



Medicaid Section 1115 Substance Use Disorder (SUD) Demonstrations: Impacts on SUD Service Access in 17 Demonstration States

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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 disorder (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 early findings and insights about section 1115 SUD demonstrations. This report presents initial estimates of the impact of section 1115 SUD demonstrations on SUD-related service utilization among Medicaid beneficiaries with a diagnosis of SUD, using Transformed Medicaid Statistical Information System (T-MSIS) Analytic Files (TAF). Analyses focused on beneficiaries in 17 states that had implemented a demonstration before June 2019: Alaska, Illinois, Indiana, Kentucky, Louisiana, Massachusetts, Michigan, North Carolina, New Hampshire, New Jersey, New Mexico, Pennsylvania, Utah, Vermont, Virginia, Washington, and West Virginia.

The results presented in this report address two main questions related to the demonstration's goal of increasing access to treatment for SUD:

1. How did the number and percentage of Medicaid beneficiaries who received any SUD treatment service change over the study period?
2. Has the demonstration had an impact on the use of four categories of SUD-related services among beneficiaries receiving treatment for SUD?
 - a. Institutional (residential and inpatient)
 - b. Outpatient (including intensive outpatient/partial hospitalization and telehealth)
 - c. Withdrawal management (WM)
 - d. MAT

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. Accessed July 11, 2022. <https://www.samhsa.gov/data/sites/default/files/reports/rpt29393/2019NSDUHFFR1PDFWHTML/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.medicare.gov/federal-policy-guidance/downloads/smd15003.pdf>

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

⁸ CMS, SAMHSA, National Institutes of Health. (2014). *Medication-assisted treatment for substance use disorders*. <https://www.medicare.gov/federal-policy-guidance/downloads/cib-07-11-2014.pdf>

This preliminary examination was conducted as part of a meta-evaluation of the section 1115 SUD demonstrations and was used to test methods for subsequent analyses that will use TAF data and include additional demonstration states and additional years of data. In addition to providing methodological insights for the final meta-evaluation, findings in this report offer an early look at demonstration effects on Medicaid beneficiaries' SUD-related service utilization in each of the 17 states. These early analyses also demonstrate the feasibility of using TAF as a primary data source for the meta-evaluation impact analyses and identify data limitations that will inform its methodology.

About Section 1115 SUD Demonstrations

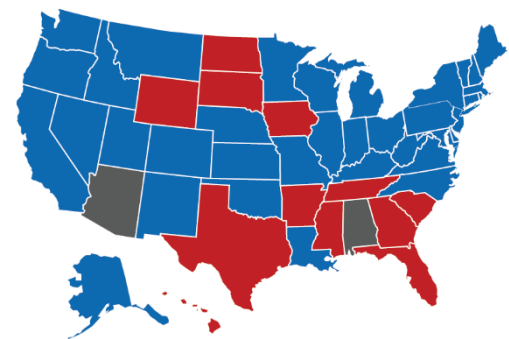
The goals of section 1115 SUD demonstrations include increasing access to SUD treatment and raising rates of identification, initiation, and engagement in treatment; increasing treatment adherence and retention; reducing overdose mortality; decreasing preventable or inappropriate emergency department 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 (**Exhibit 1**).

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:

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.

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



Section 1115 SUD Demonstration
■ Approved ■ Pending ■ None

Overview of Findings

Findings in this report are based on RTI's analysis of TAF Research Identifiable File (RIF) data from 2016-2020. It includes 17 states that implemented Medicaid section 1115 SUD demonstrations prior to June 2019.

Descriptive analyses of unadjusted trends in SUD-related service use among Medicaid beneficiaries indicate that:

- In every state, the number of beneficiaries treated for SUD increased prior to the start of their demonstrations and during the demonstration period until the start of the COVID-19 pandemic, both in total and as a percentage of all Medicaid beneficiaries.
- The number of SUD-related service users fell after the start of the COVID-19 pandemic in 7 of the 17 demonstration states.
- The number of Medicaid beneficiaries receiving treatment for SUD in outpatient settings increased in every demonstration state between 2016 and 2020, and the total number of beneficiaries receiving medication-assisted treatment (MAT) increased in all but one state.
- The number beneficiaries receiving withdrawal management (WM) or treatment for SUD in institutional settings decreased in a third of the states between 2016 and 2020.

We conducted multivariate analysis using difference-in-differences (DID) methodology and out-of-state comparison groups to assess demonstration impacts on the use of outpatient services, institutional services, MAT, and WM among Medicaid beneficiaries treated for SUD. Results include:

- In more than half of the demonstration states, use of outpatient services decreased relative to their comparison groups (results were statistically significant for 7 of these demonstration states). These services include low-intensity outpatient services as well as intensive outpatient services and partial hospitalization programs. Most states did not add or expand outpatient service levels under the demonstration. The total number of beneficiaries using outpatient services increased in every state over the study period. Therefore, a relative decrease may reflect a smaller increase in service use in the demonstration state than in the comparison group.
- There is evidence from some states that relative decreases in outpatient service use may reflect substitution of residential care. The relative decline in outpatient service use may also be due to (1) limited non-outpatient services in non-demonstration states, which may be associated with higher outpatient use rates in our comparison groups because beneficiaries had fewer options, and (2) high levels of outpatient use achieved in demonstration states just prior to the demonstration or after implementation, which limited opportunity for continued growth.
- Over half of the demonstration states showed relative increases in use of institutional services, including care in residential and inpatient settings, and in use of MAT (these impacts were statistically significant in 6 states for institutional services and in 5 states for MAT). Most states added coverage for services in IMDs; offered new or expanded residential levels of care; added or strengthened requirements to make MAT available to individuals in residential settings (a demonstration requirement); or added methadone as a covered MAT option.
- There is little consistency in the direction or magnitude of estimated impacts from the demonstrations on the use of WM services. Although most states added or expanded WM services, use may not always be captured in claims or managed care encounters because it is often part of a broader package of services in residential or inpatient settings and there may not be an incentive to code it (e.g., higher reimbursement).

The variation in results across states could be due to an assortment of factors including methodological considerations (e.g., varying lengths of baseline and demonstration periods included in the analysis); the extent to which states had to adopt systematic changes to meet demonstration requirements; varying timelines for implementing demonstration requirements; and differing state contexts for demonstration implementation, related to, for example, coverage of services prior to the demonstration, provider supply, the COVID-19 pandemic, and other reforms that may impact billing and reimbursement for SUD services. The meta-evaluation will explore the influence of factors such as these on demonstration impacts.

Approach

This report summarizes initial findings from analyses of the use of SUD treatment services by Medicaid beneficiaries between January 2016 and December 2020. We include information for 17 of the 19 states that implemented section 1115 SUD demonstrations prior to June 1, 2019. We excluded California and Rhode Island because of substantial missing and/or invalid data before and after the start of their demonstrations, preventing reliable measurement of service use and demonstration impacts. For all states, we conducted descriptive analyses to assess trends in use of SUD treatment services. We also used difference-in-differences (DID) modeling to compare changes in use of SUD treatment in demonstration states before and after demonstration implementation with changes over the same period in comparison groups of similar beneficiaries from non-demonstration states. Vermont is excluded from modeling because we lacked an adequate comparison group for this state and its population.

Data Sources

The analysis used Medicaid claims in RIFs in the Chronic Conditions Warehouse (CCW). Our study population included Medicaid beneficiaries who were enrolled for any length of time during the analysis period, 12 to 64 years of age, eligible for full benefits, and not dually enrolled in Medicare.

To support interpretation of results, we draw 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 are 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.

Sample

The sample for our analyses included beneficiaries aged 12 to 64 years receiving at least one SUD treatment service. These included beneficiaries who had at least one claim for a SUD-related inpatient stay, emergency department visit, residential treatment, intensive outpatient care, partial hospitalization, outpatient service, MAT (either provider-administered medication or a prescription dispensed by a pharmacy), or WM. We used a combination of definitions for beneficiaries with SUD and users of any SUD-related treatment service provided to states in guidance for reporting demonstration monitoring metrics using Medicaid claims data.⁹ This approach ensured that no beneficiary receiving treatment for SUD would be overlooked because of small differences in those definitions. We tracked changes in the number of beneficiaries treated for SUD both in total and as a share of all Medicaid beneficiaries.

Comparison Groups

We created a separate comparison group of beneficiaries for each demonstration state. Comparison group selection was stratified by state Medicaid expansion status and applied propensity score weighting to improve the balance between each demonstration state and its comparison. Most section 1115 SUD demonstration states have expanded Medicaid eligibility as authorized under the Affordable Care Act. For these states, the comparison group consisted of beneficiaries from expansion states that did not have an approved demonstration: Arizona, Connecticut, Hawaii, Iowa, Montana, Nevada, and New York. One demonstration state, North Carolina, has not expanded Medicaid. Its comparison group consisted of beneficiaries from Georgia, Missouri, South Carolina, South Dakota, Texas, and Wyoming—all non-expansion, non-demonstration states. Three demonstration states—Louisiana, Utah, and Virginia—expanded Medicaid during the study period. For Louisiana, which expanded in 2016 and started the demonstration in 2018, we excluded data before Medicaid expansion and used a comparison group from the set of expansion states without an approved SUD demonstration. For Utah and Virginia, which expanded Medicaid after they implemented their demonstrations, we used a comparison group from all the expansion and non-expansion comparison states without an approved SUD demonstration.

We used a unique set of propensity score-based weights for the comparison group of each demonstration state to assign greater weight to comparison group beneficiaries who were more like the beneficiaries in a demonstration state than those who were less similar based on individual and county-level characteristics.¹⁰ As such, the weights help to alleviate differences between each demonstration state and its pooled comparison group, providing the best possible counterfactual given available comparators. The final weights used in DID models also re-scaled the comparison group to align with the number of beneficiaries treated for SUD in the demonstration state.

Outcome Measures

To assess the impacts of section 1115 SUD demonstrations on access to SUD treatment services, we constructed four outcome measures based on the monitoring metric guidance issued to demonstration states.⁹ Among beneficiaries treated for a SUD (our sample), we calculated the number and proportion of beneficiaries who received:

- Residential and Inpatient Services (Metric #10)
- Intensive Outpatient and Partial Hospitalization Services or Outpatient Services (Metrics #8, #9)
- WM Service (Metric #11)
- MAT (Metric #12).

All outcomes were binary measures (yes/no) indicating any use of the service during a calendar quarter (3-month). We employed logistic regression to obtain DID estimates of the impact of each demonstration on these services, relative to a comparison group. All models adjusted for the same person-level and county-level factors used in the propensity score models. Because the COVID-19 public health emergency affected counties and states in different ways and at different times, the models also used a 3-month rolling average of the NIH COVID-19 Pandemic Vulnerability Index,¹¹ measured at the county level, for each calendar quarter in 2020 to mitigate potential confounding of results due to changes in beneficiary and provider behavior unrelated to the demonstrations.

⁹ Mathematica. (2021). Medicaid Section 1115 Substance Use Disorder Demonstrations: Technical specifications for monitoring metrics, version 4.0.

¹⁰ Person-level characteristics used to align the groups include age, biological sex, race, Chronic Illness and Disability Payment System (CDPS) score (a measure of health status), and indicators for eligibility due to Medicaid expansion and enrollment in a managed care plan. County-level characteristics included Rural-Urban Continuum Code, percent of the population that is non-Hispanic White, unemployment rate, number of physicians, and supply of short-term acute care hospital beds.

¹¹ National Institutes of Health, National Institute of Environmental Health Sciences. (2021). *COVID-19 Pandemic Vulnerability Index quick start guide*. <https://www.niehs.nih.gov/research/programs/coronavirus/covid19pvi/index.cfm>

Analysis Period

Available data for all states covered the period from January 1, 2016, through December 31, 2020, a total of 20 calendar quarters.¹² The number of baseline (pre-demonstration) quarters and quarters in the demonstration period for each state depended on its implementation plan approval date.¹³ For each state, we assigned the start of the demonstration period to the first day of the calendar quarter during which the state's implementation plan was approved unless it was approved during the last month of the quarter, in which case we assigned the start of the demonstration period to the first day of the subsequent quarter. All states had at least five quarters of baseline data and at least seven quarters of demonstration data.

Appendix A provides further detail on our methods including data sources, sample selection, propensity scores and analytic weights, outcome measures, analysis periods by state, and statistical analysis. It also includes discussion of methodological limitations.

Appendix B contains trend graphs for all outcomes in each demonstration state and its comparison group, quarter-specific impact estimates from DID models, and results of sensitivity analyses to assess if DID model results differ depending on whether baseline trends are assumed to be parallel or nonparallel.

Results

Number and Percentage of Beneficiaries Treated for SUD

Over the 20-quarter study period from the beginning of 2016 through the end of 2020, the number of beneficiaries treated for SUD increased in all study states, though the rate of growth varied widely across states (**Exhibit 2**). In six states the number of beneficiaries treated for SUD more than doubled over the 5-year period. The number of individuals using services in the institutional, outpatient, and MAT categories also increased substantially. No states had a decrease in the number of outpatient service users; four states showed a decrease in the number of individuals using any institutional service; and only one state had a decrease in the number of persons receiving MAT.¹⁴

Exhibit 3 separates the changes in the number of beneficiaries treated for SUD in each state during three periods: (1) prior to the demonstration, (2) demonstration start through the first quarter of 2020, and (3) during the COVID-19 pandemic starting in the second quarter of 2020 through the end of 2020. A positive percent change indicates an increase in the number of beneficiaries treated for SUD during a period and a negative percent indicates a decrease. Direct comparison of baseline growth rates (red lines in **Exhibit 3**) or pre-pandemic demonstration growth rates (dark blue lines) across states is not advised because each state started its demonstration at a different time, so these changes occur over varying lengths.

The number of beneficiaries treated for SUD increased in every state both prior to the demonstration and until the onset of the COVID-19 pandemic. The extreme growth rates for Louisiana (baseline), Utah, and Virginia (both demonstration start until COVID) are mostly due to Medicaid eligibility expansions in those states, but numbers of beneficiaries treated for SUD continued to climb even after the initial surge of newly eligible individuals. Utah's baseline growth rate (103%) may be overstated because of an undercount of service users in the first quarter of 2016 attributable to missing data (see Limitations in **Appendix A**).

We provide separate trends in **Exhibit 3** for the period after the start of the pandemic (second quarter of 2020 through the end of 2020) because the number of beneficiaries treated for SUD changed dramatically in some states. In 7 of the 17 demonstration states, fewer people received treatment for SUD in the fourth quarter of 2020 than in the first quarter of 2020. In the remaining 10 states, the number of beneficiaries receiving treatment continued to grow after the start of the pandemic. **Appendix B** includes graphs for each demonstration state that show quarterly trends in the number of beneficiaries treated for SUD and the percentages using outpatient, institutional, MAT, and WM services. Across states and service categories, most states had reductions in service use in the second quarter of 2020 but the degree and speed of recovery from those initial declines varied widely.

¹² Because of concerns about missing or inaccurate data, the DID models for Washington excluded the first quarter of 2016, the models for Utah excluded the first and second quarters of 2016, and the models for West Virginia excluded the first and second quarters of 2018. We also excluded the first and second quarters of 2016 for Louisiana's DID models to limit analysis only to periods after the state's Medicaid eligibility expansion went into effect in July 2016.

¹³ For Massachusetts and Virginia, we used the effective date of the demonstration's special terms and conditions (STC) because states approved prior to the November 1, 2017, letter to State Medicaid Directors (SMD #17-003) were not required to submit implementation plans.

¹⁴ The DQ Atlas (<https://www.medicaid.gov/dq-atlas/welcome>) for TAF RIF rated the pharmacy claims volume in North Carolina as "moderate concern" in 2016 and "high concern" every other year, with just 40–60% of the national median volume per 10,000 enrolled months. The trends for MAT in North Carolina shown in Appendix B reflect these low volumes, raising doubt about the reliability of the measured decline.

Exhibit 2. Percent change in the number of beneficiaries treated for SUD and using services for SUD, Q1 2016 to Q4 2020 [A]

State	Treated for SUD	Using service categories among those treated for SUD			
		Outpatient	Institutional	MAT	WM
Alaska	48.2	40.1	-0.2	182.9	-40.0
Illinois	56.8	134.6	-17.9	166.9	-76.9
Indiana	143.1	146.5	194.5	484.7	340.2
Kentucky	98.1	161.9	228.8	181.6	399.6
Louisiana [B]	311.2	343.9	533.7	554.2	657.4
Massachusetts	17.7	21.3	42.9	34.7	-44.7
Michigan	19.9	25.5	-0.5	67.5	0.0
New Hampshire	159.2	264.3	406.7	206.7	1,007.7
New Jersey	109.9	84.4	176.9	182.5	203.2
New Mexico	27.1	18.6	72.7	75.3	43.1
North Carolina	33.3	47.9	-0.7	-1.6 [C]	-37.7
Pennsylvania	19.9	17.2	2.3	84.9	4.1
Utah [B]	626.9	1,138.6	852.9	760.1	1,211.8
Vermont	15.8	24.4	-37.9	40.4	-54.0
Virginia [B]	363.9	844.4	718.1	513.6	22,200.0
Washington	19.7	81.5	69.7	156.8	9.5
West Virginia	69.4	77.1	437.8	147.9	31.6

Notes:

(A) The percent changes in all columns reflect the difference between the number of beneficiaries in the fourth calendar quarter of 2020 and the number of beneficiaries in the first calendar quarter of 2016, divided by the number of beneficiaries in the first calendar quarter of 2016.

(B) The high growth in Louisiana, Utah, and Virginia is mostly due to Medicaid eligibility expansions in those states. Virginia added coverage for WM under the demonstration and it was almost never reported on claims in baseline years, so the extreme growth there is due to a very small denominator.

(C) The Data Quality (DQ) Atlas for TAF RIF (<https://www.medicaid.gov/dq-atlas/welcome>) rated the pharmacy claims volume in North Carolina as “moderate concern” in 2016 and “high concern” every other year, with just 40-60% of the national median volume per 10,000 enrolled months, raising doubt about the reliability of the measured decline.

Sample: Medicaid beneficiaries ages 12–64, eligible for full benefits, not dually enrolled in Medicare.

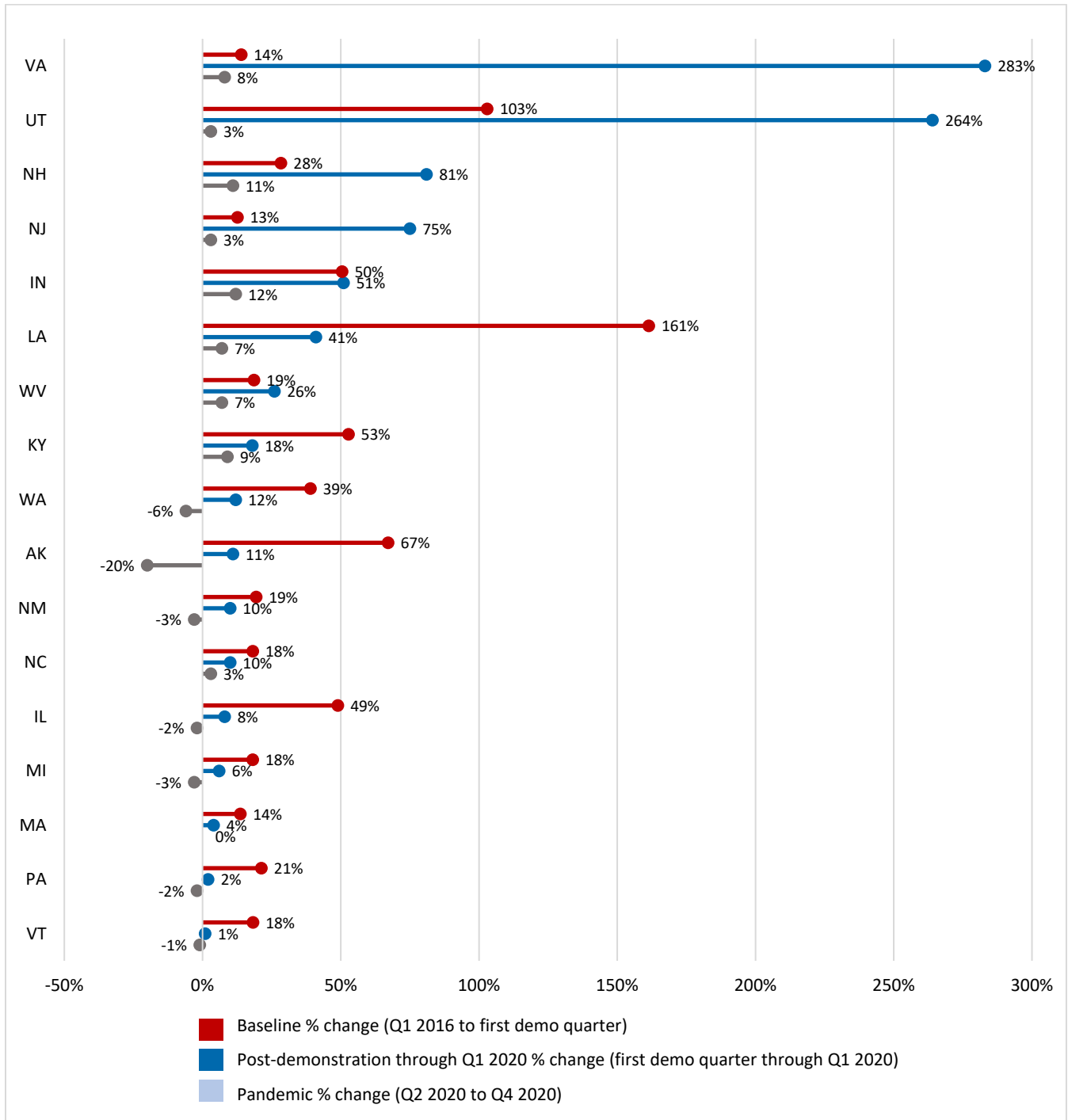
Source: RTI analysis of TAF RIF data for January 2016 through December 2020.

In addition to changes in the counts of beneficiaries, we also observed changes in the percentage of all Medicaid beneficiaries treated for SUD. These percentages provide a crude measure of whether access is expanding or contracting, relative to the population.

Appendix B provides quarterly trends for the number and percent of beneficiaries treated for SUD for each state. The share of beneficiaries treated for SUD increased in every demonstration state from baseline until the start of the pandemic. After demonstration start, 10 states¹⁵ either closed the gap between their rates and higher rates in the comparison group, surpassed the previously higher rate in the comparison group, or increased rates that were already higher than the comparison group. The remaining states mostly maintained their position relative to the comparison group: only Alaska clearly lost ground. Growth for demonstration states generally outpaced changes in their comparison groups.

¹⁵ Vermont is left out of this tabulation because it did not have a comparison group.

Exhibit 3. Changes in the number of beneficiaries treated for SUD by state, during pre-demonstration (baseline), the demonstration until Q1 2020, and the COVID-19 pandemic (Q2 2020 through Q4 2020)



Notes:
 The high growth rates in Louisiana (baseline), Utah (baseline and demonstration through Q1 2020), and Virginia (demonstration through Q1 2020) are mostly due to Medicaid eligibility expansions in those states.
Sample: Medicaid beneficiaries ages 12–64, eligible for full benefits, not dually enrolled in Medicare.
Source: RTI analysis of TAF RIF data for January 2016 through December 2020.

