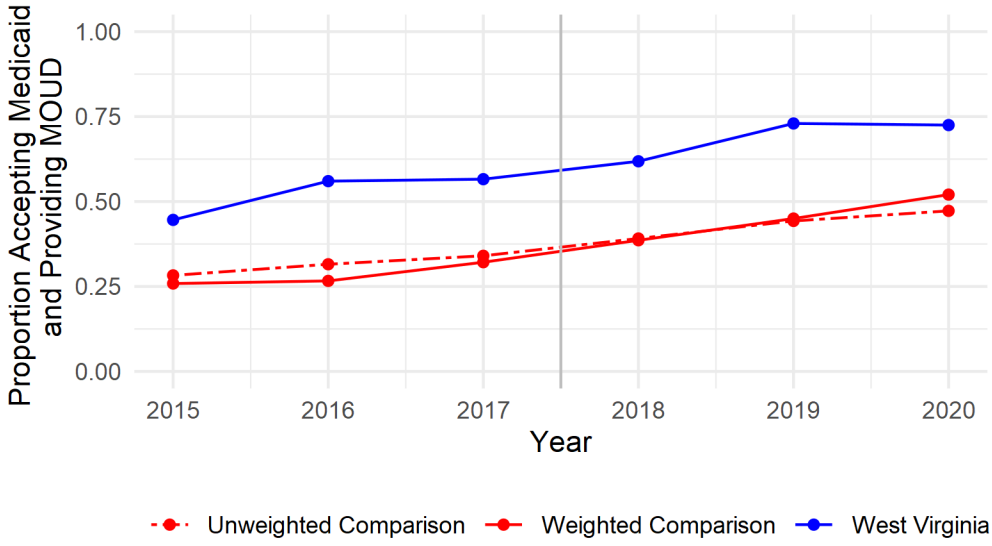


Figure A2e. Trends in SUD facilities' acceptance of Medicaid and provision of MOUD in West Virginia



To further investigate the parallel trends assumption, we used a regression model to test whether the slope in each outcome in the baseline period significantly differed between each early intervention state and the comparison group using corresponding entropy balancing weights. The model was specified as follows:

$$y_{it} = \alpha + \gamma_s + T_t\tau + (EI_S * T_t)\delta + X_{it}\beta + \varepsilon_i \qquad \text{(equation 1)},$$

where y_{it} is the outcome for facility i captured in year t, α is the intercept, γ_s are state fixed effects, respectively, T_t represents continuous time 1..N, EI_s represents an indicator for the early intervention state, X_{it} represents a set of controls at the facility or county level, and ε_{it} represents the error term. Equation 1 was estimated for each early intervention state and each outcome using only the baseline period, and standard errors were assumed to be clustered at the state level. The parameter δ is the coefficient for the interaction of the time trend and the early intervention state and the parameter of interest. A significant δ indicates that the trends in the outcomes differ between facilities in the early intervention state and the set of comparison facilities, suggesting that the data may violate the parallel trends assumption. Coefficients and p-values for the parameter δ are shown below in **Table A4**.

It is important to note that that a failure to reject the null hypothesis of parallel trends (i.e., finding a statistically insignificant interaction term [δ] from equation 1) is *not* equivalent to affirming parallel trends in the baseline period. Conventional thresholds for statistical significance test thresholds favor type II error over type I error, so an insignificant test could be a false negative indicator that the trends

between exposed and unexposed facilities are not different.[28] Thus, we used a threshold of p=0.2 from this test to determine whether we would assume parallel trends in the outcomes model. As a result, we assumed parallel trends for CA and MD on the first outcome, and for VA and WV on the second.