Demonstration Impacts on Use of SUD-related Services

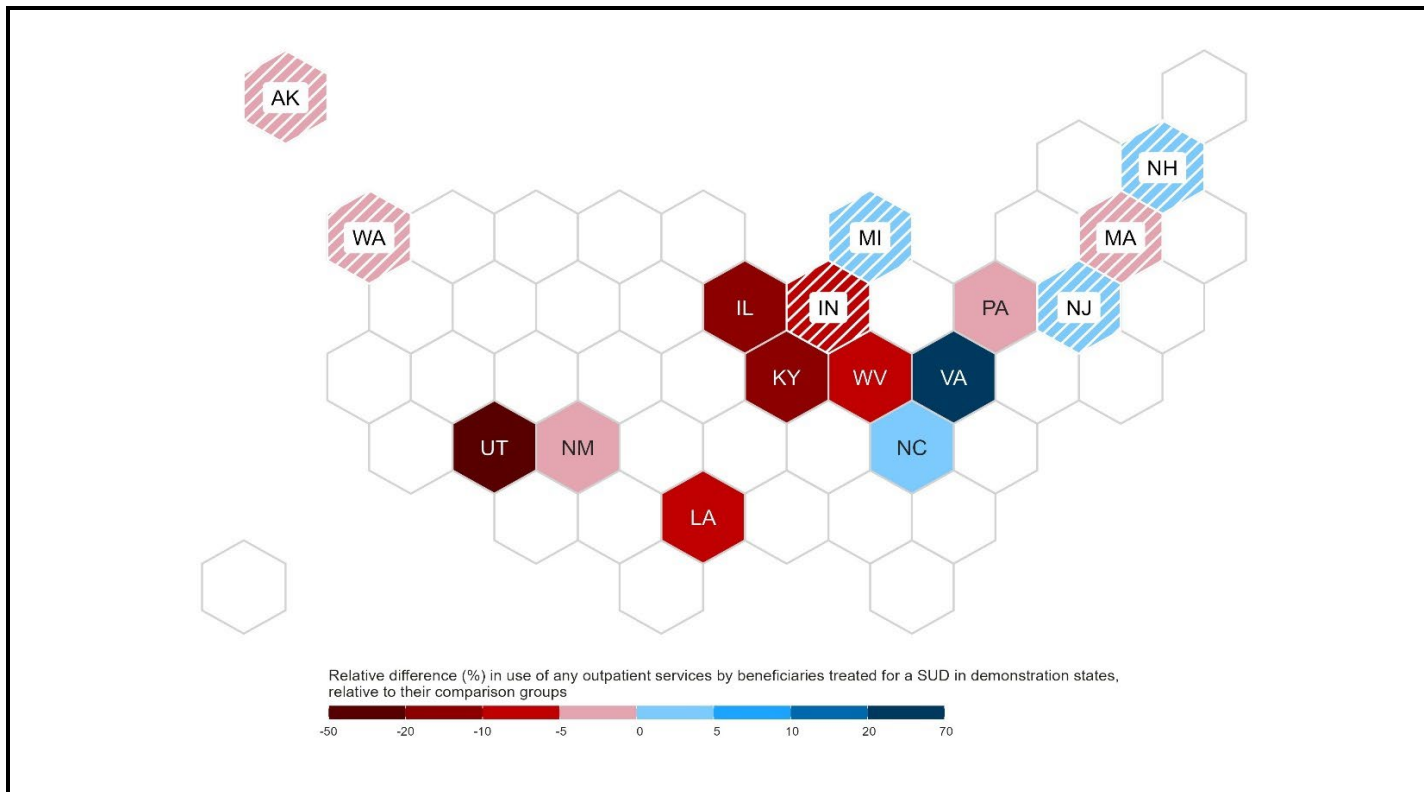
In this section, we present estimates of section 1115 SUD demonstration impacts on use of four categories of SUD treatment services among beneficiaries treated for SUD: institutional (residential and inpatient); outpatient (including intensive outpatient, partial hospitalization, and telehealth); WM; and MAT. Derived from DID models, the impact estimate is the relative difference between the

demonstration state and its comparison group in the change in service use from the baseline period to the demonstration period, expressed as a percentage of the demonstration state's baseline average. A negative value for the relative difference 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 its comparison group. A positive value corresponds to a greater increase or a smaller decrease in an outcome in the demonstration state than in the comparison group. The results in this section include just 16 states because Vermont did not have a suitable comparison group.

Exhibits 4 through 7 present the results for each service category. The table included in each exhibit provides the specific impact estimate for each state and the accompanying hexagonal map summarizes the statistical significance and magnitude of these estimates across states. In addition to impact estimates, the table summarizes changes in relevant policies or services adopted by each demonstration state under the demonstration.¹⁶ Specifically, we identify if any change was made and, if there was a change, whether it represented a new benefit or policy or an expansion to or update of an existing benefit or policy. For states that did not make a change in their policy/service, we indicate whether the state already had or did not have the policy/service. We provide this context to aid interpretation of the results. Generally, we hypothesized states with no or less change in relevant policies/services would be more likely to have no or smaller demonstration impacts and that states with more change in policies/services would be more likely to have larger demonstration impacts on SUD treatment use.

Outpatient Services. **Exhibit 4** shows changes in coverage of select outpatient services made by each demonstration state and estimates of demonstration impacts on use of outpatient services from DID models. Prior to the demonstration, all states covered low-intensity outpatient services for individuals with SUD, such as the American Society of Addiction Medicine (ASAM) Level 1.0 services described in Appendix A. They are provided by many types of professionals (e.g., physicians, psychologists, social workers, counselors) in a wide range of settings (e.g., offices, schools, clinics, treatment facilities). Under the demonstration, states are required to cover Level 2 intensive outpatient services but could also cover Level 2.1 intensive outpatient services and Level 2.5 partial hospitalization services. As shown in Exhibit 1, all states but one covered some form of intensive outpatient and/or partial hospitalization services prior to the demonstration, and a total of 7 states out of the 16 added or expanded coverage of intensive outpatient and partial hospitalization services under the demonstration. Examples of expansion through the demonstrations include covering these services for adults when they were previously only covered for children and allowing community health centers to bill for these services.

Exhibit 4. Demonstration impacts on outpatient services by state, with related changes in policies/services



Hexagon Map Notes: diagonal stripes on a state in the hexagonal map indicate that the relative difference between the state and its comparison group is not statistically significant ($p > .10$).

¹⁶ RTI International (2022). Medicaid Section 1115 Substance Use Disorder (SUD) Demonstrations: Features of state approaches to improve Medicaid SUD treatment delivery systems.

State (with # of demonstration quarters)	Changes in relevant policies or services for 1115 SUD demonstration states		Relative difference between the demonstration state and its comparison group from baseline to demonstration period (%)		
	Coverage of intensive outpatient services	Coverage of partial hospitalization services	Any SUD-related outpatient service		
			Relative difference	90% C.I. lower bound	90% C.I. upper bound
Alaska (7)	+	+	-2.4	-6.9	2.0
Illinois (10)	-	-	-18.89***	-30.0	-8.1
Indiana (12) [A]	↗	-	-5.0	-5.0	-12.1
Kentucky (9)	-	↗	-12.5***	-16.2	-8.8
Louisiana (12)	-	⊘	-6.8*	-13.5	-0.32
Massachusetts (14)	-	-	-1.7	-7.34	3.90
Michigan (7)	-	-	0.0	-2.37	2.42
North Carolina (7)	↗	↗	4.8***	2.38	7.27
New Hampshire (10)	-	-	0.4	-4.4	5.3
New Jersey (11)	↗	↗	0.5	-4.2	5.2
New Mexico (7)	↗	↗	-4.6**	-8.11	-1.1
Pennsylvania (10)	↗	↗	-3.0**	-5.6	-0.5
Utah (14) [B]	-	-	-42.0**	-66.2	-26.5
Virginia (15)	-	-	66.0***	Not estimated [C]	
Washington (10)	-	⊘	-2.1	-8.2	4.2
West Virginia (11) [D]	-	-	-7.2***	-10.2	-4.2



Adding policy/
coverage



Updating policy



Expanding
coverage



Already covered



Not covered

* P-value < .10

** P-value < .05

*** P-value < .01

Table Notes: C.I. = confidence interval

(A) In Indiana, the DQ Atlas judged completeness of other services (OT) managed care encounter volume to be “medium concern” in 2019–2020 due to low volume. These potential shortcomings could lead to underestimated outpatient SUD service use in 2019 and maybe 2020 and a negative bias in the DID results, because most SUD services are identified through OT records.

(B) In Utah, procedure codes were missing on roughly one-third of all records in the OT files for 2017–2020. It is very likely that we significantly underestimated the number of beneficiaries receiving outpatient services in those years. This could have introduced bias into our DID model if the degree of undercounting varied over time, but the direction or size of any bias is uncertain.

(C) The 90% confidence interval for Virginia was not estimated because the underlying p-value was so small that our calculation software set the p-value = 0. Many of Virginia’s OT facility claims in 2016 lack procedure codes due to an error in how the data were submitted to T-MSIS. We may have slightly underestimated outpatient or institutional service use for Virginia in 2016 because some services require a procedure code for identification, but any bias in DID models is likely quite small.

(D) The demonstration quarters for West Virginia exclude two quarters in 2019 because of high volumes of missing outpatient records. See limitations, Appendix B.

Methods: A logistic regression model was used to obtain estimates. Results are weighted by the fraction of time the beneficiary was enrolled in Medicaid (eligibility fraction) and the propensity score weight. Appendix A details the methods.

How to interpret the results: The relative difference is the DID estimate as a percentage of the demonstration state’s baseline period adjusted mean. A *negative* value for the relative difference 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 state than in the comparison group. The number of demonstration quarters varies by state (counts are in parentheses after the state name), so comparisons between states are not advised.

Sample: Medicaid beneficiaries ages 12–64, eligible for full benefits, not dually enrolled in Medicare.

Source: RTI analysis of TAF RIF data for January 2016 through December 2020.

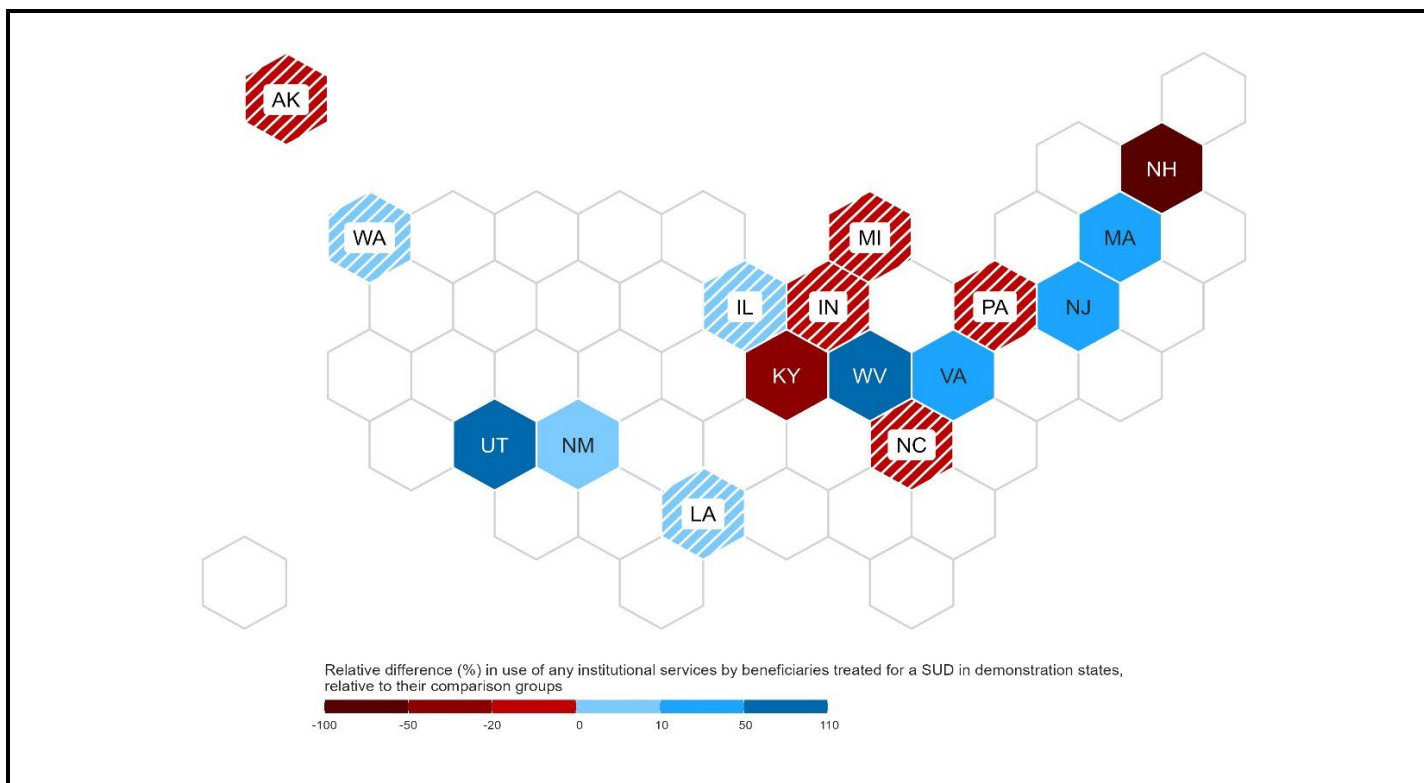
Relative to the comparison groups, 7 of 16 states experienced a statistically significant decrease in the percentage of Medicaid beneficiaries being treated for SUD who use SUD-related outpatient services after demonstration implementation and 2 states had a statistically significant increase. Among the seven states that added or expanded intensive outpatient or partial hospitalization services as part of the demonstration, North Carolina was the only state that had an increase in SUD-related outpatient service use relative to their comparison group after demonstration implementation (4.8% relative increase, $p < 0.01$, see **Exhibit 4**). Kentucky, New Mexico, and Pennsylvania had a relative decline in SUD-related outpatient service use (-12.1%, -4.6%, -3.0%, respectively), and the change over time in the other three states that expanded services (Alaska, Indiana, and New Jersey) did not differ from their comparison group.

Among the nine states that did not make changes to their coverage of outpatient services under the demonstration, four states (Illinois, Louisiana, Utah, and West Virginia) had a relative decline in the percentage of beneficiaries using SUD-related outpatient service compared to their comparison group (-18.9%, -6.8%, -42.0%, and -7.2%, respectively). The difference in Utah was due to a large increase in the comparison group (53% to 71%) and a relatively lower increase in Utah (34% to 38%). However, Utah has substantial rates of missing and invalid outpatient procedure codes in every year of the study period. Many outpatient services are identified by the combination of a procedure code and SUD-related diagnosis code, so we may have significantly undercounted actual levels of use. Virginia had a 66 percent increase in SUD-related outpatient service use relative to their comparison group. The percentage difference was large in Virginia because the state started at a much lower rate at baseline (33% of SUD users using outpatient services versus 69% in the comparison group), so Virginia had more potential for change (after demonstration, 57% of SUD users used outpatient services in Virginia versus 71% in the comparison group). The change in SUD-related outpatient service use in the other three states (Massachusetts, Michigan, and Washington) did not differ from their comparison group.

Appendix B includes tables of quarterly impact estimates on use of outpatient services in all 16 demonstration states, which may be of interest to readers wishing to delve deeper into whether and how impacts changed over time.

Institutional Services. **Exhibit 5** shows changes in coverage of residential SUD services made by each demonstration state and estimates of demonstration impacts on use of institutional services from DID models. Before the section 1115 demonstration, states could not use Medicaid funding to cover residential stays in IMDs. Some states still offered these services through the “in-lieu-of” provision or under state funding. The demonstration enabled all states to add Medicaid coverage for care provided in IMDs. The residential levels of care each state covered before the demonstration varied. Under the demonstration, states added new residential levels of care or expanded their existing ones to new populations (e.g., if a state covered residential care for youth before the demonstration, they may have added coverage for adults). All but one state included in the analysis (Washington) added or expanded residential services as part of the demonstration (residential services were already covered in Washington).

Exhibit 5. Demonstration impacts on institutional services by state, with related changes in policies/services



Hexagon Map Notes: diagonal stripes on a state in the hexagonal map indicate that the relative difference between the state and its comparison group is not statistically significant ($p > .10$)

State (with # of demonstration quarters)	Changes in relevant policies or services for 1115 SUD demonstration states	Relative difference between the demonstration state and its comparison group from baseline to demonstration period (%)		
	Coverage of residential services	Any institutional service (including residential and inpatient)		
		Relative difference	90% C.I. lower bound	90% C.I. upper bound
Alaska (7)	+	-6.6	-18.38	4.40
Illinois (10)	↗	2.2	-2.5	7.2
Indiana (12)	+	-8.7	-20.6	2.89
Kentucky (9) [A]	↗	-49.1***	-70.9	-28.1
Louisiana (12)	↗	4.0	-2.79	10.98
Massachusetts (14)	+	24.6***	16.8	32.8
Michigan (7)	↗	-3.3	-10.58	3.74
North Carolina (7)	+	-2.8	-15.7	9.7
New Hampshire (10)	↗	-95.2***	-147.8	-52.8
New Jersey (11)	+	49.1***	Not estimated [B]	
New Mexico (7)	↗	9.1*	1.0	20.1
Pennsylvania (10)	↗	-5.0	-11.6	1.4
Utah (14) [C]	↗	74.3***	Not estimated [B]	
Virginia (15)	+	36.7***	19.0	54.5
Washington (10)	-	5.5	-3.2	14.3
West Virginia (11) [D]	+	106.6***	69.7	157.3

+

Adding policy/ coverage

↻

Updating policy

↗

Expanding coverage

-

Already covered

⊘

Not covered

* P-value < .10
 ** P-value < .05
 *** P-value < .01

Table Notes: C.I. = confidence interval.

(A) In Kentucky, the DQ Atlas rated procedure codes on the IP file “unusable” for 2016 due to more than half of records missing a primary procedure code and another 30-plus percent having invalid codes. We may have undercounted institutional service use in 2016 because procedure codes are necessary to identify some services. Any resulting bias in DID models was likely small but would have increased the size of the negative impact estimate.

(B) The 90% confidence intervals for New Jersey and Utah were not estimated because the underlying p-values were so small that our calculation software set the p-value = 0.

(C) In Utah, procedure codes were missing on roughly one-third of all records in the Other Services (OT) files for 2017–2020. It is very likely that we significantly underestimated the number of beneficiaries receiving institutional services in those years. This could have introduced bias into our DID model if the degree of undercounting varied over time, but the direction or size of any bias is uncertain.

(D) The demonstration quarters for West Virginia exclude two quarters in 2019 because of high volumes of missing outpatient records. See limitations, Appendix B.

Methods: A logistic regression model was used to obtain estimates. Results are weighted by the fraction of time the beneficiary was enrolled in Medicaid (eligibility fraction) and the propensity score weight. Appendix A details the methods.

How to interpret the results: The relative difference is the DID estimate as a percentage of the demonstration state’s baseline period adjusted mean. A *negative* value for the relative difference 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 state than in the comparison group. The number of demonstration quarters varies by state (counts are in parentheses after the state name), so comparisons between states are not advised.

Sample: Medicaid beneficiaries ages 12–64, eligible for full benefits, not dually enrolled in Medicare.

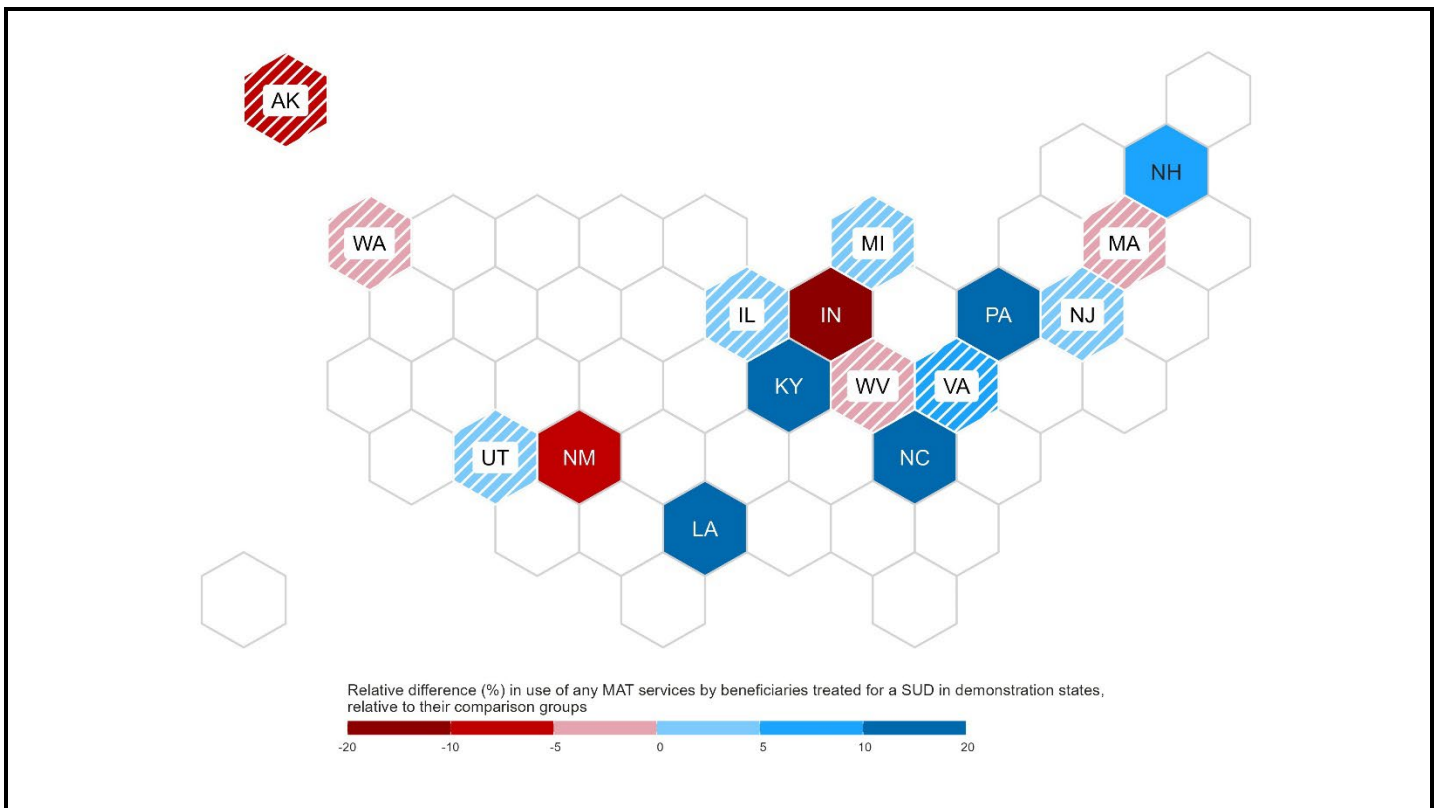
Source: RTI analysis of TAF RIF data for January 2016 through December 2020.

Relative to the comparison groups, 6 of 16 states experienced a statistically significant increase in the percentage of Medicaid beneficiaries being treated for SUD who used SUD-related institutional services following demonstration implementation, and 2 states had a statistically significant decrease. New Mexico had a 9.1 percent increase in SUD-related institutional services relative to their comparison group. The impacts in the other states with a statistically significant increase were much larger. Massachusetts, New Jersey, Utah, Virginia, and West Virginia all had increases in institutional services that were over 20 percent higher than their comparison group (24.6%, 49.1%, 74.3%, 36.7%, and 106.6%, respectively).¹⁷ In general, the percentage changes were large because the baseline percentage of beneficiaries using institutional services was low, so even a small absolute change represents a large relative percentage difference. While most states that had an increase in institutional services relative to their comparison group experienced an absolute increase in the percentage of beneficiaries using institutional services, the percentage did not change in Utah but declined in the comparison group, leading to a large overall relative increase. Despite expanding coverage of residential services, Kentucky and New Hampshire had large relative declines in SUD-related institutional service use (-49.1% and -95.2%, respectively). Similar to the states with a large increase, the percentage changes were large because a small percentage of beneficiaries used institutional services during the baseline period. The change over time in seven states that expanded services (Alaska, Illinois, Indiana, Louisiana, Louisiana, Michigan, North Carolina, and Pennsylvania) and in Washington, which did not expand institutional services, did not differ from their comparison group.

Appendix B includes quarterly impact results for institutional services all 16 demonstration states, which may be of interest to readers wishing to delve deeper into whether and how impacts changed over time.

Medication-assisted Treatment. Exhibit 6 shows changes in relevant policies or services made by each demonstration state and estimates of demonstration impacts on use of MAT from DID models. MAT includes medications used to treat substance use that are included in the monitoring metric lists, including naltrexone, buprenorphine, and methadone (see Appendix A). Thirteen of the 16 states covered the provision of methadone prior to their demonstration, but a few started reimbursing for it as part of the demonstration or changed how they reimburse it to incentivize the treatment. As a condition of the section 1115 demonstration, states had to require that residential providers either provide MAT or ensure access to it off-site. Two state Medicaid agencies already had these requirements in place, but the other 14 states that did not already have this requirement for all providers added to or otherwise amended their existing policies.

Exhibit 6. Demonstration impacts on MAT by state, with related changes in policies/services



Hexagon Map Notes: diagonal stripes on a state in the hexagonal map indicate that the relative difference between the state and its comparison group is not statistically significant ($p > .10$)

¹⁷ Identification of institutional services is less reliant on procedure codes and therefore much less likely to be undercounted in Utah, unlike outpatient services.

State (with # of demonstration quarters)	Changes in relevant policies or services for 1115 SUD demonstration states		Relative difference between the demonstration state and its comparison group from baseline to demonstration period (%)		
			Any MAT		
	Residential MAT requirements	Coverage of methadone	Relative difference	90% C.I. lower bound	90% C.I. upper bound
Alaska (7)	+	-	-8.1	-24.3	7.6
Illinois (10)	+	-	1.1	-7.19	9.08
Indiana (12)	+	-	-11.3*	-22.0	-0.9
Kentucky (9)	+	+	17.1***	10.99	23.31
Louisiana (12)	+	+	11.0***	5.26	17.03
Massachusetts (14)	-	-	-1.6	-4.07	0.76
Michigan (7)	+	-	3.6	-1.0	8.3
North Carolina (7) [A]	↻	↗	15.4***	12.0	19.1
New Hampshire (10)	↻	-	9.8**	2.63	17.00
New Jersey (11)	+	-	1.6	-2.77	6.20
New Mexico (7)	+	-	-6.6*	-12.63	-0.71
Pennsylvania (10)	↻	-	10.8***	7.24	14.68
Utah (14) [B]	-	-	2.0	-17.94	21.80
Virginia (15)	+	-	5.5	-1.06	12.32
Washington (10)	+	-	-4.4	-11.5	2.7
West Virginia (11) [C]	+	+	-2.1	-9.2	4.9

+

Adding policy/ coverage

↻

Updating policy

↗

Expanding coverage

-

Already covered

⊘

Not covered

* P-value < .10
 ** P-value < .05
 *** P-value < .01

Table Notes: C.I. = confidence interval

(A) In North Carolina, the DQ Atlas rated pharmacy (RX) claims as “high concern” in 2017-2020 and “moderate concern” in 2016, always due to low volume. Patterns may simply reflect low use in the state, but we may have underestimated MAT more in later years if paid claims are not captured in TAF RIF. This could have biased our DID result for MAT downward.

(B) In Utah, procedure codes were missing on roughly one-third of all records in the Other Services (OT) files for 2017–2020. MAT use may be slightly underestimated in those years. This could have introduced a small negative bias into our DID models.

(C) The demonstration quarters for West Virginia exclude two quarters in 2019 because of high volumes of missing outpatient records. See limitations, Appendix B.

Methods: A logistic regression model was used to obtain estimates. Results are weighted by the fraction of time the beneficiary was enrolled in Medicaid (eligibility fraction) and the propensity score weight. Appendix A details the methods.

How to interpret the results: The relative difference is the DID estimate as a percentage of the demonstration state’s baseline period adjusted mean. A *negative* value for the relative difference 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 state than in the comparison group. The number of demonstration quarters varies by state (counts are in parentheses after the state name), so comparisons between states are not advised.

Sample: Medicaid beneficiaries ages 12–64, eligible for full benefits, not dually enrolled in Medicare.

Source: RTI analysis of TAF RIF data for January 2016 through December 2020.

Relative to the comparison groups, the percentage of Medicaid beneficiaries being treated for SUD who used MAT showed a statistically significant increase after demonstration implementation in 5 of 16 states and a statistically significant decrease in 2 states. Utah and Massachusetts, which did not show statistically significant impacts, were the only states that did not add or expand MAT. However, Massachusetts had consistently high levels of MAT use during the entire study period. In addition, Utah had underlying data

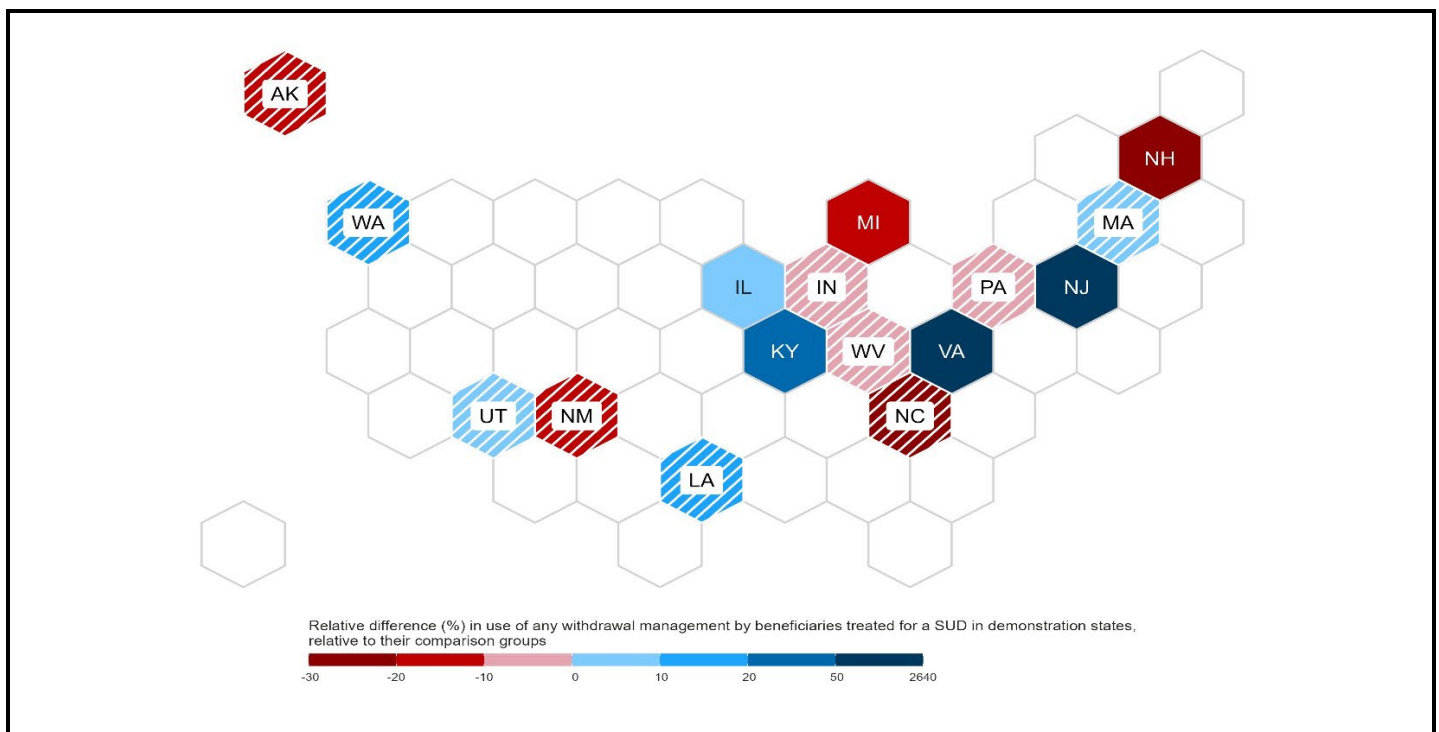
issues that likely prevented us from capturing their true trends. Among the states that added or expanded MAT, Kentucky, Louisiana, North Carolina, New Hampshire, and Pennsylvania had an increase in MAT use relative to their comparison group after demonstration implementation (17.1%, 11.0%, 15.4%, 9.8%, and 10.8% relative increase, respectively). Use of MAT declined relative to their comparison group by 11.3 percent in Indiana and 6.6 percent in New Mexico. The change over time in use of MAT for the remaining states (Alaska, Illinois, Michigan, New Jersey, Virginia, Washington, and West Virginia) did not differ from their comparison group.

Appendix B includes tables of quarterly impact estimates on use of MAT in all demonstration states, which may be of interest to readers wishing to delve deeper into whether and how impacts changed over time. The pandemic's effect on MAT use appears low relative to its effect on other services.

Withdrawal Management Services. WM services include detoxification services provided in any medical setting. **Exhibit 7** shows changes in coverage of WM services made by each demonstration state and estimates of demonstration impacts on use of WM services from DID models. As part of the demonstration, states are required to provide medically supervised WM and some states added other levels of WM as well. Thirteen states added or expanded WM services while three states already covered it. WM may not always be billed as a separate service if it occurs during an inpatient or residential stay; impact estimates should be interpreted cautiously.

Relative to the comparison groups, there was a statistically significant increase in the percentage of Medicaid beneficiaries being treated for SUD who use WM services following demonstration implementation in 4 of 16 states and a statistically significant decrease in 2 states. Among the 13 states that added or expanded WM services, 4 states had an increase in the percentage of beneficiaries using WM services relative to their comparison group (Illinois: 7.0%; Kentucky: 46.5%; New Jersey: 69.5%; and Virginia: 2,638.3%) and Michigan had a decrease of 17.8 percent relative to their comparison group. The percentage increases in Kentucky, New Jersey, and Virginia were large because the baseline percent of beneficiaries using WM services was low, so even a small absolute change represents a large relative percentage difference. Virginia did not cover WM services pre-demonstration so the percentage of beneficiaries in the baseline period was nearly zero, which led to the relative difference of over 2,000 percent. Because WM was not a covered service, providers may not have submitted claims for it or added it as a line-item on broader institutional claims during the baseline period. The change over time in WM services for the remaining states that added or expanded coverage (Alaska, Indiana, Louisiana, Massachusetts, New Mexico, North Carolina, North Carolina, New Hampshire, Pennsylvania, Utah, and West Virginia) did not differ from their comparison group. Among the states that had coverage prior to the demonstration and did not expand that coverage, New Hampshire had a 22.2 percent decline in WM service use relative to their comparison group while the change over time did not differ from the comparison group for Massachusetts and Washington.

Exhibit 7. Demonstration impacts on WM by state, with related changes in policies/services



Hexagon Map Notes: diagonal stripes on a state in the hexagonal map indicate that the relative difference between the state and its comparison group is not statistically significant ($p > .10$).

State (with # of demonstration quarters)	Changes in relevant policies or services for 1115 SUD demonstration states	Relative difference between the demonstration state and its comparison group from baseline to demonstration period (%)		
		Any WM service		
	Coverage of WM	Relative difference	90% C.I. lower bound	90% C.I. upper bound
Alaska (7)	+	-10.1	-54.8	11.7
Illinois (10)	↗	7.0***	3.9	11.7
Indiana (12)	↗	-0.2	-17.2	16.3
Kentucky (9)	+	46.5***	26.8	69.2
Louisiana (12)	↗	14.6	-1.8	32.8
Massachusetts (14)	-	1.1	-15.9	18.2
Michigan (7)	↗	-17.8*	-35.0	-1.4
North Carolina (7)	+	-24.8	-67.5	11.4
New Hampshire (10)	-	-22.2*	-62.9	0.4
New Jersey (11)	↗	69.5***	Not estimated [A]	
New Mexico (7)	+	-11.2	-48.1	6.0
Pennsylvania (10)	↗	-6.1	-15.5	2.9
Utah (14) [B]	+	5.4	-16.7	30.7
Virginia (15) [C]	+	2,638.3***	Not estimated [A]	
Washington (10)	-	19.8	-9.6	54.6
West Virginia (11) [D]	+	-8.6	-54.3	24.1



Adding policy/coverage



Updating policy



Expanding coverage



Already covered



Not covered

* P-value < .10
 ** P-value < .05
 *** P-value < .01

Table Notes: C.I. = confidence interval

(A) The 90% confidence intervals for New Jersey and Virginia were not estimated because the underlying p-values were so small that our calculation software set the p-value = 0.

(B) In Utah, procedure codes were missing on roughly one-third of all records in the OT files for 2017–2020. It is very likely that we significantly underestimated the number of beneficiaries receiving WM services in those years. This issue could have introduced bias into our DID models if the degree of undercounting varied over time, but the direction or size of any bias is uncertain.

(C) Virginia added coverage for WM under the demonstration and it was almost never reported on claims in baseline years, so the extreme growth there is due to a very small denominator.

(D) The demonstration quarters for West Virginia exclude two quarters in 2019 because of high volumes of missing outpatient records. See limitations, Appendix B.

Methods: A logistic regression model was used to obtain estimates. Results are weighted by the fraction of time the beneficiary was enrolled in Medicaid (eligibility fraction) and the propensity score weight. Appendix A details the methods.

How to interpret the results: The relative difference is the DID estimate as a percentage of the demonstration state's baseline period adjusted mean. A *negative* value for the relative difference 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 state than in the comparison group. The number of demonstration quarters varies by state (counts are in parentheses after the state name), so comparisons between states are not advised.

Sample: Medicaid beneficiaries ages 12–64, eligible for full benefits, not dually enrolled in Medicare.

Source: RTI analysis of TAF RIF data for January 2016 through December 2020.






Demonstration Impacts Across Service Categories within Each State

To ascertain any relationships between impacts across service categories, **Exhibit 8** summarizes the direction of impacts for the four service categories for each demonstration state. Putting the impacts side-by-side makes it easier to observe where the most and fewest impacts occurred, whether the direction of impact varied across services within a state and whether there was potential substitution between service types. The red and blue arrows indicate statistically significant relative decreases and increases, respectively. Recall

that statistical significance indicates a high level of confidence that the direction of effect is correct for our sample, even if there is still uncertainty about its size. The gray arrows indicate results that are not statistically significant. A result that is not statistically significant is often thought of as “no impact” but it is also accurate to say these may be small impacts, where the direction of effect is uncertain. The gray arrows show the direction of the estimated relative difference at the center of the confidence intervals for those outcomes (i.e., the range in which the “true” impact for the sample likely falls), but the intervals include impacts in the opposite direction (shown in Exhibits 1 through 4, above).

Exhibit 8. Compilation of demonstration impacts, by state

State	Any SUD-related outpatient service	Any SUD-related institutional service	MAT	WM
Alaska	↓	↓	↓	↓
Illinois	↓	↑	↑	↑
Indiana	↓	↓	↓	↓
Kentucky	↓	↓	↑	↑
Louisiana	↓	↑	↑	↑
Massachusetts	↓	↑	↓	↑
Michigan	↔	↓	↑	↓
North Carolina	↑	↓	↑	↓
New Hampshire	↑	↓	↑	↓
New Jersey	↑	↑	↑	↑
New Mexico	↓	↑	↓	↓
Pennsylvania	↓	↓	↑	↓
Utah	↓	↑	↑	↑
Virginia	↑	↑	↑	↑
Washington	↓	↑	↓	↑
West Virginia	↓	↑	↓	↓

 Increase relative to the comparison group	 Decrease relative to the comparison group	 No change relative to the comparison group	 Statistically significant increase relative to the comparison group	 Statistically significant decrease relative to the comparison group
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Methods: Logistic regression models were used to obtain estimates for all outcomes. Results are weighted by the fraction of time the beneficiary was enrolled in Medicaid (eligibility fraction) and the propensity score weight. Appendix A details the methods.

Sample: Medicaid beneficiaries ages 12–64, eligible for full benefits, not dually enrolled in Medicare.

Source: RTI analysis of TAF RIF data for January 2016 through December 2020.

Looking across services, the largest number of statistically significant relative increases is for institutional services (6 states), and the second largest is for MAT (5 states). Including results that are not statistically significant, 9 states had relative increases for institutional services and 10 states had relative increases for MAT. The largest number of statistically significant relative decreases is for outpatient services (7 states) and a total of 11 states have estimated relative decreases in this service category when we include estimates that are not statistically significant. The addition and expansion of institutional care in nearly all states offered some possibility of substitution of newly available residential services in place of outpatient services for high-acuity, high need patients. There were relative increases in institutional services and relative decreases in outpatient services relative to their respective comparison groups in Illinois, Louisiana, Massachusetts, New Mexico, Utah, Washington, and West Virginia, although at least one of these relative changes was not statistically significant in four of those states.

All states except Alaska and Washington have at least one estimated impact that is statistically significant. Alaska was one of the last states to start its demonstration in our sample (Q2 2019) and service use fell much farther during the pandemic in 2020 than in any other state. Three states started around the same time as Alaska:

- Michigan had just one statistically significant impact, a relative decrease in WM.
- New Mexico had a statistically significant relative increase for institutional services and relative decreases for outpatient and MAT, but the state added new residential and outpatient service levels in the quarter prior to implementation. Thus, it had a head start on institutional changes, and the early start for outpatient may bias the demonstration impact estimate downward.
- North Carolina's statistically significant relative increases were for outpatient services and MAT, where the state expanded and updated current coverage, which may take less time to show impacts.

There were very few changes to service levels in Washington during the demonstration. The state expanded institutional services prior to the demonstration using state funds to align the pending demonstration levels of service with managed care contracts, potentially biasing its institutional effect toward no impact due to the jump in use at the end of the baseline. Like Washington, Massachusetts made limited changes to services and had just one statistically significant effect, a relative increase in institutional use, where they added residential service levels.

Kentucky was the only state where every estimated impact was statistically significant, but there may be reasons that are not attributable to the demonstration for three of the four effects. New Jersey and Virginia are the only states where all the estimated impacts suggested increases in service use relative to the comparison group. In both states, use of all service categories except MAT was low relative to the comparison group during baseline and the gaps closed significantly or were completely erased during the demonstration. These circumstances are described further in the Conclusions.

Conclusions

The number and percentage of Medicaid beneficiaries treated for SUD increased in all study states prior to and during their demonstrations, at least until the start of the COVID-19 pandemic in early 2020. This growth reflected upward pressure from several factors on demand for SUD treatment services, in addition to potential impacts of the demonstrations. The opioid epidemic helped to fuel increases in all states, and other state initiatives may have helped link more Medicaid beneficiaries to SUD-related treatment. Medicaid eligibility expansions in Louisiana, Utah, and Virginia brought in thousands of newly eligible adults who did not qualify for coverage prior to expansion, a population that tends to have much higher rates of alcohol and drug addiction.¹⁸ Most states continued to provide SUD treatment to growing numbers of Medicaid beneficiaries during the rest of 2020, although percentages tended to flatten out or decline because total enrollment surged due to high unemployment and other effects of the pandemic.

We hypothesized that states adding Medicaid coverage for new service levels would experience greater impacts from the demonstration, driven by a stronger response from providers to offer the new Medicaid services because of the new reimbursement opportunity. Ten states in this study added levels of care for SUD treatment in outpatient, institutional, or WM services (we talk about MAT separately, below). We found statistically significant increases in the percentages of beneficiaries treated for SUD using the service categories with newly added service levels in five of them (Kentucky, Massachusetts, New Jersey, Virginia, and West Virginia¹⁹), relative to their comparison groups; a sixth state (Utah) had a small relative increase for WM that was not statistically significant. There were no statistically significant relative decreases in use where a state added new levels of outpatient, institutional, or WM services. Thus, adding services generally seems to have produced relative increases in service use.

We expected more muted impacts when states expanded offerings in an existing service level, in part because these are incremental changes rather than all-new offerings. On the other hand, it is possible these incremental changes could have more substantial impacts than adding new services, at least early on, if they can be implemented more quickly. We estimated statistically significant relative decreases in the percentage of beneficiaries with SUD using outpatient services in 3 of the 6 states that expanded outpatient levels of care and only one (North Carolina) had a statistically significant increase. Among the 8 states that expanded residential levels of care,

¹⁸ Vestal, C. (2015). *States gear up to help Medicaid enrollees beat addictions*. Pew Charitable Trusts. <https://www.pewtrusts.org/en/research-and-analysis/blogs/stateline/2015/1/13/states-gear-up-to-help-medicare-enrollees-beat-addictions>

¹⁹ West Virginia is the only one of these five states that added coverage for a service and did not have a statistically significant estimated increase (for WM), but there was a significant increase for a second category with added coverage levels (institutional services).

two showed statistically significant relative declines in the percentages of beneficiaries using institutional services and two showed increases that were statistically significant, relative to their comparison groups. The story was similar for WM. Thus, state choices to expand outpatient, institutional, or WM levels of care did not appear to consistently increase the percentages of beneficiaries treated for SUD who used those services.

Nearly all states had to add coverage or update policies to explicitly require availability of MAT in residential settings to meet demonstration requirements. Because availability of residential MAT in residential settings is an important but somewhat incremental change, we hypothesized there would be muted increases in those states. Three states also made the more significant change to add coverage of methadone treatment (other states already covered it). We expected more substantial increases in those states. We estimated increases in the share of beneficiaries receiving MAT in 9 of the 14 states that added or updated residential MAT policies, relative to their comparison groups. Of those nine, five were statistically significant (Kentucky, Louisiana, North Carolina, New Hampshire, and Pennsylvania) and two of those five added methadone (Kentucky and Louisiana). West Virginia was the only state that added methadone and did not have a statistically significant relative increase in MAT use—we estimated a nonsignificant relative decrease. We discuss why this might have been the case later in this section.

Although increasing access to SUD-related treatment services is a goal of the demonstrations, services can be substitutes. Additional demonstration goals of improving care coordination and ensuring that beneficiaries receive treatment appropriate to meet their level of need may result in reductions in other service categories. For example, if beneficiaries who need institutional care were previously unable to access those services and instead only received outpatient services, then a decrease in use of outpatient services may be desirable. In interviews conducted in 2022, providers and managed care plan representatives in demonstration states described shifts in referral patterns that reflected application of standard placement criteria and placement of patients in the most appropriate care.²⁰ Seven states in our sample added or expanded institutional services and had relative increases in institutional service use and relative decreases in outpatient use.²¹

Another reason that relative decreases were more common for outpatient services may be because beneficiaries in the comparison group have less access to the more intensive outpatient and residential services and services in IMDs provided in demonstration states. Thus, the share of beneficiaries treated for SUD using outpatient services in the comparison group increased relative to the demonstration state because of the lack of other options. As noted in **Exhibit 8**, all demonstration states provided outpatient SUD treatment services to more beneficiaries in 2020 than in 2016, so the relative difference does not mean fewer beneficiaries overall received outpatient services in the demonstration states.

States that started their demonstrations earlier (Virginia, Massachusetts, Utah, Indiana, Louisiana, and West Virginia) had potential to experience larger overall shifts in SUD-related treatment in the study period because they had more demonstration periods. States that started later, especially those that started in 2019 (Alaska, Michigan, New Mexico, and North Carolina), had less time to implement policy changes, expand provider capacity, and connect patients with providers prior to the COVID-19 pandemic. Based on provider narratives, we expected use of institutional and WM services to decline noticeably in the first quarter of the pandemic (Q2 2020), but use of outpatient services may also have been affected by workforce shortages exacerbated by the pandemic and capacity limits imposed as part of the public health emergency (e.g., single rather than double room occupancy). However, many states offered new telehealth options during the pandemic, which may have boosted outpatient service use. It is particularly difficult to separate demonstration impacts from impacts of the pandemic in later implementing states. We may be better able to control for effects of the pandemic when we have additional years of data after the initial shock in 2020.

Lagged implementation of key demonstration features, such as service expansions, could partially explain variation in results. Addition of service levels did not always occur in the same quarter as the demonstration start date. For example, Indiana had a long delay between its implementation quarter and effective dates to expand residential levels of care, and some policy changes in North Carolina and Pennsylvania were delayed. Pre-demonstration changes also affect results. In New Mexico, new residential and outpatient service levels were added in the quarter prior to implementation, and Washington expanded residential services using state funds prior to the demonstration.

Other state activities outside of the demonstration may also contribute to the variation in estimated impacts. For example, New Jersey carved behavioral health services into managed care and was one state with relative increases for all service categories. Virginia, one of the few states with a positive relative increase in outpatient use, raised Medicaid reimbursement rates for intensive outpatient services and more providers started offering outpatient services, in effect increasing access to “new” services although coverage of ASAM service levels did not change.

These demonstrations also come on the heels of unprecedented growth in need and demand for SUD-related treatment services in many states. For demonstration states that experienced substantial growth in service use prior to demonstration implementation, a negative relative difference may reflect limitations of our models. There may be a limit to how high rates of service use can climb. For

²⁰ RTI International (2022). Medicaid Section 1115 Substance Use Disorder (SUD) Demonstrations: Early experiences of managed care and SUD provider organizations with changes in care coordination.

²¹ Washington is included in the seven states, although the state expanded residential services during the year prior to the demonstration to incorporate the coverage into new managed care contracts.

example, there may not be enough providers to meet demand in every part of the state; workforce shortages may limit the ability of providers to meet demand, especially for higher-intensity outpatient, institutional, and WM services; and some beneficiaries may be particularly difficult to engage in treatment. In these cases, negative relative differences may also reflect limitations of DID models, especially when we do not have parallel baseline trends. We offer two examples:

- Kentucky’s use of outpatient and institutional services increased relative to the comparison group in the baseline, then leveled off during the demonstration. In both cases, we estimated declines in use relative to the comparison group because the nonparallel DID models assume Kentucky’s baseline trend should continue. However, both services reached high levels of use just before or after the start of the demonstration. Roughly 12 percent of beneficiaries treated for SUD in Kentucky used institutional services during the demonstration, much higher than the roughly constant 8–9 percent rate in the comparison group. More than 70 percent used outpatient services during the demonstration, at levels nearly identical to the comparison group.
- Similarly, West Virginia added methadone and residential MAT requirements under the demonstration. Although the other two states that made these changes (Kentucky and Louisiana) had statistically significant relative increases in DID models for MAT use, we estimated a small decrease in West Virginia that was not significant relative to the comparison group. MAT use had already increased from about 50 percent to nearly 70 percent of beneficiaries treated for SUD in West Virginia before the start of the demonstration, then moved above 70 percent during the demonstration through the end of the study period. The share of beneficiaries using MAT in the comparison group was roughly half the level in West Virginia in any period. Kentucky and Louisiana also had substantially lower levels of MAT use at the start of the demonstration.