Table A4: Baseline trend test by outcome and state

Outcome and State	Logit Coefficient and P-value from Trend Test
P(Accept Medicaid)	
CA	-0.051 (p = 0.638)
MD	0.002 (p=0.975)
MA	0.103 (p=0.070)
VA	-0.126 (p=0.188)
WV	-0.129 (p=0.007)
P(Accept Medicaid and provide MOUD on-site)	
CA	-0.330 (p = 0.047)
MD	-0.654 (p < 0.001)
MA	-0.099 (p=0.163)
VA	0.011 (p=0.937)
WV	0.029 (p=0.791)

Outcomes Model Specification

We used four models to estimate the impact of the demonstration on the two study outcomes. The first (equation 2) is a typical regression D-in-D specification to estimate the effect of the intervention:

$$y_i = \alpha + \gamma_s + \lambda_i + D_i\delta + X_i\beta + \varepsilon_i \quad \text{(equation 2)},$$

where y_i is the outcome for facility i captured in year t, α is the intercept, and γ_s and λ_i are state and year fixed effects, respectively. D_{it} is an indicator for whether the demonstration is active for facility i in year t, X_i represents a set of controls at the facility or county level, and ε_i represents the error term. The parameter δ represents the effect of the demonstration. Because equation 2 was estimated using logistic regression on a binary outcome, we present marginal effects of D_i in place of the logit coefficient δ_i. The marginal effects represent the impact of the demonstration in terms of the outcome rather than on the log odds scale.

The second (equation 3) decomposes the impact of the demonstration by year:

$$y_i = \alpha + \gamma_s + \lambda_i + \sum_{k=1}^{K}(D_i * year_k\delta_k) + X_i\beta + \varepsilon_i \quad \text{(equation 3)},$$

$year_k$ is a set of indicators for the 1st, 2nd, through kth year that the demonstration is in effect. The set of parameters δ_k represent year-specific effects of the demonstration on facility outcomes and represent the parameters of interest for this model. As with equation 2, we present marginal effects rather than untransformed model coefficients.

Equation 4 is an alternative specification to equation 3 that estimates the effect of the demonstration under the assumption that the difference in trends between the exposed and unexposed groups of facilities would have remained as they were in the baseline period if the demonstration had not gone into effect.[29] This relaxes the parallel trends assumption. Equation 4 is specified as follows:

$$y_i = \alpha + \gamma_s + P_i + P_i * S_i + \sum_{k=1}^{K}(year_k\delta_k) + \sum_{k=1}^{K}(D_i * year_k\delta_k) + X_i\beta + \varepsilon_i \quad \text{(equation 4)},$$

where P_i is a continuous variable for time period (i.e., t=1 in 2015 and 6 in 2021) and S_i is an indicator for the early implementation state. As in equation 3, the set of parameters δ_k represent year-specific effects of the demonstration on facility outcomes and represent the parameters of interest for this model. As with equations 2 and 3, we present marginal effects rather than untransformed model coefficients.

[28] Bilinski, A., & Hatfield, L. A. (2018). Nothing to see here? Non-inferiority approaches to parallel trends and other model assumptions. *arXiv preprint arXiv:1805.03273*.

[29] Cataife, G., Hesgrove, B., & Varghese, R. (n.d.). *Generalization of the difference-in-differences model for applied research.* IMPAQ International. https://ashecon.confex.com/ashecon/2018/webprogram/Paper5803.html

For cases where the parallel trends assumption is rejected, we estimate the overall effect of the demonstration (equivalent to δ in equation 2) by taking the average of the marginal effects of coefficients δ_k from equation 4.[30]

Finally, equation 5 is a triple differences model designed to estimate how the impact of the demonstration varies by subgroups of facilities:

$$y_i = \alpha + \gamma_s + \lambda_i + D_i\delta + (\gamma_s * G_i) + (\lambda_i * G_i) + [D_i * G_i]\theta + X_i\beta + \varepsilon_i \quad \text{(equation 5)}$$