In both examples, DID models have to assume nonparallel baseline trends, but by assuming baseline trends should continue indefinitely, they end up “penalizing” the demonstration state for services that may have reached sustainable levels.

Although our comparison groups met common standards for balance with the demonstration states on key covariates, the pool of comparison group states was limited to thirteen states that had not implemented a SUD demonstration and that had usable TAF data. We further stratified the comparison group by Medicaid expansion status because the populations treated for SUD differ substantially in states that have expanded Medicaid coverage for low-income adults compared to those that have not. At the time of this analysis, seven comparison group states had expanded Medicaid while nearly all demonstration states had done so. As a result, we were limited to seven comparison group states for demonstration states that expanded Medicaid and six demonstration states for the one demonstration state that had not yet expanded Medicaid. Further, geographic and Medicaid policy differences could affect the balance between the demonstration and comparison populations on unobserved socioeconomic and area-level characteristics. They also may be reflected in differential baseline service levels and/or trends. These unobserved differences could bias results. Future analyses will be even more constrained as additional states implement SUD demonstrations and expand Medicaid, further limiting our pool of comparison states. As such, future analyses will consider alternative comparison group and statistical analysis methods.

Lastly, TAF RIF data have some inherent data limitations, discussed in more detail in the appendices and noted in notes on tables, exhibits, and figures throughout the report and appendices. For example, Indiana is the only state other than Alaska where estimated impacts suggest declines relative to the comparison group for all service categories. While Alaska’s negative impact estimates are likely due to confounding from the COVID-19 pandemic, Indiana’s negative estimates may be more attributable to possible undercounting of service use during the demonstration due to missing data. Likewise, Kentucky had a big spike in WM use in 2020, but this jump appeared to be driven by a change in billing practices during the pandemic. WM services may be particularly subject to underreporting as the service is often part of a package of services, especially in residential and other institutional settings, where the fee structure may not necessitate or incentivize providers to specify that WM was provided when seeking reimbursement.

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The Federal Meta-Analysis Support Contract

In 2018, the Centers for Medicare & Medicaid Services (CMS) commissioned the Federal Meta-Analysis Support contract (HHSM-500-2014-000371) 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: Methods, Data, and Limitations

This report summarizes initial findings from analyses of the use of SUD treatment services by Medicaid beneficiaries in states with section 1115 SUD demonstrations between January 2016 and December 2020. The analysis focused on 17 states that implemented their demonstration prior to June 1, 2019: Alaska, Illinois, Indiana, Kentucky, Louisiana, Massachusetts, Michigan, North Carolina, New Hampshire, New Jersey, New Mexico, Pennsylvania, Utah, Virginia, Vermont, Washington, and West Virginia. Three states that also implemented demonstrations were not included because of missing and inaccurate data that prevented reliable identification of SUD-related diagnoses (Maryland) or measurement of service use and demonstration impacts (California and Rhode Island).

This appendix covers methods for the impact analyses, including: (1) the data sources used; (2) the selection of demonstration and comparison group study populations; (3) the propensity score weighting approach; (4) the analytic time frame; and (5) the statistical analysis used, including detailed measure specifications for each outcome.

Data Sources

Medicaid Data. We used Transformed Medicaid Statistical Information System (T-MSIS) Analytic Files (TAF) Research Identified Files (RIF) from the Chronic Conditions Warehouse (CCW) to derive Medicaid eligibility and enrollment information, demographic characteristics, and SUD utilization outcomes for Medicaid beneficiaries in the 17 implementing states and their comparison groups. For this report, we used Medicaid data from January 2016 through December 2020. We start with 2016 because it is the first complete year of TAF RIF data for all states. Data quality concerns were more widespread with TAF data prior to 2016. Furthermore, mixing TAF with the older Medicaid Analytic eXtract (MAX) format used for some states in 2015 and most states prior to that year can unintentionally influence model results due to inconsistencies between the reporting formats.

Area Health Resources File (AHRF). We used AHRF data for county-level covariates in the propensity score and outcome models. The AHRF comprises data collected by the Health Resources and Services Administration from more than 50 sources containing more than 6,000 variables related to health care access at the county level.

American Community Survey (ACS) Public Use Microdata Sample (PUMS). We used ACS PUMS data to obtain county-level estimates of the of non-Hispanic White share of the population, used in the propensity score and outcome models. 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.

U.S. Department of Agriculture (USDA) 2013 Rural-Urban Continuum Codes. We used the 2013 Rural-Urban Continuum Codes produced by the USDA Economic Research Service²² in the propensity score and outcome models. These data classify all U.S. counties as one of nine categories, based on 2010 U.S. Census data. There are three metropolitan classifications ranging from large metro areas with more than 1 million people to small metro areas with fewer than 250,000 population. Nonmetropolitan counties are given one of six designations, depending on the size of the urban population in the county and whether the county is adjacent to a metropolitan area.

Bureau of Labor Statistics (BLS). We used county-level annual average unemployment rates for 2016–2020 in the propensity score and outcome models, from the BLS Local Area Unemployment Statistics (LAUS) labor force data.²³

COVID-19 Pandemic Vulnerability Index (PVI). This index, developed by the National Institute for Environmental Health Sciences (NIEHS) in collaboration with North Carolina State University and Texas A&M University, estimates the overall risk of COVID-19 cases and deaths for each United States county.²⁴ We used 3-month rolling averages of the PVI for each county and calendar quarter to adjust for differences in the spread of the virus and other factors reflected by the PVI: population concentration, social distancing and testing, and health and environmental factors such as air pollution, co-morbidities and disparities.

Sample Selection

We assessed trends in SUD-related service use and estimated impacts of the section 1115 SUD demonstrations separately for each of the 17 states. For all demonstration states, we focused on all Medicaid beneficiaries aged 12 to 64 years with full Medicaid benefits (including children covered by a Medicaid Expansion Children's Health Insurance Program) who were not dually enrolled in Medicare. Although there are no age limits on receipt of SUD services, cases among children under age 12 are extremely rare and for dually

²² U.S. Department of Agriculture (USDA) Economic Research Service (2013). *Rural-Urban continuum codes*. <https://www.ers.usda.gov/data-products/rural-urban-continuum-codes/>.

²³ U.S. Bureau of Labor Statistics. *Local unemployment statistics*. <https://www.bls.gov/lau/>

²⁴ National Institutes of Health, National Institute of Environmental Health Sciences. (2021). *COVID-19 Pandemic Vulnerability Index quick start guide*. <https://www.niehs.nih.gov/research/programs/coronavirus/covid19pvi/index.cfm>

eligible beneficiaries we may not capture all relevant service use because Medicare is the primary payer. The sample includes all beneficiaries enrolled for any length of time in the measurement period.

We identified beneficiaries receiving SUD treatment services by applying a combination of two definitions provided for reporting section 1115 SUD demonstration monitoring metrics using Medicaid claims data.²⁵ The first of these definitions is for “beneficiaries with SUD” (used in Metrics #2, #3, #4, and #30), and the second is for “beneficiaries enrolled in the measurement period receiving any SUD treatment service, facility claim, or pharmacy claim” (Metric #6). Any beneficiary that met either set of criteria was included in the sample. For brevity, we call them “beneficiaries treated for SUD.” We chose to use the combination of the two metrics because there were minor differences in the definitions that caused small numbers of beneficiaries to be captured in one measure but not the other, despite all of them using some form of treatment for SUD. Beneficiaries treated for SUD is the study population for the analyses of use of individual service categories described below, but also includes early intervention services, emergency department visits, and a few other services not captured in those outcome measures.

To generate reliable impact estimates, the difference-in-differences (DID) models described in the *Statistical Analysis* section used a comparison group that serves as a good proxy for the counterfactual—that is, what would have occurred in the demonstration state if the demonstration was not implemented. Because all SUD demonstrations included in the analysis are statewide, we constructed comparison groups for each demonstration state from a pooled set of beneficiaries treated for SUD in states without a demonstration.²⁶ Comparison group selection was stratified by state Medicaid expansion status. Most SUD demonstration states have expanded Medicaid eligibility as authorized by the Affordable Care Act. For these states, the comparison group consisted of beneficiaries in Medicaid expansion states that did not have an approved demonstration at the time we began our analysis in March 2022. One demonstration state, North Carolina, has not expanded Medicaid. Its comparison group included beneficiaries from non-expansion, non-demonstration states. Three demonstration states expanded Medicaid during the study period. Louisiana expanded Medicaid in 2016 and started the demonstration in 2018, so our DID models excluded data from time periods before Medicaid expansion and used a comparison group of beneficiaries from non-demonstration states that expanded Medicaid. For Utah and Virginia, which expanded Medicaid after they implemented their SUD demonstrations, we used a comparison group from all expansion and non-expansion states without a demonstration. **Table A-1** summarizes the demonstration and comparison group state pairings.

Table A-1. Comparison group states by demonstration state and Medicaid expansion status

Demonstration state	Comparison group drawn from...
States that expanded Medicaid eligibility prior to their SUD demonstrations	
AK, IL, IN, KY, LA, MA, MI, NH, NJ, NM, PA, WA, WV	AZ, CT, HI, IA, MT, NV, NY
VT	Not included in DID analyses because we could not create propensity scores due to data limitations (see table notes)
States that expanded Medicaid eligibility during their SUD demonstrations	
UT, VA	AZ, CT, GA, HI, IA, MO, MT, NV, NY, SC, SD, TX, WY
States that did not expand Medicaid eligibility	
NC	GA, MO, SC, SD, TX, WY

Notes: A balanced comparison group for could not be identified for Vermont because of multiple data issues, most importantly high levels of missing ZIP code and county identifiers.

Propensity Score Weighting

Annual propensity score weights were applied to comparison group observations in each state analysis to improve balance of person- and county-level characteristics between the section 1115 SUD demonstration and comparison groups. We used a unique set of weights for the comparison group for each demonstration state. The propensity scores were produced from logistic regression models in which the outcome was the probability of an individual residing in the SUD demonstration state. Individual- and county-level covariates included in propensity score models are described in **Table A-2**. Beneficiary ZIP code and county were missing for 40% to more than 70% of eligibility records for individuals treated for SUD in Vermont in 4 of 5 years, so we could not link to the county-level variables used to create propensity scores. Because of this, we were unable to create a balanced comparison group for Vermont and, therefore, only conducted descriptive analyses of the state’s trends.

²⁵ Mathematica. (2021). Medicaid Section 1115 Substance Use Disorder Demonstrations: Technical specifications for monitoring metrics, version 4.0.

²⁶ We excluded Alabama, Arkansas, Florida, Mississippi, North Dakota, and Tennessee from the pool of comparison group states because they had unusable data for one or more periods or extreme and unexplained changes in the variables used to identify and exclude dual eligibles or individuals with full benefits. We also excluded states with demonstrations approved as of March 2022 that started after June 1, 2019: Colorado, Delaware, the District of Columbia, Idaho, Kansas, Maine, Minnesota, Nebraska, Ohio, Oklahoma, Oregon, and Wisconsin.

Table A-2. Covariates included in propensity score and outcome models

Covariate	Description	Source	State	
			Propensity score models that included the covariate	Outcome models that included the covariate
Enrollee-level covariates				
Female indicator	Reported sex is female	TAF	All	All
Age	Age in years is < 18, 18-44, 45 or greater as of the final day of the measurement year	TAF	All	All
Eligible due to expansion	Eligible for Medicaid due to Medicaid expansion	TAF	All but NC, PA, IL	All but NC, PA, IL
Non-White or Hispanic	Indicator that the beneficiary was a non-White race, or was Hispanic	TAF	All but MI	All but MI
Missing race	Indicator that the beneficiary's race and ethnicity was not reported	TAF	All but MI, NC, NJ, NM, VA	All but MI, NC, VA
Managed care indicator	Enrolled in Medicaid managed care at any point during the measurement year	TAF	All but AK, KY, LA, NC	All but KY, LA, NC
CDPS score	Natural log of the score calculated from claims in each calendar year	TAF	All	All
Total enrollment	Number of months of enrollment in the period (year for propensity score models, calendar quarter for outcome models)	TAF	All	This variable was not included in outcome models because it was a component of the analytic weight.
County-level covariates				
Population White, non-Hispanic	Percentage of total population reporting White, non-Hispanic race and ethnicity	ACS PUMS	All but AK, IN, KY, MA, NC, NH, NM, PA, UT, VA, WA, WV	All
Unemployment rate	Annual average unemployment rate	BLS	All but AK, MI, IL, IN, KY, LA, MA, NH, NM, PA, UT, VA, WA, WV	All but IL
RUCC	RUCC categories 1 through 9	USDA	All states included some RUCC categories; RUCC categories were not included in models if they were not present in the demonstration state	
Hospital beds per 100,000 population	Total staffed inpatient beds at all hospitals divided by total population, multiplied by 100,000	AHRF	This variable was not included in propensity score models	All
Physicians per 100,000 population	Total nonfederal MDs divided by total population, multiplied by 100,000	AHRF	This variable was not included in propensity score models	All
COVID-19 Pandemic Vulnerability Index	3-month rolling average of COVID-19 Pandemic Vulnerability Index	NIEHS	This variable was not included in propensity score models	All

Notes: ACS = American Community Survey, AHRF = Area Health Resource File, BLS = Bureau of Labor Statistics, CDPS = Chronic Illness and Disability Payment System, MD = Doctor of Medicine, NIEHS = National Institute of Environmental Health Sciences, PUMS = Public Use Micro Sample, RUCC = Rural-Urban Continuum Codes, TAF = Transformed Medicaid Statistical Information System (T-MSIS) Analytic File, USDA = U.S. Department of Agriculture

We included individual-level characteristics that are expected to affect SUD rates. Except for Illinois, North Carolina, and Pennsylvania, the propensity score models included a covariate for whether the individual qualified for Medicaid due to eligibility expansion. This variable was not reliable for Illinois and Pennsylvania, and North Carolina (and its comparison group) did not expand Medicaid eligibility. We included this variable because newly eligible expansion beneficiaries' characteristics and SUD rates differ substantially from other Medicaid eligibility groups. Furthermore, it provided a means of controlling for the impacts of Medicaid eligibility expansions in Utah and Virginia during their demonstrations. Other individual-level variables included indicators for non-White or Hispanic and missing race/ethnicity. Race/ethnicity was often not reported in some states TAF data. We included the variable for missing race/ethnicity to be able to include race/ethnicity in our models without losing large numbers of observations. We also included a county-level variable for the percent of the county population that was non-Hispanic White as an additional control due to the high volume of missing individual-level race data in many states. This variable was not used for Michigan due to inconsistent reporting of race/ethnicity across years in the study, which led to erroneous model results. We included additional county-level covariates that describe Medicaid penetration, physician and hospital capacity, and economic conditions that are expected to be correlated with SUD rates. For example, economic hardship, measured by unemployment rate, has been shown to increase substance use.²⁷

Annual propensity scores were created for the comparison sample at the person-year. The propensity scores were used to calculate inverse probability weights (propensity score / (1 – propensity score)), which were then applied to observations in the comparison group. Propensity score weights were capped at no more than 20 because extreme weights may give a small set of observations undue influence, although the cap was rarely necessary.

After propensity score weights were applied to comparison group observations, standardized differences between the means of selected characteristics in the weighted comparison group and the demonstration group were calculated and assessed for each analysis year. Covariates with standardized differences below 10 percent were considered well-balanced.²⁸ The only included covariates with standardized differences above this threshold were total enrollment for Louisiana in 2016 because of their midyear eligibility expansion, and unemployment for three periods in North Carolina. We were not able to include all individual- or county-level variables in each state's model, primarily due to missing or poor-quality individual-level data for some periods or a lack of variation in county-level variables that subsequently affected balance between the two groups. We included variables in the outcome model even if we were not able to include them in the propensity score model, where possible. **Table A-2** shows the variables included for each state's propensity score model and outcome models. We evaluated common support of propensity scores for the demonstration and comparison beneficiaries using graphs. Overlap of weighted propensity scores for each state and its comparison group was excellent.

Outcome Measures

The outcome measure definitions used in this report emulate implementation performance metrics used for monitoring progress of the section 1115 SUD demonstrations.²⁹ We created all the metrics at a calendar quarter level, as binary measures indicating any use of the service during the quarter. The descriptions below tie these metrics to levels of care defined by the American Society of Addiction Medicine (ASAM) to illustrate the range of services potentially captured in each category.³⁰ States may not cover every level of care described.

All service use reflects final, adjudicated fee-for-service (FFS) claims and managed care encounter records with service end dates in the analysis period. Medicaid beneficiaries may receive SUD-related services through programs or providers supported by non-Medicaid funding. The TAF RIF do not include any services that are not billed for payment by Medicaid. The TAF RIF also do not include any claims where the entire claim was denied payment.

Institutional (Residential and Inpatient). Residential and inpatient services include multiple levels of care defined by ASAM that are provided in 24-hour settings. Clinically managed low-intensity residential services (Level 3.1) include services provided by nonphysician professionals. Clinically managed population-specific high-intensity residential services (Level 3.3) are only for adults with significant cognitive impairments and include services provided in rehabilitation facilities and specialty units in licensed health care facilities to help stabilize SUD symptoms and aid progress toward another appropriate level of care. Clinically managed residential services (Level 3.5) consist of high-intensity services for adults, and medium-intensity services for adolescents, with significant social, psychological, or mental health conditions who cannot safely be treated in other settings. Medically monitored high-intensity inpatient services (Level 3.7) are provided in highly structured facility settings, for patients with more serious biomedical, emotional, behavioral and/or cognitive conditions. Medically managed intensive inpatient services (Level 4.0) provide 24-hour nursing care and daily physician care for adults and adolescents in a hospital-based setting, for patients with the most severe conditions. The specifications used to identify these

²⁷ Azagba, S., Shan, L., Qeadan, F., & Wolfson, M. (2021). Unemployment rate, opioids misuse and other substance abuse: Quasi-experimental evidence from treatment admissions data. *BMC Psychiatry*, 21(1), 1-9.

²⁸ 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.

²⁹ Mathematica. (2021). Medicaid Section 1115 Substance Use Disorder Demonstrations: Technical specifications for monitoring metrics, version 4.0.

³⁰ Medicaid Innovation Accelerator Program (2017). Overview of substance use disorder (SUD) care clinical guidelines: A resource for states developing SUD delivery system reforms. <https://www.medicaid.gov/state-resource-center/innovation-accelerator-program/iap-downloads/reducing-substance-use-disorders/asam-resource-guide.pdf>

services are those found in Metric #10: Residential and Inpatient Services, in the guidance to states. This measure captures stays for SUD in inpatient facilities and residential substance abuse, psychiatric, or behavioral health treatment facilities or programs.

Outpatient (Including Intensive Outpatient/Partial Hospitalization and Telehealth). ASAM classifies Outpatient Services (Level 1.0) as suitable for patients with less severe disorders; as a “step down” from more intensive services; or for ongoing monitoring, disease management, or other care coordination for patients who are stable. They are generally limited to less than 9 hours per week for adults and less than 6 hours per week for adolescents. Intensive Outpatient Services (IOP, Level 2.1) and Partial Hospitalization (PHP, Level 2.5) are elevated levels of outpatient services and are appropriate for people who need daily or near-daily care (at least 9 hours per week) but who do not need 24/7 monitoring. IOP programs offer 24/7 telephonic medical care and in-person care within 72 hours; PHP offers a minimum of 20 hours of care per week and provides daily oversight and monitoring for those who need it. The specifications used in our analysis to identify these services combine those found in Metric #8: Outpatient Services and Metric #9: Intensive Outpatient and Partial Hospitalization, in the guidance to states.

Withdrawal Management. Withdrawal management (WM) services provide support to patients withdrawing from alcohol and other substances. ASAM defines five WM levels of care (1-WM, 2-WM, 3.2-WM, 3.7-WM, and 4-WM), which vary by setting and acuity of care. These are separate from, but are usually provided concurrently with, the outpatient and institutional levels of care with the same ASAM number. The specifications used to identify these services are identical to those found in Metric #11: Withdrawal Management, in the guidance to states.

Medication-assisted Treatment. Medication-assisted treatment (MAT) is a form of SUD treatment where individuals receive medications approved for treatment of alcohol use disorder (acamprosate and disulfiram), opioid use disorder (buprenorphine and methadone), or both (naltrexone). Methadone is an opioid agonist that lessens the desire for opioids without causing intoxication; it is only dispensed in Opioid Treatment Programs (OTP) certified by the Substance Abuse and Mental Health Services Administration (SAMHSA). The specifications used in our analysis to identify these services are identical to those found in Metric #12: Medication-Assisted Treatment, in the guidance to states. In this context, it only includes claims for dispensing of MAT, including administration by providers. SAMHSA defines MAT as inclusive of counseling and behavioral therapies.³¹ Those services are captured in the outpatient measure described above, not in Metric #12 or our MAT outcome.

Analytic Time Frame

Available data for all states covered the period from January 1, 2016, through December 31, 2020, a total of 20 calendar quarters. The number of baseline or pre-demonstration quarters and demonstration quarters for each state depended on its implementation plan approval date.³² For each state, we assigned the start of the demonstration period to the first day of the calendar quarter during which the state’s implementation plan was approved unless it was approved during the last month of the quarter, in which case we assigned the start of the demonstration period to the first day of the subsequent quarter. This adjustment limits attribution of baseline service use to the demonstration period, while enabling more efficient data processing based on quarters rather than months.

Table A-3 shows the baseline and demonstration periods for each state. All states had at least five quarters of baseline data and at least 7 quarters of demonstration data.

Statistical Analysis

Our analysis began with descriptive analyses for the number and percentage of Medicaid beneficiaries treated for SUD in each state, relative to their comparison groups. These descriptive analyses focused on changes in the numbers of beneficiaries receiving SUD treatment and assess whether the percent of Medicaid beneficiaries receiving treatment increased in the demonstration states relative to their comparison groups. We included trends for Vermont, although it did not have a suitable comparison group and was not included in the DID analyses.

We employed a DID quasi-experimental design to assess demonstration impacts on use of SUD-related institutional, outpatient, and WM services and use of MAT in the population of beneficiaries treated for SUD in each demonstration state and its comparison group. All models used cross-sectional samples of beneficiaries. This section describes the baseline trends analysis that informed DID model specifications and the model specifications.

³¹ Substance Abuse and Mental Health Services Administration. (2022). *Medication-assisted treatment*. <https://www.samhsa.gov/medication-assisted-treatment>

³² For VA and MA, the effective date of the special terms and conditions (STCs) for the demonstration was used because their demonstrations were approved before CMS required states have approved implementation plans.

Table A-3. State-specific analytic time frames

Implementation date	State(s)	Baseline period	Demonstration period
April 2017	VA	Q1 2016 – Q1 2017	Q2 2017 – Q4 2020
July 2017	MA	Q1 2016 – Q2 2017	Q3 2017 – Q4 2020
November 2017	UT*	Q1 2016 – Q3 2017	Q4 2017 – Q4 2020
January 2018	WV	Q1 2016 – Q4 2017	Q1 2018 – Q4 2020
February 2018	IN, LA*	Q1 2016 – Q4 2017	Q1 2018 – Q4 2020
May 2018	NJ	Q1 2016 – Q1 2018	Q2 2018 – Q4 2020
July 2018	IL, NH, PA, VT, WA*	Q1 2016 – Q2 2018	Q3 2018 – Q4 2020
October 2018	KY	Q1 2016 – Q3 2018	Q4 2018 – Q4 2020
March 2019	AK	Q1 2016 – Q1 2019	Q2 2019 – Q4 2020
April 2019	NC	Q1 2016 – Q1 2019	Q2 2019 – Q4 2020
May 2019	MI, NM	Q1 2016 – Q1 2019	Q2 2019 – Q4 2020

Notes: For Louisiana, Utah, and Washington, we excluded either one or two quarters of data at the beginning of the baseline period when running DID models. For LA, this was to limit analysis to the periods after Medicaid eligibility expansion in mid-2016. For UT and WA, it was to mitigate the impact of questionable data at the start of the study period for multiple service categories.

Baseline Trends Analyses for Difference-in-Differences Models. Conventionally, DID models assume there are similar trends between the demonstration and comparison groups during the baseline period (“the parallel trends assumption”). We judged parallel trends through visual examination of trends, as statistical tests for parallel trends are frequently too sensitive for such large samples, deeming small deviations to be nonparallel trends. Where baseline trends were not parallel, we used a variation on the traditional DID approach that adds a linear trend and interacts this linear trend with the demonstration state indicator. By including these two additional terms, we can net out any baseline period differences in trend from the DID estimates. Where baseline trends appeared to be parallel, we also used the nonparallel model as a sensitivity analysis. We did not run parallel models if baseline trends were clearly nonparallel, as they would have produced misleading results.

Difference-in-Differences Model Specifications. Two model specifications were used: one that assumed baseline parallel trends in outcomes for the demonstration and comparison groups and a second that assumed nonparallel trends in outcomes for the demonstration and comparison groups in the baseline period.

The specification for models assuming parallel trends is shown in **Equation 1**:

$$Y_{ijt} = f(\beta_0 + D_i\beta + \sum_t \text{Year}_{t,b}\beta_t + \sum_k \text{Year}_{k,p}\beta_k + \sum_k (D_i * \text{Year}_{k,p})\delta_k + X_{ijt}\theta + \varepsilon_{it}), \quad (\text{Eq. 1})$$

where:

- $D_i (= 0, 1)$ indicates if beneficiary i resides in the section 1115 SUD demonstration state.
- $\text{Year}_{t,b}$ is a series of dummy variables for the baseline measurement years. The subscript t denotes year t out of b baseline years.
- $\text{Year}_{k,p}$ is a series of dummy variables for the implementation measurement years. The subscript k denotes year k out of p implementation years.
- X_{ijt} denotes the set of model covariates (see Table A-3 above).
- δ_k is the coefficient of interest, capturing the impact of the section 1115 SUD demonstration relative to a comparison group in implementation year k .

The alternative DID specification that assumes an underlying difference in trends across the demonstration and comparison groups is shown in **Equation 2**:

$$Y_{ijt} = f(\beta_0 + D_i\beta + \text{Trnd}_i\theta_0 + D_i\text{Trnd}_i\theta_1 + \sum_k \text{Year}_{k,p}\beta_k + \sum_k (D_i * \text{Year}_{k,p})\delta_k + X_{ijt}\theta + \varepsilon_{it}), \quad (\text{Eq. 2})$$

where:

- $\text{Trnd}_i (= 1, 2, \dots, T)$ denotes a linear trend variable that takes the values 1 for the first measurement year, 2 for the second measurement year, and so on up to the last measurement year.

- All other notation is equivalent to specification (Equation 1).

The linear trend term and the interaction of the linear trend term with the demonstration group indicator (D_i) in Equation 2 allow for baseline trends to differ between the demonstration and comparison groups. By extending the trend term across the baseline and demonstration periods, Equation 2 alters the interpretation of δ_k . Specifically, this coefficient now measures the relative change in outcome Y_{jt} after netting out the expected difference in changes that can be attributed to preexisting differences in the outcome trends across groups, which are measured by θ_l . To see this, in the special case of a linear functional form, note that the DID calculation will result in the linear combination of parameters: $\theta_l + \delta_k$. Since θ_l captures the underlying difference in trend across the demonstration and comparison groups, δ_k is a DID impact estimate after subtracting the underlying difference in trends. Where baseline trends are not monotonic—generally increasing or generally decreasing—the model may not produce plausible results.

Estimation. As noted above in the *Outcome Measures* section, all outcomes used in DID models were binary variables, measuring any use during each calendar quarter. Outcomes were modeled using logistic regression.

Calculation of Impact Estimates and Adjusted Means. We produced DID estimates of section 1115 SUD demonstration impacts for each calendar quarter, and overall DID estimates were a weighted average of the quarterly DID estimates. The weights used to calculate the weighted average were based on the number of observations in the demonstration group in each calendar quarter. Overall standard errors, used to create confidence intervals and p-values for the overall DID estimates, were also created as a function of the weighted standard errors.

For each outcome, regression-adjusted means were calculated for the SUD demonstration and comparison groups during the baseline period, in each demonstration quarter, and for the entire demonstration period. Adjusted means during the baseline period represent the average of the outcome during the baseline period, controlling for beneficiary and county-level characteristics. Adjusted means during the demonstration period represent the average of the outcome for each quarter during the demonstration, controlling for beneficiary and county-level characteristics. The overall adjusted mean is a weighted average of the quarter-specific adjusted means calculated for each of the quarters following demonstration implementation. The weights used in this calculation were chosen to account for the fact that the size of the demonstration (and comparison) group varied across quarters. The weights were the number of demonstration (or comparison) beneficiaries observed in each quarter divided by the total number of demonstration (or comparison) beneficiary-quarters observed during the implementation period.

Limitations

We rely on claims data to identify beneficiaries with SUD and SUD treatment utilization. Because of this, we are only able to identify beneficiaries with SUD who are treated for that condition during the study period. Individuals with undiagnosed or untreated SUD are not captured in the measures used in this report, so our analyses only reflect service use for beneficiaries that received any treatment and overstate treatment rates among all those who may need services. In addition, as mentioned above, outcome measures may not capture all treatments beneficiaries receive because they do not include services that are not paid by Medicaid.

The individual characteristics used in propensity scores and as covariates are limited to features captured by eligibility and claims processing systems in the TAF RIF. We are not able to control for other factors that could differ between demonstration states and their comparison groups and may influence SUD treatment use. These include family structure or family involvement, social influences (e.g., prevalence of substance use in the school or community), and access to SUD treatment providers (although we use county-level measures of rurality and hospital and physician supply as proxies).

The covariates we used to control for potential confounding effects from new Medicaid eligibility expansions and the COVID-19 pandemic may not fully capture those impacts. Newly eligible beneficiaries may have higher levels of untreated SUD and/or may have delayed treatment in anticipation of becoming Medicaid-eligible, leading to greater service use immediately after expansion than similar beneficiaries in the comparison group because those states expanded previously, and the initial surge of pent-up demand may have subsided. The PVI adjusts for risk of cases and deaths, but not whether states or large urban areas within states cut capacity in residential or outpatient facilities, which may have resulted in differential impacts that get attributed to the demonstration.

Results from DID models that assumed parallel trends were not always robust when the same model was run assuming nonparallel baseline trends. Where the results of these sensitivity analyses are consistent, confidence in the direction of impact is higher. Where results differ, the direction and/or magnitude of the effect is uncertain.

These analyses were limited by the number of years of baseline and demonstration data available. We were limited to two years of demonstration data for nine states, and it may take more time to see impacts on SUD-related utilization resulting from the demonstrations. Any state may have experienced delays and challenges in implementation during the demonstration period, especially due to the COVID-19 public health emergency. It is important that future analyses continue assessing whether impacts change over time.

Concerns about the completeness and quality of TAF data for some states are well-recognized. We reviewed findings on the quality of states' TAF RIF in the CMS Data Quality (DQ) Atlas and conducted our own data assessment during the processing of claims into our analytic files to understand how data issues might impact findings. For example, utilization trends could be influenced by changes in the

completeness of data reported. High rates of missingness in critical data elements (diagnosis, procedure, revenue, place of service codes, and National Drug Codes) in some states could also affect our ability to identify SUD treatment. We omitted California and Rhode Island from these analyses because missing and inaccurate data prevented accurate measurement of baseline and demonstration service use. We excluded Maryland because its TAF data lacked diagnosis codes for the entire baseline period, making identification of all beneficiaries treated for SUD impossible. Although we included Utah, high rates of missingness or low data quality can also affect our ability to control for important covariates. Race/ethnicity is missing for high percentages of beneficiaries in some states. As described in the propensity score section, we created an indicator for missing race/ethnicity to be able to include race/ethnicity in our models without losing large numbers of observations.

Appendix B: State-Level Results

This appendix presents state-level trends and estimates of demonstration impacts for each of the 17 states included in this report, and their comparison groups. Descriptive information provided for each state includes:

- Trends in the number of beneficiaries treated for SUD and beneficiaries treated for SUD as a percentage of all Medicaid beneficiaries in the demonstration state and its propensity-score weighted comparison group for 2016-2020.
- Trends for the percentages of beneficiaries treated for SUD receiving any SUD-related institutional service, any SUD-related outpatient service, any WM service, and any MAT service in the demonstration state and its propensity-score weighted comparison group for 2016-2020.

This appendix also shows estimates of the demonstration's impacts, among beneficiaries treated for SUD, on receipt of any SUD-related institutional service, any SUD-related outpatient service, WM, and MAT in the demonstration state relative to its comparison group. The estimates come from DID models, described in **Appendix A**. Results presented for each outcome include the following:

- DID estimates of impacts for each quarter and the entire demonstration period.
- 90% confidence intervals for the estimated impacts, which gives a sense of the uncertainty of a particular estimate; wider confidence intervals indicate less certainty about the estimated impact.
- Relative differences, which measure change in the outcome from the baseline period in relation to the change for the comparison group.
- p-values, which indicate whether the DID estimates for the demonstration state are statistically significant from the values for the comparison group; the lower the p-value, the more likely that the estimated impacts reflect the direction of effect due to the demonstration, although the magnitude may be higher or lower than the estimated DID and relative difference.

The final component for each state is a set of sensitivity analyses where DID models that assumed parallel trends were re-run using the nonparallel trends version of the model. Consistent results build confidence in the findings, while inconsistent results add uncertainty about the magnitude and/or direction of effect.

Alaska

Trends in Alaska's SUD-Related Treatment Outcomes

Exhibits AK-1 and AK-2 show weight-adjusted trends in the number of beneficiaries treated for SUD and beneficiaries treated for SUD as a percentage of all Medicaid beneficiaries in Alaska and its comparison group for 2016-2020.

Exhibit AK-1. Number of Medicaid beneficiaries treated for SUD in Alaska and its comparison group, 2016-2020

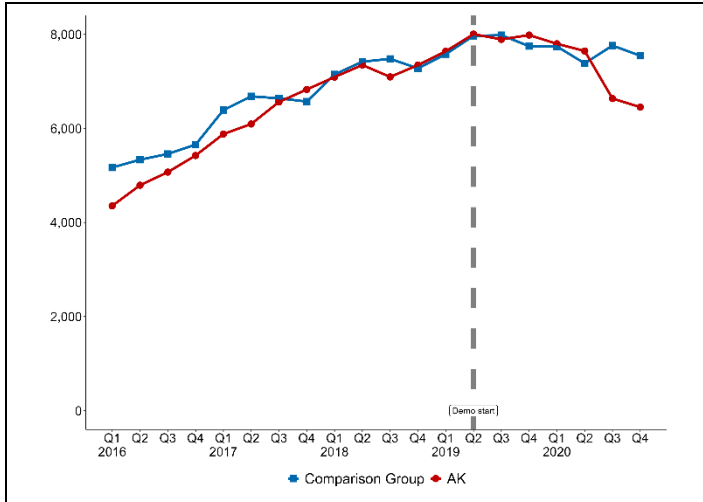
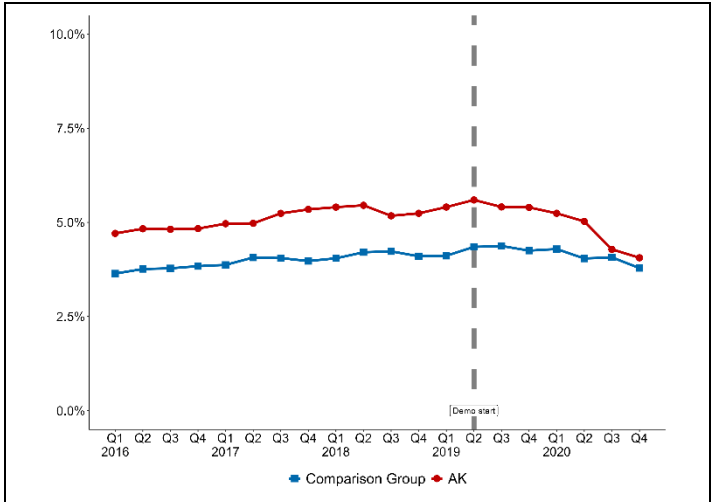


Exhibit AK-2. Beneficiaries treated for SUD as a percent of Medicaid beneficiaries in Alaska and its comparison group, 2016-2020



Notes: SUD = Substance Use Disorder

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare.

Source: RTI analysis of TAF RIF data

Exhibits AK-3 through AK-6 present weight-adjusted trends for the percentages of Medicaid beneficiaries treated for SUD receiving any SUD-related institutional service, any SUD-related outpatient service, any WM service, and any MAT in Alaska and its comparison group for 2016-2020.

Exhibit AK-3. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related institutional services in Alaska and its comparison group, 2016-2020

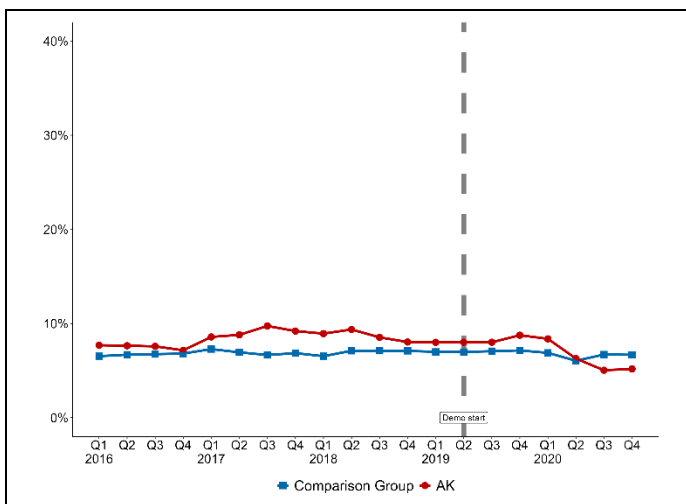
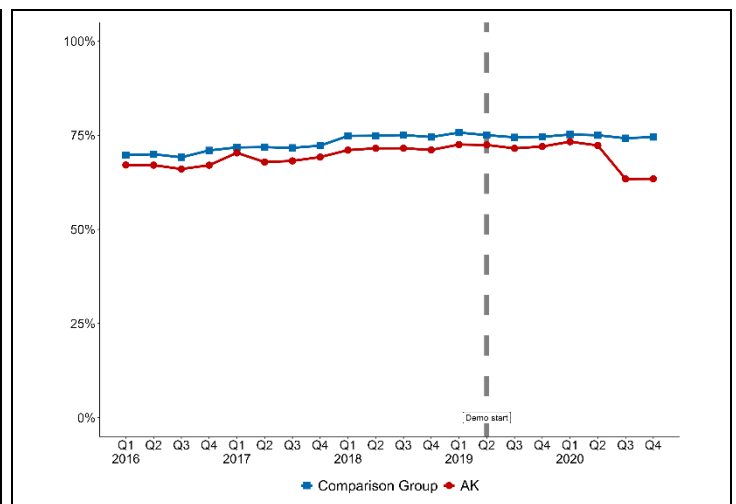


Exhibit AK-4. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related outpatient services in Alaska and its comparison group, 2016-2020



Notes: SUD = Substance Use Disorder; In Alaska, residential services furnished in IMDs were newly reimbursed by Medicaid under the demonstration

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD

Source: RTI analysis of TAF RIF data

Exhibit AK-5. Percent of Medicaid beneficiaries treated for SUD receiving WM services in Alaska and its comparison group, 2016–2020

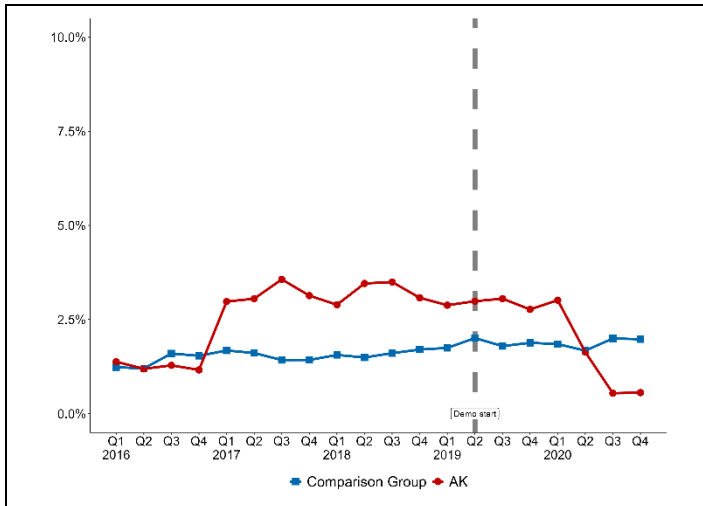
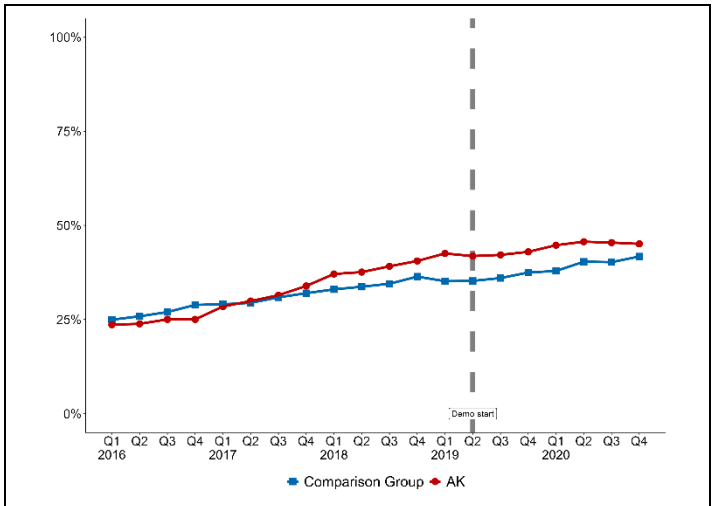


Exhibit AK-6. Percent of Medicaid beneficiaries treated for SUD receiving MAT services in Alaska and its comparison group, 2016–2020



Notes: MAT = Medicine-assisted treatment; SUD = Substance Use Disorder; In Alaska, residential provider standards were updated to require access to MAT under the demonstration

Sample: Medicaid beneficiaries ages 12–64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD

Source: RTI analysis of TAF RIF data

Alaska’s SUD Demonstration Impact Results

Exhibit AK-7 shows the DID model estimates of the demonstration’s impacts use of any SUD-related institutional service, any SUD-related outpatient service, any WM services, and any MAT among Medicaid beneficiaries treated for SUD in Alaska relative to its comparison group.

Exhibit AK-7. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in Alaska

Quarter and year	DID estimate (percentage points)	90% confidence interval	Relative difference (%)	p-value
Use of institutional services				
Q2 2019	-0.01	(-0.03, 0.01)	-5.70	0.46
Q3 2019	-0.01	(-0.03, 0.01)	-6.82	0.27
Q4 2019	-0.01	(-0.02, 0.01)	-3.34	0.65
Q1 2020	0.00	(-0.02, 0.01)	-1.40	0.80
Q2 2020	0.00	(-0.01, 0.01)	-1.48	0.75
Q3 2020	-0.02	(-0.05, -0.00)	-15.25	0.07
Q4 2020	-0.02	(-0.04, -0.00)	-14.66	0.07
Overall	-0.01	(-0.03, 0.01)	-6.57	0.33
Use of outpatient services				
Q2 2019	-0.01	(-0.03, 0.01)	-1.02	0.54
Q3 2019	-0.01	(-0.03, 0.01)	-1.12	0.51
Q4 2019	0.00	(-0.03, 0.02)	-0.49	0.79
Q1 2020	0.00	(-0.02, 0.02)	0.65	0.74
Q2 2020	0.01	(-0.03, 0.05)	1.17	0.71
Q3 2020	-0.07	(-0.13, -0.01)	-8.92	0.07
Q4 2020	-0.07	(-0.12, -0.02)	-9.37	0.03
Overall	-0.02	(-0.05, 0.01)	-2.42	0.37
Use of WM services				
Q2 2019	-0.01	(-0.01, 0.00)	-8.57	0.28
Q3 2019	0.00	(-0.01, 0.00)	-2.23	0.67
Q4 2019	-0.01	(-0.01, 0.00)	-9.76	0.16

Quarter and year	DID estimate (percentage points)	90% confidence interval	Relative difference (%)	p-value
Q1 2020	0.00	(-0.01, 0.01)	4.68	0.58
Q2 2020	0.00	(-0.02, 0.01)	-4.83	0.74
Q3 2020	-0.02	(-0.03, -0.01)	-28.11	0.00
Q4 2020	-0.02	(-0.03, -0.01)	-27.50	0.00
Overall	-0.01	(-0.02, 0.00)	-10.08	0.25
Use of MAT services				
Q2 2019	0.00	(-0.02, 0.03)	1.56	0.77
Q3 2019	-0.01	(-0.03, 0.01)	-3.52	0.47
Q4 2019	-0.02	(-0.04, 0.00)	-8.10	0.11
Q1 2020	0.00	(-0.03, 0.03)	-0.43	0.96
Q2 2020	-0.03	(-0.08, 0.01)	-11.65	0.30
Q3 2020	-0.04	(-0.11, 0.03)	-15.06	0.38
Q4 2020	-0.06	(-0.14, 0.02)	-23.50	0.20
Overall	-0.02	(-0.06, 0.02)	-8.09	0.40

DID = difference-in-differences.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD in Alaska and its comparison group.

Methods: A logistic regression model was used to obtain estimates. Results are weighted by the fraction of time the beneficiary was enrolled in Medicaid (eligibility fraction) and the propensity score weight. DID models for all outcomes assumed parallel trends in the baseline period except for MAT, for which nonparallel trends were assumed. Appendix A details the methods.

How to interpret the results: The relative difference is the DID estimate as a percentage of the demonstration state's baseline period adjusted mean. A *negative* value for the relative difference 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 state than in the comparison group.

Note: In Alaska, Medicaid coverage for intensive outpatient, partial hospitalization, and WM services was added or expanded under the demonstration. Residential care (other than by IMDs) and MAT (including methadone) were already covered prior to the demonstration. Residential standards requiring access to MAT were added under the demonstration.

Source: RTI analysis of TAF RIF data

Sensitivity Analysis

Exhibit AK-8 compares the impact estimates for Alaska's outcomes from DID models that assume nonparallel baseline trends (sensitivity analysis) and models that assume parallel baseline trends (main analysis). We did not conduct a sensitivity analysis for outcomes where the main model assumed nonparallel baseline trends. All estimates for these outcomes are not statistically significant regardless of the DID model form, which reinforces the lack of measurable impacts on use of these services by beneficiaries treated for SUD in Alaska relative to the comparison group.

Exhibit AK-8. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in Alaska under different model assumptions

Outcome	Parallel trends assumption	Main analysis: Regression-adjusted relative difference (%) (90% C.I.)	Sensitivity analysis: Regression-adjusted relative difference (%) (90% C.I.)
Any SUD-related Institutional Service	Main: Parallel Sensitivity: Not Parallel	-6.57 (-18.38, 4.40)	-9.58 (-23.98, 1.58)
Any SUD-related Outpatient Service	Main: Parallel Sensitivity: Not Parallel	-2.42 (-6.90, 2.02)	-0.55 (-5.01, 3.98)
Any WM	Main: Parallel Sensitivity: Not Parallel	-10.08 (-54.81, 11.73)	-39.03 (-200.38, 108.67)

* p<0.10; ** p<0.05; *** p<0.01.

DID = difference-in-differences; C.I. = confidence interval.

Source: RTI analysis of TAF RIF data.

Illinois

Trends in Illinois' SUD-Related Treatment Outcomes

Exhibits IL-1 and IL-2 show weight-adjusted trends in the number of beneficiaries treated for SUD and beneficiaries treated for SUD as a percentage of all Medicaid beneficiaries in Illinois and its comparison group for 2016–2020.