Equation 5 expands equation 2 by introducing G_i, an indicator variable that stratifies facilities,[31] that is fully interacted with the treatment group (represented by γ_s), binary time (baseline and demonstration period; represented by λ_i), and with both treatment group and time (represented by D_i which identifies facilities exposed to the intervention, i.e., in the early intervention state and observed in the demonstration period). The coefficient θ represents the difference in the impact of the demonstration for facilities with characteristic G_i compared to facilities without that characteristic. Equation 5 was estimated with the following definitions of G_i: (1) residential facilities (G_i=1) versus facilities that do not provide residential services (G_i=0), and (2) facilities in metropolitan counties (G_i=1) versus those in non-metropolitan counties (G_i=0). We used equation 5 to estimate differences by metropolitan status for Virginia and West Virginia only. We could not conduct this analysis in California because there are no facilities from non-metropolitan counties in the sample. In Maryland and Massachusetts, the proportion of facilities that are from non-metropolitan counties is 4 and 3 percent, respectively. We used equation 5 to estimate differences between residential facilities and those that don't provide residential services in all five early implementing states.

Limitations

There are some limitations of these analyses that must be noted. First, analyses were limited to two or three years of data before and three to four years after the onset of the section 1115 SUD demonstrations. This makes it difficult to characterize trends in the outcome before the demonstration and may miss longer-term effects of the demonstration. Second, N-SSATS data used for this analysis are limited to specialty SUD treatment facilities and exclude important providers such as office-based buprenorphine providers.

Third, our approach used D-in-D models to estimate the effects of the demonstrations. D-in-D relies on the assumption that the comparison group represents a valid counterfactual for how the outcomes would have evolved in the demonstration states in the absence of the demonstration. That assumption cannot be directly tested, but it is common to provide context for that assumption by examining trends in the baseline period. We found evidence of divergent trends between demonstration and comparison facilities for some analyses, most notably for Maryland for the Medicaid acceptance/MOUD provision outcome. To address potential violations of this "parallel trends" assumption we used an alternative specification that relies on an equally strong assumption that trend differences observed in the baseline period would have persisted into the demonstration period without the demonstration. These two specifications provide effect estimates under two different assumptions, and findings should be interpreted with caution when the two specifications yield considerably different findings (e.g., in Maryland for the Medicaid acceptance/MOUD provision outcome). However, we note that our findings of an increase in Medicaid acceptance due to the demonstrations in California, Virginia, and West Virginia is consistent across both specifications (**Appendix Table B1a**). Related to the parallel trends assumption, we note that the triple difference models assume parallel trends and thus do not use the alternative specification. As a result, estimated effects within subgroups (e.g., for residential and non-residential facilities, respectively) should be compared to D-in-D results based on an assumption of parallel trends (i.e., the results under the "Parallel Trends Assumed" heading in **Appendix Table B1a** and **B1b**).

Finally, our data are repeated cross-sections, not longitudinal. Thus, some facilities might move in or out of the sample from year to year. If this churn is sufficient to cause changes in the composition of the sample over time, it can bias the results of D-in-D analysis. In most early implementing states and among comparison states, we generally observe a gradual increase in facilities over time. However, in California we observed a large increase in facilities from 2018 to 2019, suggesting that the N-SSATS sampling frame may have changed to incorporate additional facilities. While cross-sectional data prevents identification of those new facilities, if those facilities are qualitatively different from facilities included in the baseline years, it could impact the estimates of the demonstration effects in California.

[30] Our estimate of the overall effect is based on the average of demonstration marginal effects rather than from the model specified by Cataife and colleagues[29] that is analogous to our equation 2 because the treatment effect specified by Cataife and colleagues is a linear combination of coefficients for which marginal effects cannot be computed. As noted by Cataife and colleagues, it is equivalent to an average of the demonstration coefficients (i.e., from equation 4).

[31] Note that $G_i$is a subset of X_i, so G_i is not shown in equation 5 uninteracted.

Appendix B. Results

Effect estimates for the Medicaid (**Table B1a**) and Medicaid and MOUD (**Table B1b**) outcomes from equations 2, 3, and 4 are shown below. As noted previously, equations 2 and 3 are appropriate when parallel trends can be assumed and equation 4 was used when the parallel trends assumption is rejected. The table demonstrates that the results are sensitive to the model specification, particularly in California and Maryland (for the Medicaid and MOUD outcome). This coincides with the magnitude of the logit coefficient for differences in trend in **Table A4**.