Exhibit IL-1. Number of Medicaid beneficiaries treated for SUD in Illinois and its comparison group, 2016–2020

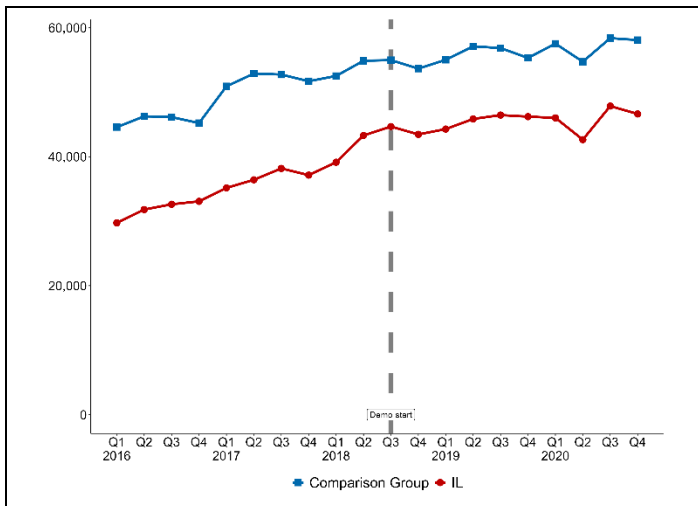
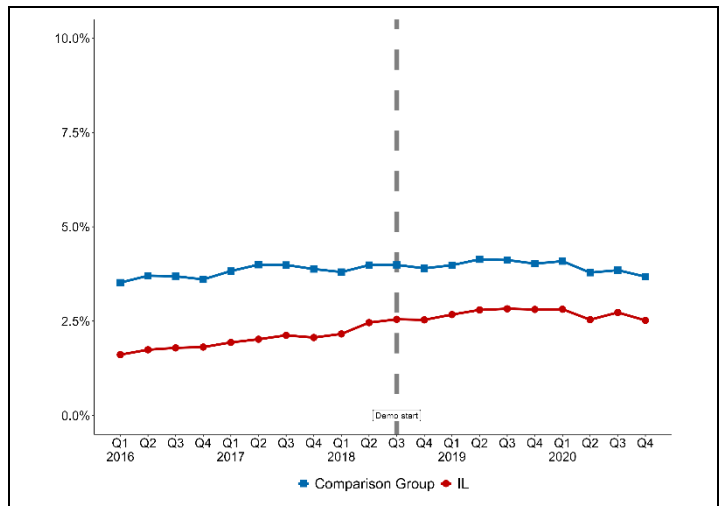


Exhibit IL-2. Beneficiaries treated for SUD as a percent of Medicaid beneficiaries in Illinois, 2016–2020



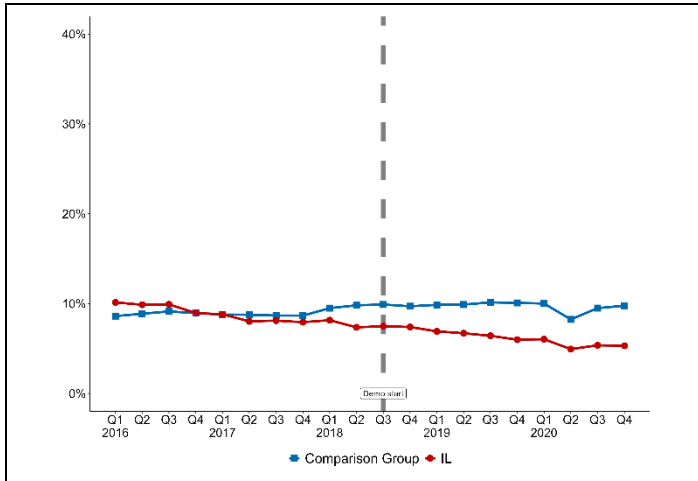
Notes: SUD = Substance Use Disorder

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare

Source: RTI analysis of TAF RIF data

Exhibits IL-3 through IL-6 present weight-adjusted trends for the percentages of beneficiaries treated for SUD receiving any SUD-related institutional service, any SUD-related outpatient service, any WM, and any MAT in Illinois and its comparison group for 2016–2020.

Exhibit IL-3. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related institutional services in Illinois, 2016–2020

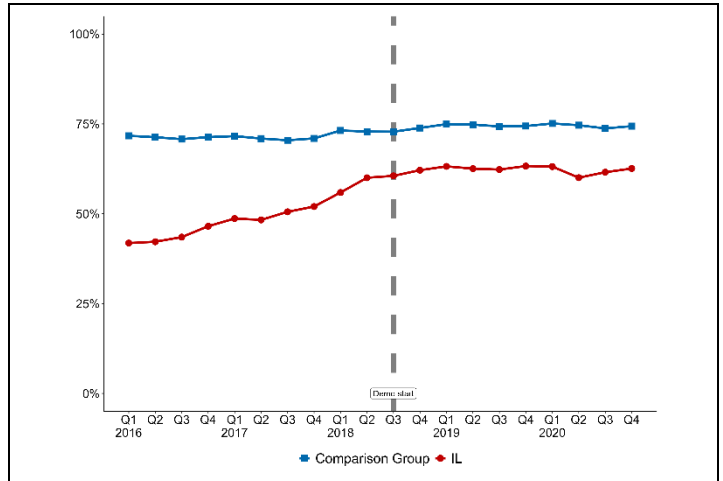


Notes: SUD = Substance Use Disorder. Medicaid coverage was expanded to IMDs under Illinois’s demonstration. We may have slightly underestimated institutional service use in 2016 because of missing diagnosis codes on long-term care records, and in all years because of missing/invalid procedure codes on facility claims in the Other Services (OT) file. Any bias in DID models was likely minimal.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD

Source: RTI analysis of TAF RIF data

Exhibit IL-4. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related outpatient services in Illinois, 2016–2020

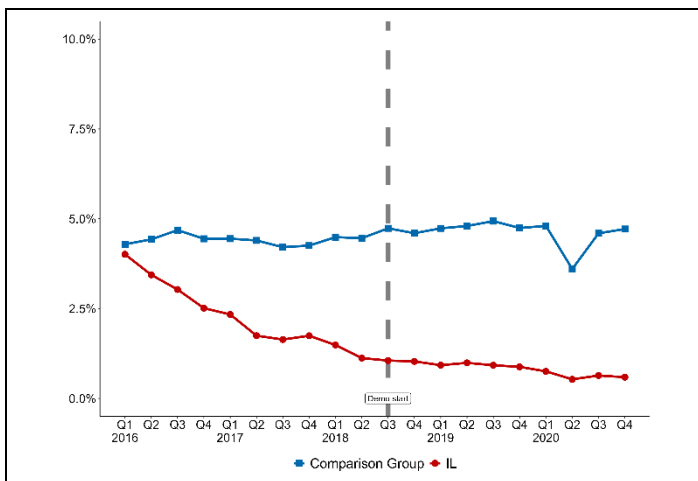


Notes: SUD = Substance Use Disorder. We may have slightly underestimated outpatient service use for Illinois in all years because of a known data quality issue with missing/invalid procedure codes on facility claims in the Other Services (OT) file. Any bias in DID models was likely minimal.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD

Source: RTI analysis of TAF RIF data

Exhibit IL-5. Percent of Medicaid beneficiaries treated for SUD receiving WM services in Illinois, 2016 – 2020

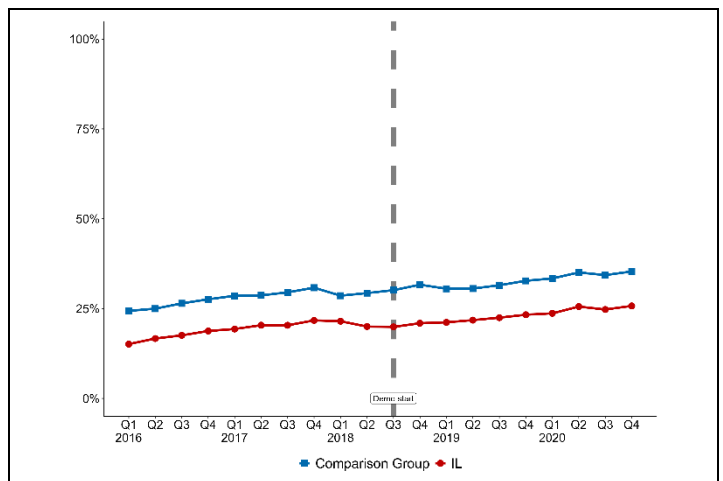


Notes: SUD = Substance Use Disorder; Illinois Medicaid newly covered WM under the demonstration;

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD

Source: RTI analysis of TAF RIF data

Exhibit IL-6. Percent of Medicaid beneficiaries treated for SUD receiving MAT services in Illinois, 2016 – 2020



Notes: MAT = Medication-assisted treatment; SUD = Substance Use Disorder; Residential coverage was expanded to IMDs under Illinois’ demonstration

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD

Source: RTI analysis of TAF RIF data

Illinois SUD Demonstration Impact Results

Exhibit IL-7 shows the DID model estimates of the demonstration's impacts use of any SUD-related institutional service, any SUD-related outpatient service, WM, and MAT in Illinois relative to its comparison group.

Table IL-7. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in Illinois

Outcome	Regression-adjusted DID (percentage points)	90% confidence interval	Relative difference (%)	p-value
Use of Any SUD-related institutional services				
Q3 2018	0.00	(-0.00, 0.00)	0.66	0.78
Q4 2018	0.00	(0.00, 0.01)	4.43	0.03
Q1 2019	0.00	(-0.00, 0.01)	1.65	0.45
Q2 2019	0.00	(-0.00, 0.01)	2.18	0.26
Q3 2019	0.00	(-0.00, 0.00)	0.45	0.85
Q4 2019	-0.00	(-0.00, 0.00)	-0.12	0.96
Q1 2020	0.00	(-0.00, 0.01)	2.73	0.30
Q2 2020	0.00	(-0.00, 0.01)	3.39	0.43
Q3 2020	0.00	(-0.00, 0.01)	3.30	0.43
Q4 2020	0.00	(-0.00, 0.01)	3.51	0.44
Overall	0.00	(-0.00, 0.01)	2.21	0.44
Use of Any SUD-related outpatient services				
Q3 2018	-0.00	(-0.02, 0.02)	-0.28	0.93
Q4 2018	-0.01	(-0.04, 0.01)	-2.87	0.45
Q1 2019	-0.04	(-0.07, -0.00)	-8.89	0.07
Q2 2019	-0.06	(-0.10, -0.02)	-13.86	0.01
Q3 2019	-0.07	(-0.11, -0.03)	-16.31	0.01
Q4 2019	-0.07	(-0.12, -0.03)	-17.40	0.00
Q1 2020	-0.10	(-0.16, -0.05)	-24.27	0.00
Q2 2020	-0.15	(-0.21, -0.09)	-34.81	0.00
Q3 2020	-0.14	(-0.21, -0.08)	-33.69	0.00
Q4 2020	-0.15	(-0.22, -0.08)	-35.07	0.00
Overall	-0.08	(-0.13, -0.04)	-18.89	0.00

Outcome	Regression-adjusted DID (percentage points)	90% confidence interval	Relative difference (%)	p-value
Use of Any SUD-related WM services				
Q3 2018	-0.00	(-0.00, 0.00)	-0.83	0.47
Q4 2018	0.00	(0.00, 0.00)	3.49	0.05
Q1 2019	0.00	(0.00, 0.00)	3.61	0.04
Q2 2019	0.00	(0.00, 0.00)	7.40	0.00
Q3 2019	0.00	(0.00, 0.00)	7.40	0.00
Q4 2019	0.00	(0.00, 0.00)	8.83	0.00
Q1 2020	0.00	(0.00, 0.00)	7.40	0.01
Q2 2020	0.00	(0.00, 0.00)	6.35	0.01
Q3 2020	0.00	(0.00, 0.00)	8.58	0.00
Q4 2020	0.00	(0.00, 0.00)	7.93	0.00
Overall	0.00	(0.00, 0.00)	6.07	0.00
Use of Any SUD-related MAT services				
Q3 2018	-0.01	(-0.02, -0.00)	-5.73	0.12
Q4 2018	-0.01	(-0.03, -0.00)	-6.35	0.10
Q1 2019	-0.00	(-0.01, 0.01)	-0.90	0.81
Q2 2019	0.00	(-0.01, 0.02)	2.56	0.48
Q3 2019	0.00	(-0.01, 0.02)	1.41	0.73
Q4 2019	0.00	(-0.01, 0.01)	1.06	0.81
Q1 2020	0.00	(-0.01, 0.02)	1.53	0.74
Q2 2020	0.01	(-0.01, 0.03)	5.31	0.34
Q3 2020	0.01	(-0.01, 0.03)	4.61	0.50
Q4 2020	0.01	(-0.01, 0.03)	4.94	0.47
Overall	0.00	(-0.01, 0.02)	0.90	0.85

DID = difference-in-differences.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD in Illinois and its comparison group.

Methods: A logistic regression model was used to obtain estimates. Results are weighted by the fraction of time the beneficiary was enrolled in Medicaid (eligibility fraction) and the propensity score weight. DID models for all outcomes assumed nonparallel trends in the baseline period except for MAT, for which parallel trends were assumed. Appendix A details the methods.

How to interpret the results: The relative difference is the DID estimate as a percentage of the demonstration state's baseline period adjusted mean. A *negative* value for the relative difference 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 state than in the comparison group.

Note: In Illinois, Medicaid coverage residential services and WM services was added or expanded under the demonstration Residential standards requiring access to MAT were added under the demonstration.

Source: RTI analysis of TAF RIF data

Sensitivity Analysis

Exhibit IL-8 shows how the impact estimates for Illinois’s outcomes differ when DID models that we ran assuming parallel trends were rerun assuming nonparallel baseline trends. We did not conduct a sensitivity analysis for outcomes where the main model assumed nonparallel baseline trends. The estimates for MAT are not statistically significant regardless of the DID model form, which reinforces the lack of measurable impacts for beneficiaries treated for SUD in Illinois relative to the comparison group.

Exhibit IL-8. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in Illinois under different model assumptions

Outcome	Parallel trends assumption	Main analysis: Regression-adjusted relative difference (%) (90% C.I.)	Sensitivity analysis: Regression-adjusted relative difference (%) (90% C.I.)
Any MAT	Main: Parallel Sensitivity: Not parallel	0.90 (-6.97, 8.63)	-12.49 (-25.51, 0.28)

* p<0.10; ** p<0.05; *** p<0.01.

C.I. = confidence interval; DID = difference-in-differences.

Source: RTI analysis of TAF RIF data.

Indiana

Trends in Indiana’s SUD-Related Treatment Outcomes

Exhibits IN-1 and IN-2 show weight-adjusted trends in the number of beneficiaries treated for SUD and beneficiaries treated for SUD as a percentage of all Medicaid beneficiaries in Indiana and its comparison group for 2016-2020.

Exhibit IN-1. Number of Medicaid beneficiaries treated for SUD in Indiana, 2016–2020

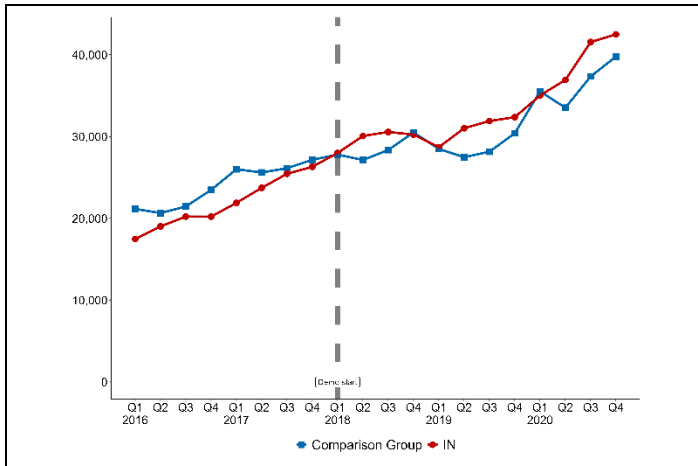
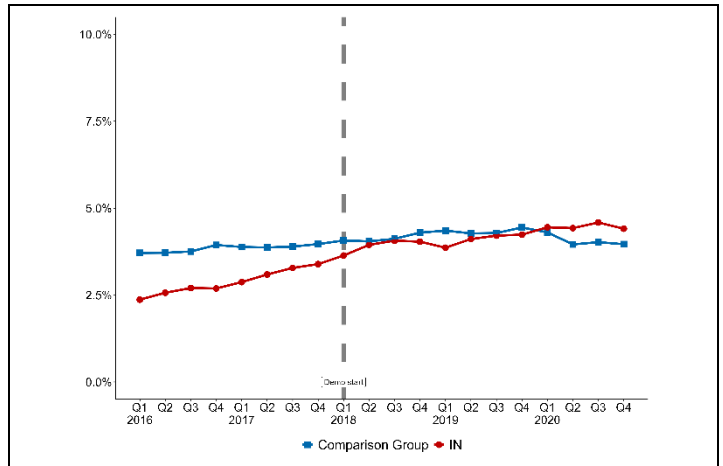


Exhibit IN-2. Beneficiaries treated for SUD as a percent of Medicaid beneficiaries in Indiana and its comparison group, 2016–2020



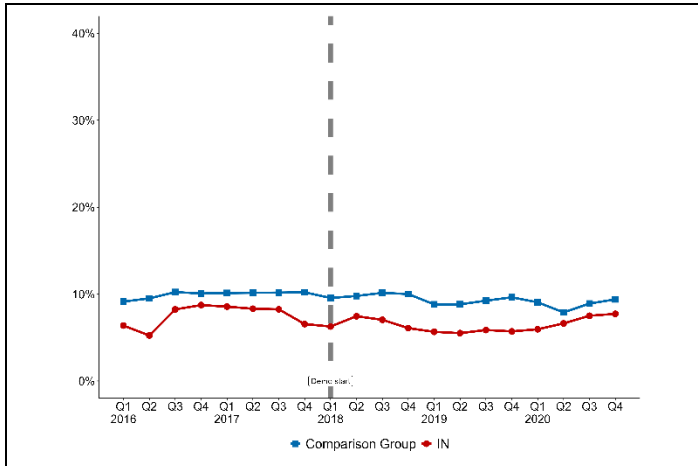
Notes: SUD = Substance Use Disorder

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare

Source: RTI analysis of TAF RIF data

Exhibits IN-3 through IN-6 present weight-adjusted trends for the percentages of beneficiaries treated for SUD receiving any SUD-related institutional service, any SUD-related outpatient service, any WM, and any MAT in Indiana and its comparison group for 2016–2020.

Exhibit IN-3. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related institutional services in Indiana and its comparison group, 2016–2020

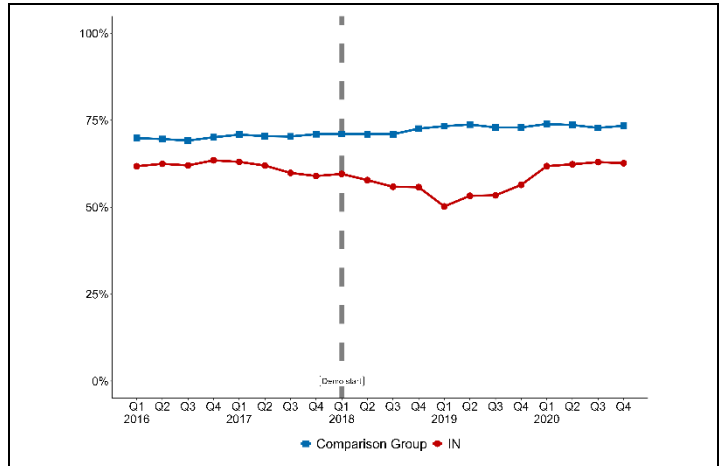


Notes: SUD = Substance Use Disorder; Indiana Medicaid began reimbursing for residential care under the demonstration. The DQ Atlas listed the completeness of inpatient (IP) managed care encounters in Indiana as medium-to-high concern in all study years due to factors such as low volume, relatively few line items per claim, and number of plans with no encounter data in the IP file. We may underestimate institutional service use but any bias introduced in DID models is likely minimal.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD

Source: RTI analysis of TAF RIF data

Exhibit IN-4. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related outpatient services in Indiana and its comparison group, 2016–2020

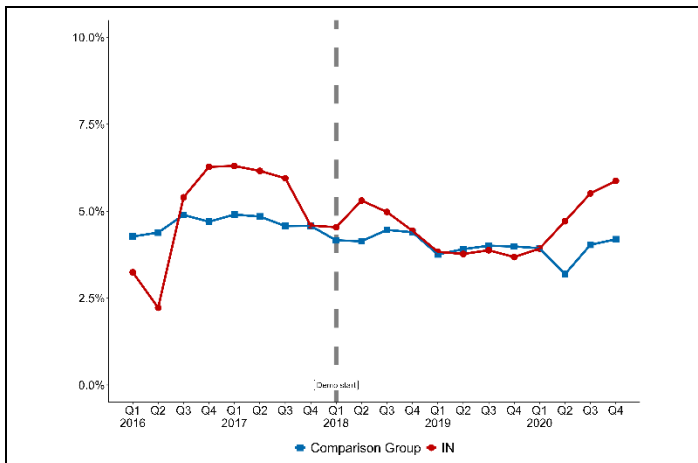


Notes: SUD = Substance Use Disorder; Indiana Medicaid began allowing managed care organizations to bill for IOP under the demonstration. The DQ Atlas judged completeness of other services (OT) managed care encounter volume in Indiana to be medium concern in 2019-2020 due to low volume. We may underestimate outpatient service use in 2019 and maybe 2020, because most SUD services are identified through OT records.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD

Source: RTI analysis of TAF RIF data

Exhibit IN-5. Percent of Medicaid beneficiaries treated for SUD receiving WM services in Indiana and its comparison group, 2016–2020

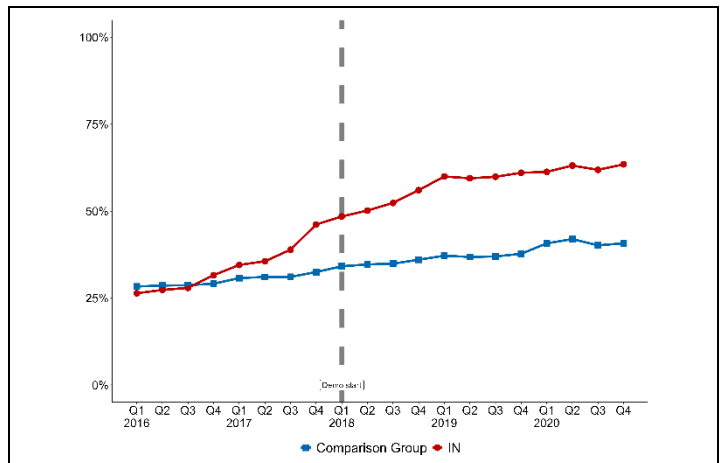


Notes: SUD = Substance Use Disorder; Admission guidelines for WM were revised under Indiana’s demonstration.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD

Source: RTI analysis of TAF RIF data

Exhibit IN-6. Percent of Medicaid beneficiaries treated for SUD receiving MAT services in Indiana and its comparison group, 2016–2020



Notes: MAT = Medication-assisted treatment; SUD = Substance Use Disorder; Residential providers were required to provide access to MAT under Indiana’s demonstration.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD

Source: RTI analysis of TAF RIF data

Indiana SUD Demonstration Impact Results

Exhibit IN-7 shows the DID model estimates of the demonstration's impacts use of any SUD-related institutional service, any SUD-related outpatient service, WM, and MAT in Indiana relative to its comparison group.

Exhibit IN-7. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in Indiana

Outcome	DID estimate (percentage points)	90% confidence interval	Relative difference (%)	p-value
Use of institutional services				
Q1 2018	-0.01	(-0.01, -0.00)	-12.01	0
Q2 2018	0.00	(-0.01, 0.01)	-1.71	0.76
Q3 2018	-0.01	(-0.01, -0.00)	-9.93	0.09
Q4 2018	-0.01	(-0.02, -0.01)	-18.28	0.01
Q1 2019	-0.01	(-0.02, -0.00)	-16.33	0.04
Q2 2019	-0.01	(-0.02, -0.00)	-19.52	0.02
Q3 2019	-0.01	(-0.02, -0.00)	-18.37	0.03
Q4 2019	-0.02	(-0.03, -0.01)	-21.83	0
Q1 2020	-0.01	(-0.02, -0.00)	-13.49	0.09
Q2 2020	0	(-0.00, 0.01)	6.02	0.39
Q3 2020	0	(-0.00, 0.01)	4.71	0.47
Q4 2020	0	(-0.01, 0.01)	4.39	0.56
Overall	-0.01	(-0.01, 0.00)	-8.72	0.21
Use of outpatient services				
Q1 2018	-0.02	(-0.03, -0.01)	-2.88	0.02
Q2 2018	-0.03	(-0.05, -0.01)	-4.35	0.01
Q3 2018	-0.04	(-0.07, -0.02)	-6.36	0.01
Q4 2018	-0.05	(-0.09, -0.02)	-8.26	0.01
Q1 2019	-0.13	(-0.02, -0.10)	-20.04	0
Q2 2019	-0.10	(-0.14, -0.06)	-14.9	0
Q3 2019	-0.08	(-0.13, -0.04)	-12.71	0
Q4 2019	-0.06	(-0.11, -0.03)	-8.38	0.08
Q1 2020	0.01	(-0.06, 0.07)	0.93	0.87
Q2 2020	0.01	(-0.05, 0.08)	2.16	0.72
Q3 2020	0.03	(-0.04, 0.10)	4.16	0.51
Q4 2020	0.02	(-0.06, 0.09)	2.58	0.7
Overall	-0.03	(-0.08, 0.01)	-4.95	0.25
Use of WM services				
Q1 2018	0.00	(-0.00, 0.00)	-0.96	0.87
Q2 2018	0.01	(0.00, 0.01)	13.62	0.05
Q3 2018	0.00	(-0.01, 0.00)	-2.67	0.77
Q4 2018	0.00	(-0.01, 0.00)	-10.19	0.28
Q1 2019	0.00	(-0.01, 0.00)	-10.88	0.38
Q2 2019	-0.01	(-0.02, 0.00)	-17.6	0.17
Q3 2019	-0.01	(-0.02, -0.00)	-17.92	0.14
Q4 2019	-0.01	(-0.02, -0.00)	-21.12	0.08
Q1 2020	0	(-0.01, -0.00)	-10.85	0.35
Q2 2020	0.01	(0.00, 0.02)	21.54	0.02
Q3 2020	0.01	(0.00, 0.01)	16.89	0.09
Q4 2020	0.01	(0.00, 0.02)	21.44	0.06
Overall	0.00	(-0.01, 0.01)	-0.23	0.98
Use of MAT services				
Q1 2018	0.02	(0.02, 0.03)	9.37	0
Q2 2018	0.01	(0.00, 0.02)	5.08	0.05
Q3 2018	0.00	(-0.01, 0.02)	1.89	0.6
Q4 2018	0.00	(-0.01, 0.02)	1.29	0.75
Q1 2019	0.03	(0.01, 0.06)	12.05	0.04
Q2 2019	0.01	(-0.01, 0.04)	4.36	0.47
Q3 2019	-0.01	(-0.04, 0.02)	-2.37	0.73
Q4 2019	-0.02	(-0.06, 0.01)	-8.97	0.22
Q1 2020	-0.07	(-0.11, -0.03)	-26.5	0
Q2 2020	-0.08	(-0.12, -0.05)	-30.82	0
Q3 2020	-0.09	(-0.13, -0.05)	-35.22	0
Q4 2020	-0.1	(-0.13, -0.06)	-37.95	0
Overall	-0.03	(-0.06, -0.00)	-11.32	0.07

DID = difference-in-differences.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD in Indiana and its comparison group.

Methods: A logistic regression model was used to obtain estimates. Results are weighted by the fraction of time the beneficiary was enrolled in Medicaid (eligibility fraction) and the propensity score weight. DID models for all outcomes assumed parallel trends in the baseline period except for outpatient services and MAT, for which nonparallel trends were assumed. Appendix A details the methods.

How to interpret the results: The relative difference is the DID estimate as a percentage of the demonstration state's baseline period adjusted mean. A *negative* value for the relative difference 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 state than in the comparison group.

Note: In Indiana, Medicaid coverage residential services, intensive outpatient services, and WM services was added or expanded under the demonstration. Residential standards requiring access to MAT were added under the demonstration.

Source: RTI analysis of TAF RIF data

Sensitivity Analysis

Exhibit IN-8 shows how the impact estimates for Indiana’s demonstration differ when DID models that we ran assuming parallel trends were rerun assuming nonparallel baseline trends. We did not conduct a sensitivity analysis for outcomes where the main model assumed nonparallel baseline trends. These results suggest that demonstration impacts may be larger than those estimated by the main DID models.

Exhibit IN-8. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in Indiana under different model assumptions

Outcome	Parallel trends assumption	Main analysis: Regression-adjusted relative difference (%) (90% C.I.)	Sensitivity analysis: Regression-adjusted relative difference (%) (90% C.I.)
Any SUD-related Institutional Service	Main: Parallel Sensitivity: Not Parallel	-8.72 (-20.62, 2.89)	-10.86 (-37.27, 14.92)
Any WM	Main: Parallel Sensitivity: Not parallel	-0.23 (-17.19, 16.28)	-64.58* (-128.94, -1.35)

* p<0.10; ** p<0.05; *** p<0.01.

Notes: DID = difference-in-differences; C.I. = confidence interval

Source: RTI analysis of TAF RIF data

Kentucky

Trends in SUD-Related Treatment Outcomes

Exhibits KY-1 and KY-2 show weight-adjusted trends in the number of beneficiaries treated for SUD and beneficiaries treated for SUD as a percentage of all Medicaid beneficiaries in Kentucky and its comparison group for 2016-2020.

Exhibit KY-1. Number of Medicaid beneficiaries treated for SUD in Kentucky, 2016–2020

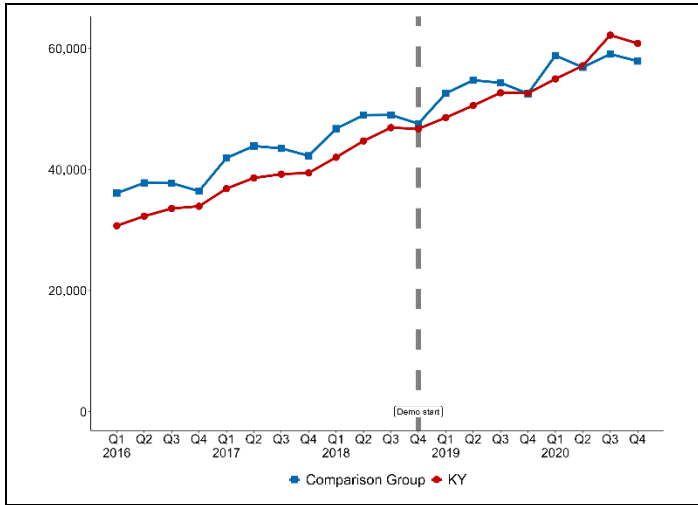
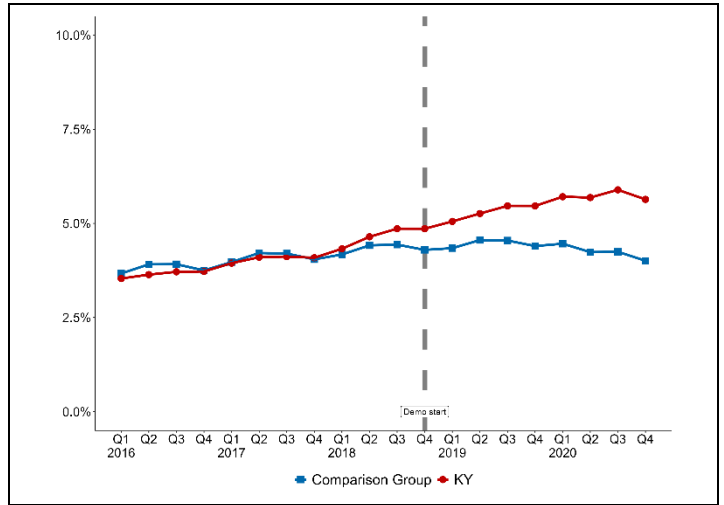


Exhibit KY-2. Beneficiaries treated for SUD as a percent of Medicaid beneficiaries in Kentucky, 2016–2020



Notes: SUD = Substance Use Disorder

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare

Source: RTI analysis of TAF RIF data

Exhibits KY-3 through KY-6 present weight-adjusted trends for the percentages of beneficiaries treated for SUD receiving any SUD-related institutional service, any SUD-related outpatient service, any WM, and any MAT in Kentucky and its comparison group for 2016-2020.

Exhibit KY-3. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related institutional services in Kentucky, 2016–2020

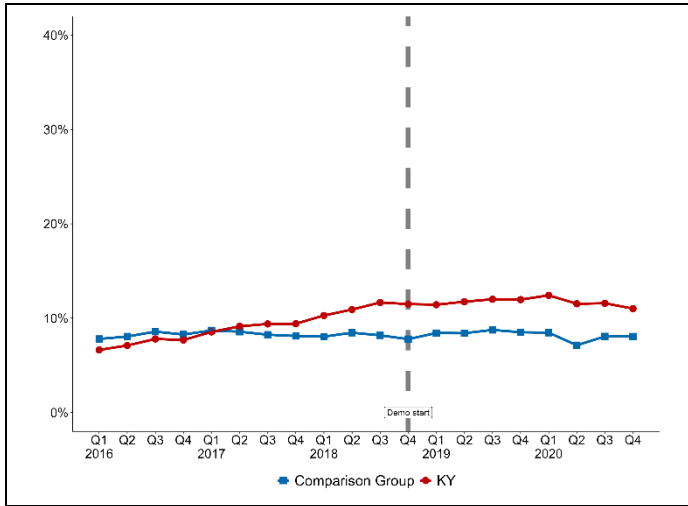
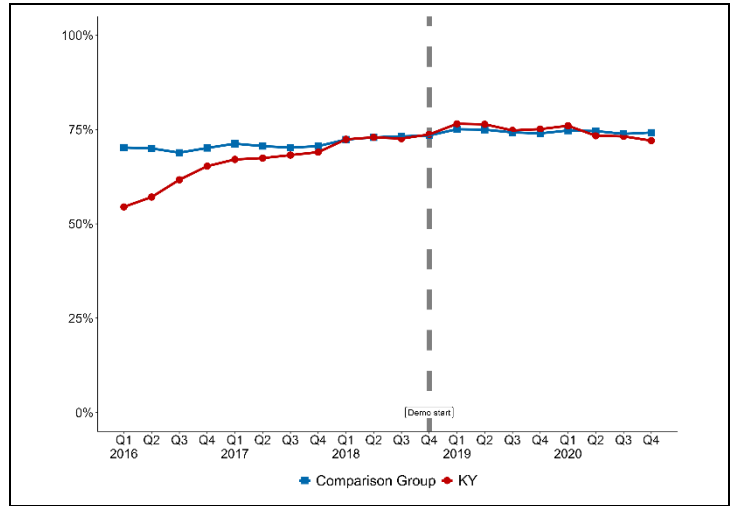
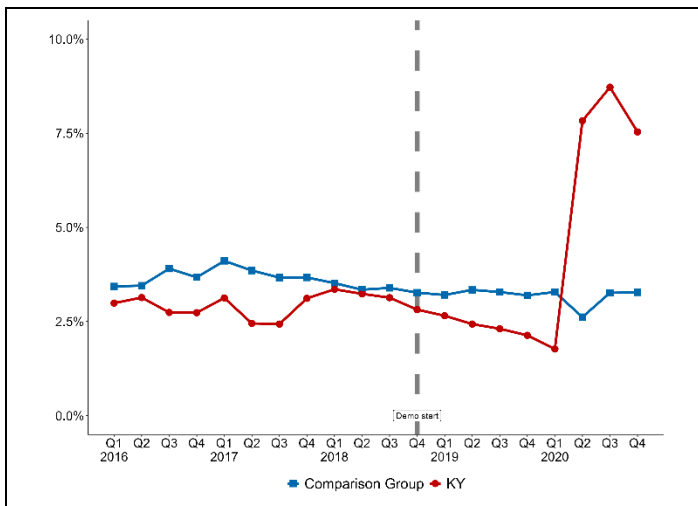


Exhibit KY-4. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related outpatient services in Kentucky, 2016–2020



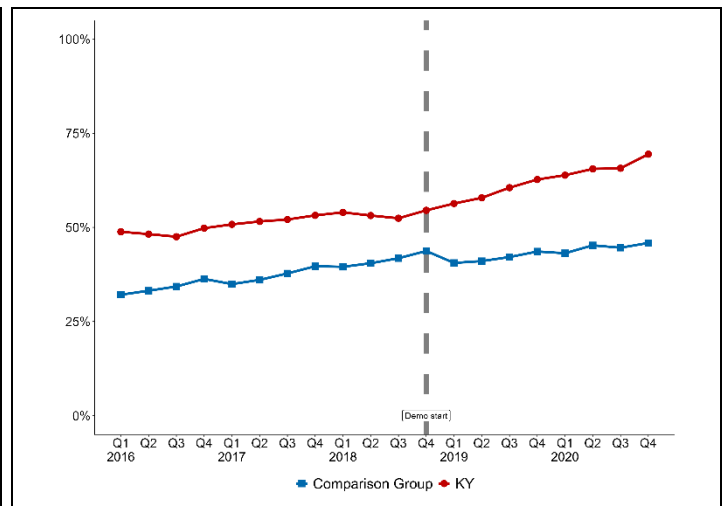
Notes: SUD = Substance Use Disorder; Kentucky added new Medicaid coverage for residential care under its demonstration.
 Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
 Source: RTI analysis of TAF RIF data

Exhibit KY-5. Percent of Medicaid beneficiaries treated for SUD receiving WM services in Kentucky, 2016–2020



Notes: SUD = Substance Use Disorder; Kentucky's demonstration added Medicaid coverage for four levels of WM.
 Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
 Source: RTI analysis of TAF RIF data

Exhibit KY-6. Percent of Medicaid beneficiaries treated for SUD receiving MAT services in Kentucky, 2016–2020



Notes: MAT = Medication-assisted treatment; SUD = Substance Use Disorder; Kentucky's demonstration added Medicaid coverage for methadone, as well as adding a requirement for residential providers to facilitate access to MAT.
 Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
 Source: RTI analysis of TAF RIF data

Kentucky SUD Demonstration Impact Results

Exhibit KY-7 shows the estimates of any SUD-related institutional service, any SUD-related outpatient service, WM, and MAT for Medicaid beneficiaries in Kentucky relative to individuals in the comparison group. The findings are as follows:

Exhibit KY-7. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in Kentucky

Outcome	DID estimate (percentage points)	90% confidence interval	Relative difference (%)	p-value
Use of institutional services				
Q4 2018	0.00	(-0.00, 0.01)	0.99	0.81
Q1 2019	-0.01	(-0.02, -0.00)	-15.58	0.01
Q2 2019	-0.02	(-0.03, -0.01)	-20.99	0.01
Q3 2019	-0.02	(-0.04, -0.01)	-31.3	0
Q4 2019	-0.03	(-0.04, -0.01)	-34.26	0
Q1 2020	-0.05	(-0.07, -0.03)	-60.81	0
Q2 2020	-0.04	(-0.06, -0.02)	-52.82	0
Q3 2020	-0.07	(-0.10, -0.05)	-92.99	0
Q4 2020	-0.08	(-0.11, -0.06)	-107.17	0
Overall	-0.04	(-0.05, -0.02)	-49.12	0
Use of outpatient services				
Q4 2018	-0.03	(-0.04, -0.01)	-4.71	0
Q1 2019	-0.03	(-0.04, -0.01)	-4.66	0
Q2 2019	-0.04	(-0.06, -0.02)	-6.58	0
Q3 2019	-0.06	(-0.08, -0.04)	-10.23	0
Q4 2019	-0.06	(-0.09, -0.04)	-11.04	0
Q1 2020	-0.06	(-0.09, -0.04)	-10.64	0
Q2 2020	-0.10	(-0.12, -0.08)	-17.2	0
Q3 2020	-0.11	(-0.14, -0.09)	-19.53	0
Q4 2020	-0.13	(-0.18, -0.09)	-22.91	0
Overall	-0.07	(-0.09, -0.05)	-12.49	0

Outcome	DID estimate (percentage points)	90% confidence interval	Relative difference (%)	p-value
Use of WM services				
Q4 2018	0.00	(-0.00, 0.00)	0.98	0.84
Q1 2019	0.00	(-0.00, 0.00)	-1.40	0.78
Q2 2019	-0.00	(-0.01, -0.00)	-13.12	0.05
Q3 2019	-0.01	(-0.01, -0.01)	-14.92	0.03
Q4 2019	-0.01	(-0.01, -0.00)	-17.61	0.03
Q1 2020	-0.01	(-0.02, -0.01)	-42.24	0
Q2 2020	0.05	(0.04, 0.06)	156.89	0
Q3 2020	0.06	(0.04, 0.07)	167.38	0
Q4 2020	0.04	(0.03, 0.05)	130.53	0
Overall	0.02	(0.01, 0.02)	46.47	0
Use of MAT services				
Q4 2018	-0.02	(-0.03, -0.01)	-4.53	0
Q1 2019	0.02	(0.01, 0.04)	5.33	0.01
Q2 2019	0.04	(0.02, 0.04)	7.85	0
Q3 2019	0.05	(0.03, 0.07)	11.06	0
Q4 2019	0.06	(0.04, 0.08)	12.63	0
Q1 2020	0.12	(0.09, 0.14)	25.56	0
Q2 2020	0.12	(0.08, 0.15)	25.36	0
Q3 2020	0.13	(0.08, 0.18)	28.26	0
Q4 2020	0.15	(0.11, 0.19)	32.83	0
Overall	0.08	(0.05, 0.10)	17.07	0

DID = difference-in-differences.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD in Kentucky and its comparison group.

Methods: A logistic regression model was used to obtain estimates. Results are weighted by the fraction of time the beneficiary was enrolled in Medicaid (eligibility fraction) and the propensity score weight. DID models for all outcomes assumed nonparallel trends in the baseline period except for withdrawal management and MAT, for which parallel trends were assumed. Appendix A details the methods.

How to interpret the results: The relative difference is the DID estimate as a percentage of the demonstration state's baseline period adjusted mean. A *negative* value for the relative difference 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 state than in the comparison group.

Note: In Kentucky, Medicaid coverage for methadone, residential services, partial hospitalization services, and WM services was added or expanded under the demonstration. Residential standards requiring access to MAT were added under the demonstration.

Source: RTI analysis of TAF RIF data

Sensitivity Analysis

Exhibit KY-8 shows how the impact estimates for Kentucky's outcomes differ when DID models that we ran assuming parallel trends were rerun assuming nonparallel baseline trends. We did not conduct a sensitivity analysis for outcomes where the main model assumed nonparallel baseline trends. The results are very consistent, reinforcing the direction and general size of effects on WM and MAT use by beneficiaries treated for SUD in Kentucky, relative to the comparison group.

Exhibit KY-8. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in Kentucky under different model assumptions

Outcome	Parallel trends assumption	Main analysis: Regression-adjusted relative difference (%) (90% C.I.)	Sensitivity analysis: Regression-adjusted relative difference (%) (90% C.I.)
Any WM	Main: Parallel Sensitivity: Nonparallel	46.47*** (26.82, 69.16)	38.39*** (14.66, 65.16)
Any MAT	Main: Parallel Sensitivity: Nonparallel	17.07*** (10.99, 23.31)	19.94*** (14.14, 26.17)

* p<0.10; ** p<0.05; *** p<0.01.

Notes: DID = difference-in-differences; C.I. = Confidence Interval.

Source: RTI analysis of TAF RIF data

Louisiana

Trends in SUD-Related Treatment Outcomes

Exhibits LA-1 and LA-2 show weight-adjusted trends in the number of beneficiaries treated for SUD and beneficiaries treated for SUD as a percentage of all Medicaid beneficiaries in Louisiana and its comparison group for 2016-2020. Louisiana implemented a Medicaid eligibility expansion in July 2016 that brought thousands of newly eligible adults into the program.

Exhibit LA-1. Number of Medicaid beneficiaries treated for SUD in Louisiana, 2016–2020

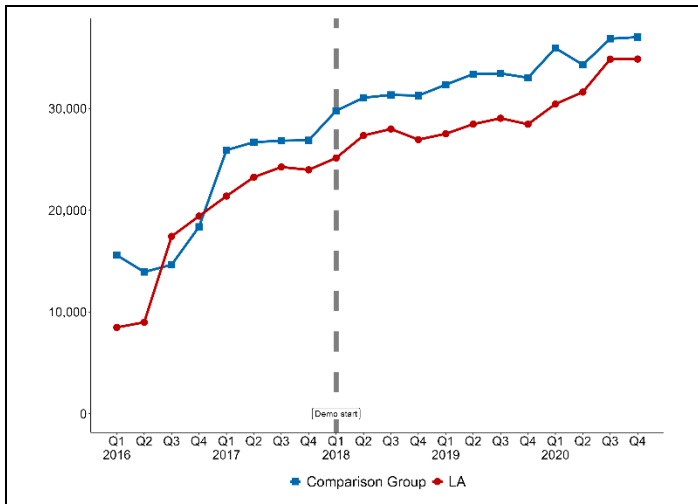
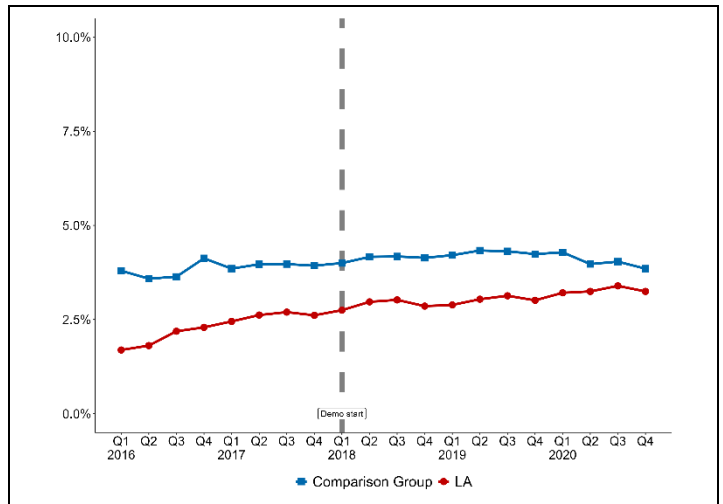


Exhibit LA-2. Beneficiaries treated for SUD as a percent of Medicaid beneficiaries in Louisiana, 2016–2020



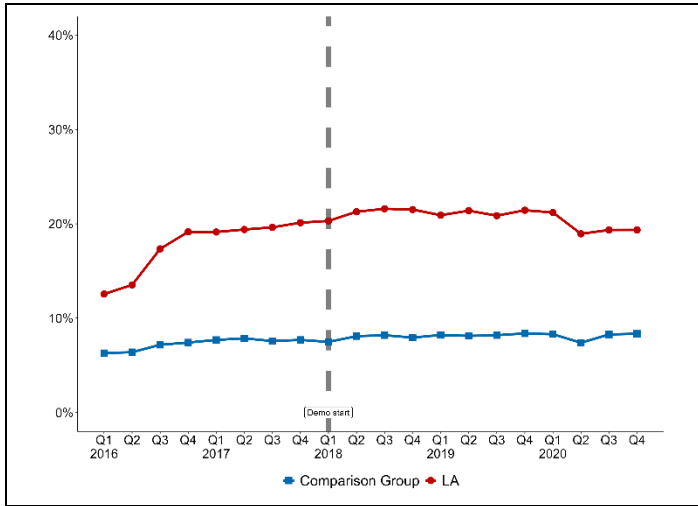
Notes: SUD = Substance Use Disorder

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare

Source: RTI analysis of TAF RIF data

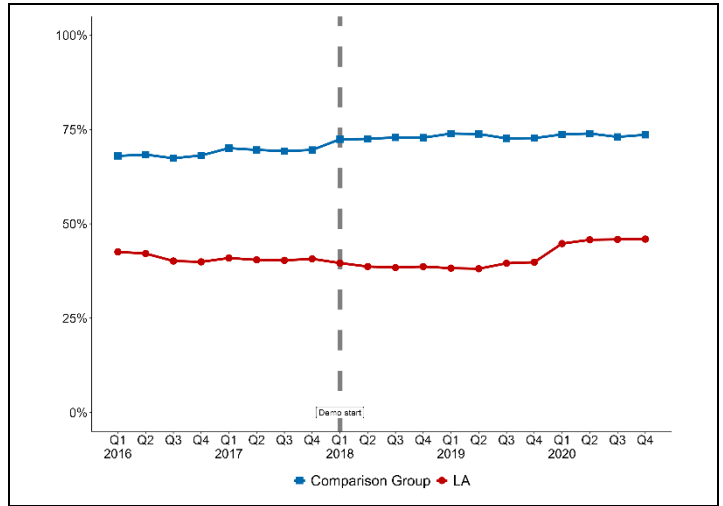
Exhibits LA-3 through LA-6 present weight-adjusted trends for the percentages of beneficiaries treated for SUD receiving any SUD-related institutional service, any SUD-related outpatient service, any WM, and any MAT in Louisiana and its comparison group for 2016-2020.