Table B1a. Section 1115 SUD demonstration effects by year: SUD facilities' acceptance of Medicaid

Year	Parallel Trends Assumed		Parallel Trends Rejected	
	Marginal Effect	90% CI	Marginal Effect	90% CI
CA (N=26,828)				
2017	**0.104‡**	**0.076–0.132‡**	0.121	0.072–0.170
2018	**0.115‡**	**0.079–0.151‡**	0.144	0.057–0.231
2019	**0.031‡**	**-0.033–0.095‡**	0.074	-0.039–0.187
2020	**0.046‡**	**-0.010–0.102‡**	0.101	-0.056–0.258
Overall	**0.071‡**	**0.030–0.112‡**	0.110	0.012–0.208
MD (N=26,354)				
2017	**0.012‡**	**-0.006–0.030‡**	0.008	-0.020–0.036
2018	**-0.020‡**	**-0.045–0.005‡**	-0.025	-0.069–0.019
2019	**0.021‡**	**-0.009–0.051‡**	0.015	-0.039–0.069
2020	**-0.003‡**	**-0.031–0.025‡**	-0.010	-0.061–0.041
Overall	**0.002‡**	**-0.019–0.023‡**	-0.003	-0.046–0.040
MA (N=26,383)				
2018	0.050	0.029–0.071	**0.021‡**	**0.001–0.041‡**
2019	0.069	0.051–0.087	**0.027‡**	**-0.001–0.055‡**
2020	0.041	0.015–0.067	**-0.011‡**	**-0.049–0.027‡**
Overall	0.053	0.035–0.071	**0.012‡**	**-0.014–0.038‡**
VA (N=25,487)				
2017	0.023	0.002–0.044	**0.061‡**	**0.010–0.112‡**
2018	0.137	0.111–0.163	**0.202‡**	**0.117–0.287‡**
2019	0.128	0.092–0.164	**0.215‡**	**0.095–0.335‡**
2020	0.113	0.079–0.147	**0.222‡**	**0.076–0.368‡**
Overall	0.101	0.076–0.126	**0.175‡**	**0.077–0.273‡**
WV (N=24,888)				
2018	0.043	0.025–0.061	**0.057‡**	**0.031–0.083‡**
2019	0.038	0.028–0.048	**0.055‡**	**0.030–0.080‡**
2020	0.020	0.009–0.031	**0.036‡**	**0.010–0.062‡**
Overall	0.033	0.023–0.043	**0.049‡**	**0.026–0.072‡**

Primary results shown in **bold** text with dagger symbol (**‡**).

CI=confidence interval; SUD=substance use disorder.

Methods: A logistic regression model was used to obtain estimates for all outcomes. All models adjusted for facility-level variables (levels of care offered, ownership, accreditation, and whether a facility was an opioid treatment program), and county-level variables (population demographics (sex and race), metropolitan indicator and percentage of adult population covered by Medicaid). Facilities in the comparison states were balanced with facilities in the demonstration state using entropy balancing.

How to interpret the findings: A negative value for the regression-adjusted D-in-D estimate corresponds to a greater decrease or a smaller increase in an outcome after implementation of the section 1115 SUD demonstration in the demonstration state relative to the comparison group. A positive value corresponds to a greater increase or a smaller decrease in an outcome in the demonstration than in the comparison group.

SOURCE: National Survey of Substance Abuse Treatment Services.

Table B1b. Section 1115 SUD demonstration effects by year: SUD facilities' acceptance of Medicaid/provision of MOUD

Year	Parallel Trends Assumed		Parallel Trends Rejected	
	Marginal Effect	90% CI	Marginal Effect	90% CI
CA (N=26,828)				
2017	-0.022	-0.040–-0.004	**0.041‡**	**-0.010–0.092‡**
2018	-0.044	-0.087–-0.001	**0.059‡**	**-0.028–0.146‡**
2019	-0.083	-0.103–-0.063	**0.058‡**	**-0.035–0.151‡**
2020	-0.135	-0.206–-0.064	**0.077‡**	**-0.028–0.182‡**
Overall	-0.075	-0.095–-0.055	**0.059‡**	**-0.023–0.141‡**
MD (N=26,354)				
2017	-0.193	-0.280–-0.106	**-0.063‡**	**-0.143–0.017‡**
2018	-0.188	-0.242–-0.134	**0.02‡**	**-0.105–0.145‡**
2019	-0.174	-0.218–-0.130	**0.099‡**	**-0.095–0.293‡**
2020	-0.247	-0.339–-0.155	**0.060‡**	**-0.179–0.299‡**
Overall	-0.204	-0.273–-0.135	**0.029‡**	**-0.122–0.180‡**
MA (N=26,383)				
2018	0.006	-0.037– 0.049	**0.026‡**	**-0.017–0.069‡**
2019	-0.064	-0.102–-0.026	**-0.034‡**	**-0.078–0.010‡**
2020	-0.068	-0.117–-0.019	**-0.029‡**	**-0.106–0.048‡**
Overall	-0.044	-0.080–-0.008	**-0.012‡**	**-0.061–0.037‡**
VA (N=25,487)				
2017	**-0.011‡**	**-0.062– 0.040‡**	-0.022	-0.112–0.068
2018	**0.116‡**	**0.077– 0.155‡**	0.097	-0.033–0.227
2019	**0.104‡**	**0.066– 0.142‡**	0.075	-0.128–0.278
2020	**0.115‡**	**0.076– 0.154‡**	0.077	-0.195–0.349
Overall	**0.082‡**	**0.048– 0.116‡**	0.057	-0.114–0.228
WV (N=24,888)				
2018	**-0.014‡**	**-0.070– 0.042‡**	-0.045	-0.153–0.063
2019	**0.016‡**	**-0.036– 0.068‡**	-0.023	-0.138–0.092
2020	**-0.070‡**	**-0.144– 0.004‡**	-0.111	-0.227–0.005
Overall	**-0.024‡**	**-0.083– 0.035‡**	-0.060	-0.173–0.053

Primary results shown in **bold** text with dagger symbol (**‡**).

CI=confidence interval; SUD=substance use disorder; MOUD=medication for opioid use disorder.

Methods: A logistic regression model was used to obtain estimates for all outcomes. All models adjusted for facility-level variables (levels of care offered, ownership, and accreditation), and county-level variables (population demographics (sex and race), metropolitan indicator, percentage of adult population covered by Medicaid, and the rate of opioid overdose deaths per 100,000 residents). Facilities in the comparison states were balanced with facilities in the demonstration state using entropy balancing.

How to interpret the findings: A negative value for the regression-adjusted D-in-D estimate corresponds to a greater decrease or a smaller increase in an outcome after implementation of the section 1115 SUD demonstration in the demonstration state relative to the comparison group. A positive value corresponds to a greater increase or a smaller decrease in an outcome in the demonstration than in the comparison group.

SOURCE: National Survey of Substance Abuse Treatment Services.

The most dramatic differences between the results with and without the parallel trends assumption are in California and Maryland for the Medicaid/MOUD outcome. This directly corresponds to the magnitude of the baseline trend test coefficient shown in **Table A4**. The larger the estimated difference in trends, the larger the impact of the shift from assuming parallel trends to assuming that observed baseline trends would prevail.

For example, if we assume parallel trends in Maryland for the Medicaid and MOUD outcome, we estimate a negative and significant effect of the demonstration on the outcome. However, Maryland experienced a slower increase in the proportion of SUD treatment facilities that accepted Medicaid and offered MOUD over the baseline period (2015–2017) than did facilities in comparison states (**Figure A2b**). When we take that difference in trends into account, the estimated effect for Maryland is no longer statistically significant.

It must be noted that the assumption underlying equation 4 (used to estimate the effect in the absence of parallel trends) is as stringent as the assumption of parallel trends itself. The assumption is that the difference in trends in the baseline period precisely represents what the difference in trends would be in the demonstration period without the demonstration (or in other words, the difference in trends in the baseline period defines the counterfactual trend). As with the parallel trends assumption (which assumes the zero difference in trends without the demonstration), equation 4 also requires us to make a precise assumption about counterfactual trends. One approach is not more conservative than the other; any deviation from that assumption (whether parallel trends are assumed or not) biases the effect estimate.

We used equation 5 (**Appendix A**) to examine the difference in demonstration effect among residential versus non-residential facilities (**Table B2)**.Triple differences models revealed no significant differences in the effect of the demonstration on either outcome in California or Virginia. In Maryland, the effect of the demonstration on Medicaid acceptance was larger for residential facilities than non-residential facilities. On the other hand, although the D-in-D estimates for the Medicaid acceptance and MOUD provision outcome was significantly negative for both residential and non-residential facilities (consistent with results from **Table B1b** assuming parallel trends), the effect was significantly more negative for residential facilities. While our D-in-D model found no overall effect of the demonstration on increasing Medicaid acceptance in Massachusetts, triple difference analysis identified a significant increase among residential facilities, compared with non-residential facilities. There was no significant effect of the demonstration for either residential or non-residential facilities in terms of the Medicaid acceptance/MOUD provision outcome in Massachusetts. Finally, in West Virginia we found no significant difference in the effect of the demonstration on the Medicaid acceptance outcome; however, results suggest that a significant positive effect of the demonstration on Medicaid acceptance and MOUD provision among residential facilities was offset by slower growth in this outcome relative to the comparison group among non-residential facilities. Stratified estimates obtained using the triple difference models may not align with estimates from DID models due to differing parallel trends assumptions (see **Tables B1a** and **B1b** for DID model parallel trends assessments).

We also used triple difference models (equation 5) to examine differences in effects of the demonstration among facilities in metropolitan counties and those in non-metropolitan counties in Virginia and West Virginia (**Table B3**). The other early implementing states—California, Maryland, and Massachusetts—were excluded due to the lack (CA) or an insufficient number (MD and MA) of non-metropolitan facilities to support estimation of the triple differences model. In Virginia, the demonstration significantly increased both outcomes in both metropolitan and non-metropolitan areas, but the effect on the Medicaid acceptance outcome was larger in non-metropolitan areas, and the effect on the Medicaid acceptance/MOUD provision outcome was larger in metropolitan areas. In West Virginia, the overall effect on Medicaid acceptance (**Table 8**) was driven by increases among facilities in metropolitan counties. The finding of a negative effect for non-metropolitan counties should be interpreted with caution because nearly all (96%) facilities in non-metropolitan counties in West Virginia already accepted Medicaid, thus the potential effect of the demonstration on this measure was severely limited. The demonstration had no effect on the Medicaid acceptance/MOUD provision outcome in either metropolitan or non-metropolitan areas.

Table B2: Differences in effect of section 1115 SUD demonstration for residential and non-residential facilities

Outcome	Baseline		Demonstration		Regression-Adjusted D-in-D (90% CI)	Relative Difference	Regression-Adjusted Triple Difference Estimate
	Demonstration State Facilities	Comparison State Facilities	Demonstration State Facilities	Comparison State Facilities			
California (N=26,828)							
Proportion of SUD treatment facilities accepting Medicaid							
Residential	0.13	0.68	0.32	0.73	0.14 (0.07 to 0.21)	108.0%	0.05 (-0.03 to 0.14)
Non-residential	0.43	0.78	0.59	0.86	0.09 (0.05 to 0.13)	20.1%	
Proportion of SUD treatment facilities accepting Medicaid and offering MOUD on-site							
Residential	0.07	0.28	0.09	0.31	-0.01 (-0.08 to 0.06)	-15.3%	0.08 (-0.01 to 0.17)
Non-residential	0.30	0.40	0.32	0.52	-0.09 (-0.14 to -0.04)	-30.5%	
Maryland (N=26,354)							
Proportion of SUD treatment facilities accepting Medicaid							
Residential	0.68	0.51	0.81	0.57	0.07 (0.02 to 0.13)	11.1%	0.08 (0.01 to 0.15)
Non-residential	0.82	0.64	0.87	0.70	-0.01 (-0.05 to 0.04)	-0.9%	
Proportion of SUD treatment facilities accepting Medicaid and offering MOUD on-site							
Residential	0.61	0.45	0.43	0.58	-0.30 (-0.45 to -0.16)	-50.2%	-0.11 (-0.18 to -0.05)
Non-residential	0.66	0.48	0.63	0.65	-0.19 (-0.30 to -0.08)	-29.0%	
Massachusetts (N=26,383)							
Proportion of SUD treatment facilities accepting Medicaid							
Residential	0.39	0.62	0.71	0.70	0.24 (0.19 to 0.29)	61.8%	0.30 (0.22 to 0.37)
Non-residential	0.95	0.80	0.94	0.85	-0.06 (-0.09 to -0.02)	-5.9%	
Proportion of SUD treatment facilities accepting Medicaid and offering MOUD on-site							
Residential	0.26	0.39	0.29	0.44	-0.02 (-0.08 to 0.05)	-7.6%	0.01 (-0.09 to 0.11)
Non-residential	0.58	0.49	0.66	0.61	-0.03 (-0.13 to 0.06)	-5.5%	

Outcome	Baseline		Demonstration		Regression-Adjusted D-in-D (90% CI)	Relative Difference	Regression-Adjusted Triple Difference Estimate
	Demonstration State Facilities	Comparison State Facilities	Demonstration State Facilities	Comparison State Facilities			
Virginia (N=25,487)							
Proportion of SUD treatment facilities accepting Medicaid							
Residential	0.42	0.45	0.56	0.53	0.06 (0.00 to 0.11)	13.8%	-0.06 (-0.12 to 0.01)
Non-residential	0.65	0.65	0.81	0.70	0.11 (0.09 to 0.14)	17.5%	
Proportion of SUD treatment facilities accepting Medicaid and offering MOUD on-site							
Residential	0.26	0.24	0.42	0.30	0.11 (0.07 to 0.16)	44.5%	0.00 (-0.06 to 0.05)
Non-residential	0.26	0.22	0.49	0.33	0.12 (0.08 to 0.15)	44.1%	
West Virginia (N=24,888)							
Proportion of SUD treatment facilities accepting Medicaid							
Residential	0.92	0.66	0.90	0.68	-0.04 (-0.08 to 0.00)	-4.3%	-0.06 (-0.12 to 0.01)
Non-residential	0.93	0.80	1.00	0.85	0.02 (-0.03 to 0.07)	2.0%	
Proportion of SUD treatment facilities accepting Medicaid and offering MOUD on-site							
Residential	0.29	0.33	0.60	0.37	0.26 (0.21 to 0.31)	88.7%	0.35 (0.28 to 0.42)
Non-residential	0.58	0.31	0.71	0.52	-0.09 (-0.14 to -0.03)	-15.3%	

CI=confidence interval; SUD=substance use disorder; MOUD=medication for opioid use disorder.

Methods: A logistic regression model was used to obtain average predictions, D-in-D and triple difference estimates for all outcomes. All models adjusted for facility-level variables (levels of care offered, ownership, and accreditation), and county-level variables (population demographics (sex and race), metropolitan indicator and percentage of adult population covered by Medicaid). The Medicaid model also adjusted for whether a facility was an opioid treatment program and the MOUD model adjusted for the rate of opioid overdose deaths per 100,000 residents. Facilities in the comparison states were balanced with facilities in the demonstration state using entropy balancing.

How to interpret the findings: The first four data columns are baseline and demonstration average predictions from the logistic regression model. A negative value for the regression-adjusted D-in-D estimate corresponds to a greater decrease or a smaller increase in an outcome after implementation of the section 1115 SUD demonstration in residential or non-residential facilities in the demonstration state relative to the comparison group. A positive value corresponds to a greater increase or a smaller decrease in an outcome in the demonstration than in the comparison group. The relative difference is the D-in-D estimate as a percentage of the demonstration state's baseline period prediction. The rightmost column (triple difference estimate) represents the difference in demonstration effect in residential and non-residential facilities. A positive coefficient implies an increase in the outcome in residential facilities relative to non-residential facilities, and a negative coefficient implies an increase in the outcome in non-residential facilities relative to residential facilities.

SOURCE: National Survey of Substance Abuse Treatment Services.

Table B3: Differences in effect of section 1115 SUD demonstration by metropolitan status

Outcome	Baseline		Demonstration		Regression-Adjusted D-in-D (90% CI)	Relative Difference	Regression-Adjusted Triple Difference Estimate
	Demonstration State Facilities	Comparison State Facilities	Demonstration State Facilities	Comparison State Facilities			
Virginia (N=25,487)							
Proportion of SUD treatment facilities accepting Medicaid							
Metropolitan	0.61	0.62	0.76	0.67	0.11 (0.08 to 0.13)	17.8%	-0.05 (-0.09 to -0.01)
Non-metropolitan	0.64	0.57	0.89	0.66	0.16 (0.13 to 0.19)	25.2%	
Proportion of SUD treatment facilities accepting Medicaid and offering MOUD on-site							
Metropolitan	0.27	0.24	0.49	0.34	0.12 (0.10 to 0.15)	46.4%	0.04 (0.01 to 0.07)
Non-metropolitan	0.22	0.17	0.40	0.26	0.09 (0.06 to 0.12)	39.0%	
West Virginia (N=24,888)							
Proportion of SUD treatment facilities accepting Medicaid							
Metropolitan	0.91	0.81	0.97	0.82	0.05 (0.03 to 0.07)	5.7%	0.16 (0.09 to 0.23)
Non-metropolitan	0.98	0.71	1.00	0.84	-0.11 (-0.18 to -0.03)	-10.9%	
Proportion of SUD treatment facilities accepting Medicaid and offering MOUD on-site							
Metropolitan	0.52	0.39	0.67	0.56	-0.01 (-0.08 to 0.06)	-2.4%	0.01 (-0.11 to 0.13)
Non-metropolitan	0.53	0.24	0.71	0.45	-0.02 (-0.12 to 0.07)	-4.4%	

CI=confidence interval; SUD=substance use disorder; MOUD=medication for opioid use disorder.

Methods: A logistic regression model was used to obtain average predictions, D-in-D and triple difference estimates for all outcomes. All models adjusted for facility-level variables (levels of care offered, ownership, and accreditation), and county-level variables (population demographics (sex and race), metropolitan indicator and percentage of adult population covered by Medicaid). The Medicaid model also adjusted for whether a facility was an opioid treatment program and the MOUD model adjusted for the rate of opioid overdose deaths per 100,000 residents. Facilities in the comparison states were balanced with facilities in the demonstration state using entropy balancing.

How to interpret the findings: The first four data columns are baseline and demonstration average predictions from the logistic regression model. A negative value for the regression-adjusted D-in-D estimate corresponds to a greater decrease or a smaller increase in an outcome after implementation of the section 1115 SUD demonstration in metropolitan or non-metropolitan facilities in the demonstration state relative to the comparison group. A positive value corresponds to a greater increase or a smaller decrease in an outcome in the demonstration than in the comparison group. The relative difference is the D-in-D estimate as a percentage of the demonstration state's baseline period average prediction. The rightmost column (triple difference estimate) represents the difference in demonstration effect in metropolitan and non-metropolitan areas. A positive coefficient implies an increase in the outcome in metropolitan counties relative to non-metropolitan counties, and a negative coefficient implies an increase in the outcome in non-metropolitan counties relative to metropolitan counties.

SOURCE: National Survey of Substance Abuse Treatment Services.