Exhibit LA-3. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related institutional services in Louisiana, 2016–2020



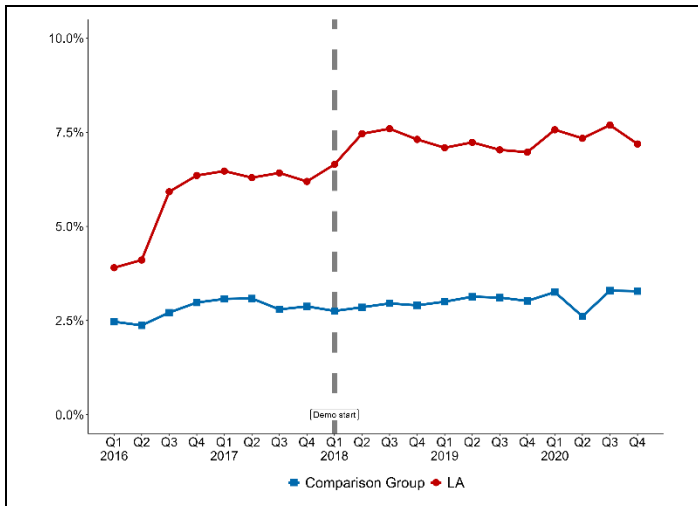
Notes: SUD = Substance Use Disorder; Louisiana’s demonstration added Medicaid coverage for IMD care.
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

Exhibit LA-4. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related outpatient services in Louisiana, 2016–2020



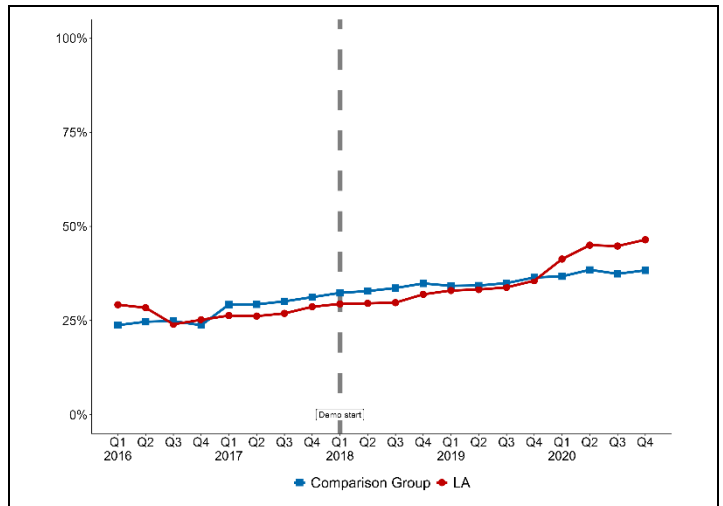
Notes: SUD = Substance Use Disorder
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

Exhibit LA-5. Percent of Medicaid beneficiaries treated for SUD receiving WM services in Louisiana, 2016–2020



Notes: SUD = Substance Use Disorder; Louisiana’s demonstration expanded Medicaid coverage for WM.
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

Exhibit LA-6. Percent of Medicaid beneficiaries treated for SUD receiving MAT services in Louisiana, 2016–2020



Notes: MAT = Medication-assisted treatment; SUD = Substance Use Disorder; Louisiana’s demonstration added Medicaid coverage for methadone and added residential MAT provider standards.
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

Louisiana SUD Demonstration Impact Results

Exhibit LA-7 shows the estimates of any SUD-related Institutional service, any SUD-related outpatient service, WM, and MAT for Medicaid beneficiaries in Louisiana relative to individuals in the comparison group. Data prior to Louisiana's Medicaid eligibility expansion in July 2016 were not included in DID models.

Exhibit LA-7. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in Louisiana

Outcome	DID estimate (percentage points)	90% confidence interval	Relative difference (%)	p-value
Use of institutional services				
Q1 2018	0.02	(0.01, 0.03)	10.21	0
Q2 2018	0.01	(0.00, 0.02)	6.82	0.01
Q3 2018	0.01	(0.00, 0.02)	7.46	0.01
Q4 2018	0.02	(0.01, 0.03)	9.75	0
Q1 2019	0.01	(-0.00, 0.02)	5.65	0.11
Q2 2019	0.02	(0.00, 0.03)	8.39	0.07
Q3 2019	0.01	(-0.00, 0.02)	3.97	0.29
Q4 2019	0.01	(-0.01, 0.02)	3.6	0.41
Q1 2020	0.01	(-0.00, 0.03)	6.02	0.25
Q2 2020	0.01	(-0.01, 0.02)	3.2	0.56
Q3 2020	-0.01	(-0.03, 0.01)	-5.41	0.28
Q4 2020	-0.01	(-0.03, 0.00)	-5.95	0.22
Overall	0.01	(-0.01, 0.02)	4.01	0.33
Use of outpatient services				
Q1 2018	-0.04	(-0.06, -0.02)	-9.48	0
Q2 2018	-0.05	(-0.07, -0.03)	-11.53	0
Q3 2018	-0.06	(-0.08, -0.03)	-13.41	0
Q4 2018	-0.05	(-0.08, -0.03)	-12.3	0
Q1 2019	-0.07	(-0.10, -0.05)	-16.63	0
Q2 2019	-0.07	(-0.10, -0.05)	-16.32	0
Q3 2019	-0.04	(-0.07, -0.02)	-9.64	0.01
Q4 2019	-0.04	(-0.07, -0.01)	-9.09	0.02
Q1 2020	0.00	(-0.03, 0.03)	0.21	0.96
Q2 2020	0.01	(-0.03, 0.04)	1.28	0.79
Q3 2020	0.02	(-0.02, 0.05)	3.89	0.41
Q4 2020	0.02	(-0.02, 0.05)	3.89	0.41
Overall	-0.03	(-0.06, -0.00)	-6.81	0.08

Outcome	DID estimate (percentage points)	90% confidence interval	Relative difference (%)	p-value
Use of WM services				
Q1 2018	0.01	(0.00, 0.01)	15.11	0
Q2 2018	0.01	(-0.00, 0.02)	24.01	0.01
Q3 2018	0.01	(-0.00, 0.02)	23.95	0
Q4 2018	0.01	(-0.01, 0.02)	20.57	0.02
Q1 2019	0.01	(-0.02, 0.02)	13.85	0.14
Q2 2019	0.01	(-0.02, 0.02)	12.28	0.22
Q3 2019	0.01	(-0.03, 0.02)	9.14	0.34
Q4 2019	0.01	(-0.03, 0.02)	9.82	0.31
Q1 2020	0.01	(-0.02, 0.02)	10.52	0.37
Q2 2020	0.02	(-0.02, 0.03)	28.6	0.01
Q3 2020	0.01	(-0.04, 0.03)	9.73	0.44
Q4 2020	0.00	(-0.05, 0.02)	0.91	0.94
Overall	0.01	(-0.02, 0.02)	14.55	0.15
Use of MAT services				
Q1 2018	-0.01	(-0.02, 0.00)	-2.63	0.18
Q2 2018	-0.01	(-0.02, -0.00)	-3.7	0.08
Q3 2018	-0.01	(-0.03, -0.00)	-4.95	0.04
Q4 2018	-0.01	(-0.02, 0.01)	-1.85	0.47
Q1 2019	0.01	(-0.01, 0.02)	1.74	0.51
Q2 2019	0.01	(-0.00, 0.02)	3.78	0.17
Q3 2019	0.01	(-0.00, 0.03)	3.81	0.21
Q4 2019	0.02	(0.00, 0.03)	5.61	0.1
Q1 2020	0.06	(0.04, 0.08)	21.45	0
Q2 2020	0.08	(0.06, 0.11)	28.44	0
Q3 2020	0.09	(0.07, 0.11)	31.29	0
Q4 2020	0.10	(0.07, 0.12)	32.98	0
Overall	0.03	(0.02, 0.04)	10.95	0

DID = difference-in-differences.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD in Louisiana and its comparison group.

Methods: A logistic regression model was used to obtain estimates. Results are weighted by the fraction of time the beneficiary was enrolled in Medicaid (eligibility fraction) and the propensity score weight. DID models for all outcomes assumed parallel trends in the baseline period. Appendix A details the methods.

How to interpret the results: The relative difference is the DID estimate as a percentage of the demonstration state's baseline period adjusted mean. A *negative* value for the relative difference 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 state than in the comparison group.

Note: In Louisiana, Medicaid coverage for methadone, residential services, and WM services was added or expanded under the demonstration. Residential standards requiring access to MAT were added under the demonstration.

Source: RTI analysis of TAF RIF data

Sensitivity Analysis

Exhibit LA-8 shows how the impact estimates for Louisiana’s outcomes differ when DID models that we ran assuming parallel trends were rerun assuming nonparallel baseline trends. The results are generally consistent, with impacts on institutional and WM use still not statistically significant and slightly larger impacts estimated for outpatient and MAT in the nonparallel models.

Exhibit LA-8. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in Louisiana under different model assumptions

Outcome	Parallel trends assumption	Main analysis: Regression-adjusted relative difference (%) (90% C.I.)	Sensitivity analysis: Regression-adjusted relative difference (%) (90% C.I.)
Any SUD-related Institutional Service	Main: Parallel	4.01 (-2.79, 10.98)	-14.04 (-32.18, 3.34)
Any SUD-related outpatient Service	Main: Parallel	-6.81* (-13.35, -0.32)	-10.76** (-19.58, -2.31)
Any WM	Main: Parallel	14.55 (-1.77, 32.75)	-0.51 (-45.01, 44.15)
Any MAT	Main: Parallel	10.95*** (5.26, 17.03)	18.60*** (10.87, 27.05)

* p<0.10; ** p<0.05; *** p<0.01.

Notes: DID = difference-in-differences; C.I.=Confidence Interval.

Source: RTI analysis of TAF RIF data

Massachusetts

Trends in SUD-Related Treatment Outcomes

Exhibits MA-1 and MA-2 show weight-adjusted trends in the number of beneficiaries treated for SUD and beneficiaries treated for SUD as a percentage of all Medicaid beneficiaries in Massachusetts and its comparison group for 2016-2020.

Exhibit MA-1. Number of Medicaid beneficiaries treated for SUD in Massachusetts, 2016–2020

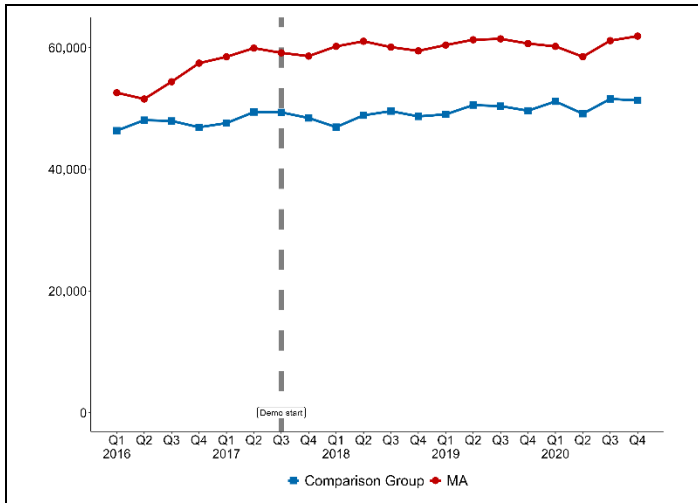
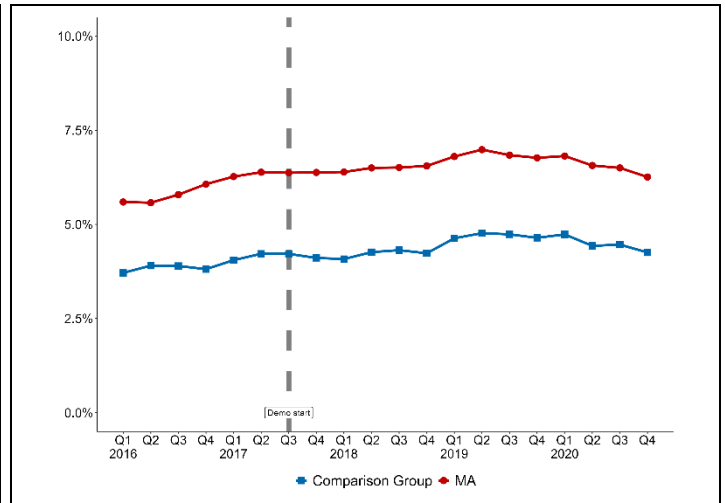


Exhibit MA-2. Beneficiaries treated for SUD as a percent of Medicaid beneficiaries in Massachusetts, 2016–2020



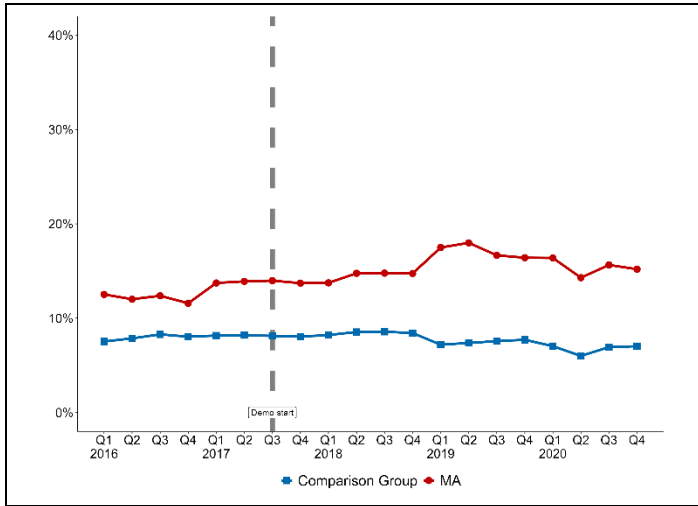
Notes: SUD = Substance Use Disorder

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare

Source: RTI analysis of TAF RIF data

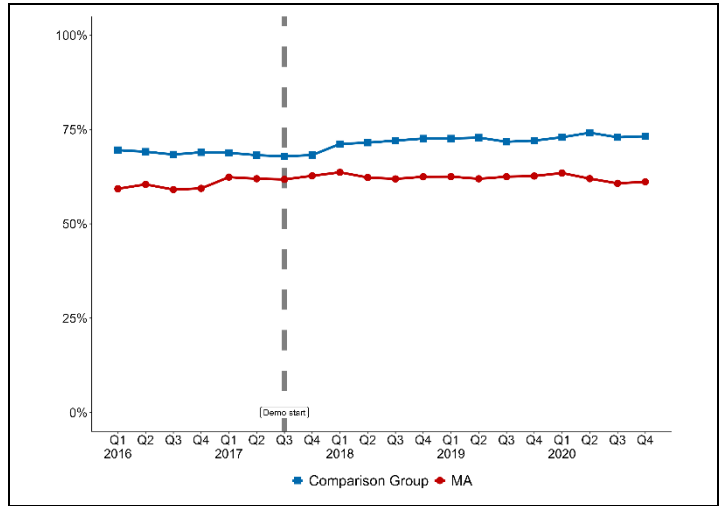
Exhibits MA-3 through MA-6 present weight-adjusted trends for the percentages of beneficiaries treated for SUD receiving any SUD-related institutional service, any SUD-related outpatient service, any WM, and any MAT in Massachusetts and its comparison group for 2016-2020. For Massachusetts, completeness of inpatient claims and other services (OT) claims and managed care encounter records are rated “high concern” in the DQ Atlas for all years, and IP encounters were frequently judged unusable. These concerns are generally due to very high volumes and relatively few line items. The patterns may reflect normal billing practices in the state, but they are somewhat inconsistent year-to-year. It is unclear what effect, if any, these concerns may have had on estimated service use and DID models.

Exhibit MA-3. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related institutional services in Massachusetts, 2016–2020



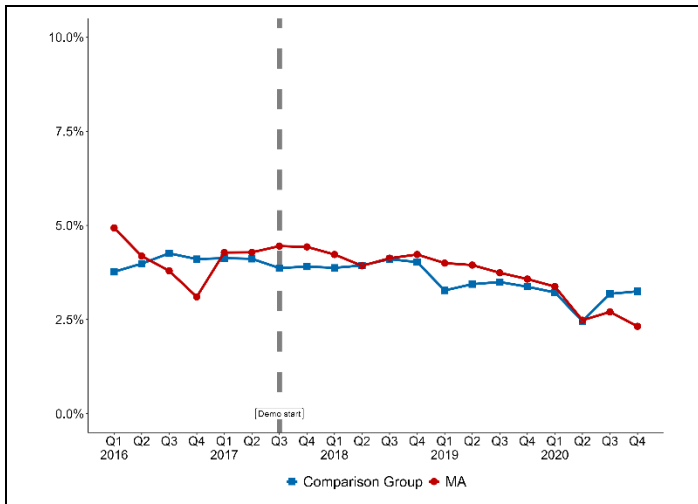
Notes: SUD = Substance Use Disorder; Massachusetts' demonstration expanded Medicaid coverage for residential care.
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

Exhibit MA-4. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related outpatient services in Massachusetts, 2016–2020



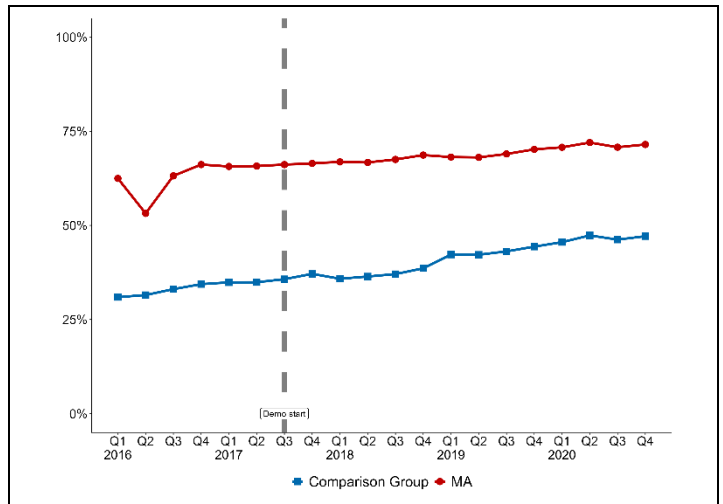
Notes: SUD = Substance Use Disorder
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

Exhibit MA-5. Percent of Medicaid beneficiaries treated for SUD receiving WM services in Massachusetts, 2016–2020



Notes: SUD = Substance Use Disorder
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

Exhibit MA-6. Percent of Medicaid beneficiaries treated for SUD receiving MAT services in Massachusetts, 2016–2020



Notes: MAT = Medication-assisted treatment; SUD = Substance Use Disorder
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

Massachusetts SUD Demonstration Impact Results

Exhibit MA-7 shows the estimates of use of any SUD-related institutional service, any SUD-related outpatient service, WM, and MAT for Medicaid beneficiaries in Massachusetts relative to individuals in the comparison group.

Exhibit MA-7. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in Massachusetts

Outcome	DID estimate (percentage points)	90% confidence interval	Relative difference (%)	p-value
Use of institutional services				
Q3 2017	0.01	(0.01, 0.02)	8.19	0.00
Q4 2017	0.01	(0.00, 0.01)	6.46	0.00
Q1 2018	0.01	(0.00, 0.02)	6.54	0.02
Q2 2018	0.01	(0.01, 0.02)	9.60	0.00
Q3 2018	0.01	(0.00, 0.02)	9.12	0.05
Q4 2018	0.01	(0.00, 0.02)	9.58	0.01
Q1 2019	0.06	(0.04, 0.08)	43.74	0.00
Q2 2019	0.06	(0.04, 0.08)	44.34	0.00
Q3 2019	0.04	(0.03, 0.05)	31.29	0.00
Q4 2019	0.04	(0.03, 0.05)	28.30	0.00
Q1 2020	0.05	(0.04, 0.07)	38.56	0.00
Q2 2020	0.05	(0.04, 0.06)	36.06	0.00
Q3 2020	0.05	(0.04, 0.06)	37.23	0.00
Q4 2020	0.05	(0.04, 0.06)	33.88	0.00
Overall	0.03	(0.02, 0.04)	24.60	0.00
Use of outpatient services				
Q3 2017	0.03	(0.02, 0.05)	5.26	0.00
Q4 2017	0.04	(0.02, 0.05)	6.21	0.00
Q1 2018	0.01	(-0.01, 0.04)	2.28	0.36
Q2 2018	0.00	(-0.03, 0.03)	-0.76	0.81
Q3 2018	-0.02	(-0.05, 0.02)	-2.55	0.43
Q4 2018	-0.01	(-0.04, 0.01)	-2.50	0.39
Q1 2019	-0.01	(-0.05, 0.02)	-2.37	0.52
Q2 2019	-0.02	(-0.06, 0.02)	-4.04	0.33
Q3 2019	-0.01	(-0.04, 0.03)	-1.03	0.77
Q4 2019	-0.01	(-0.04, 0.03)	-1.27	0.72
Q1 2020	-0.01	(-0.05, 0.03)	-1.75	0.65
Q2 2020	-0.04	(-0.09, 0.01)	-6.83	0.15
Q3 2020	-0.04	(-0.08, 0.00)	-6.88	0.12
Q4 2020	-0.04	(-0.08, 0.00)	-6.98	0.12
Overall	-0.01	(-0.04, 0.02)	-1.69	0.62

Outcome	DID estimate (percentage points)	90% confidence interval	Relative difference (%)	p-value
Use of WM services				
Q3 2017	0.00	(0.00, 0.01)	11.61	0.04
Q4 2017	0.00	(-0.00, 0.00)	5.16	0.29
Q1 2018	0.00	(-0.00, 0.01)	9.86	0.19
Q2 2018	0.00	(-0.01, 0.01)	-2.65	0.82
Q3 2018	0.00	(-0.01, 0.01)	-3.31	0.81
Q4 2018	0.00	(-0.01, 0.01)	-0.65	0.96
Q1 2019	0.01	(0.00, 0.01)	21.50	0.02
Q2 2019	0.00	(-0.00, 0.01)	11.72	0.26
Q3 2019	0.00	(-0.01, 0.01)	0.54	0.96
Q4 2019	0.00	(-0.01, 0.01)	-1.30	0.90
Q1 2020	0.00	(-0.00, 0.01)	6.83	0.46
Q2 2020	0.00	(-0.01, 0.01)	0.45	0.96
Q3 2020	-0.01	(-0.01, 0.00)	-15.39	0.16
Q4 2020	-0.01	(-0.02, -0.00)	-28.12	0.03
Overall	0.00	(-0.01, 0.01)	1.08	0.91
Use of MAT services				
Q3 2017	0.01	(0.00, 0.02)	1.48	0.03
Q4 2017	0.00	(-0.01, 0.01)	0.16	0.85
Q1 2018	0.02	(0.00, 0.03)	2.88	0.03
Q2 2018	0.01	(-0.00, 0.02)	1.62	0.25
Q3 2018	0.01	(-0.01, 0.03)	1.74	0.27
Q4 2018	0.01	(-0.01, 0.03)	1.59	0.33
Q1 2019	-0.03	(-0.04, -0.01)	-4.28	0.01
Q2 2019	-0.02	(-0.04, -0.01)	-4.02	0.01
Q3 2019	-0.02	(-0.04, -0.01)	-3.86	0.01
Q4 2019	-0.02	(-0.04, -0.01)	-3.42	0.02
Q1 2020	-0.02	(-0.04, -0.01)	-3.84	0.02
Q2 2020	-0.02	(-0.04, -0.01)	-3.80	0.02
Q3 2020	-0.03	(-0.04, -0.01)	-4.29	0.01
Q4 2020	-0.03	(-0.04, -0.01)	-4.11	0.02
Overall	-0.01	(-0.02, 0.00)	-1.60	0.27

DID = difference-in-differences.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD in Massachusetts and its comparison group.

Methods: A logistic regression model was used to obtain estimates. Results are weighted by the fraction of time the beneficiary was enrolled in Medicaid (eligibility fraction) and the propensity score weight. DID models for all outcomes assumed parallel trends in the baseline period. Appendix A details the methods.

How to interpret the results: The relative difference is the DID estimate as a percentage of the demonstration state's baseline period adjusted mean. A *negative* value for the relative difference 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 state than in the comparison group.

Note: In Massachusetts, Medicaid coverage for residential services was added under the demonstration.

Source: RTI analysis of TAF RIF data

Sensitivity Analysis

Exhibit MA-8 shows how the impact estimates for Massachusetts' outcomes differ when DID models that we ran assuming parallel trends were rerun assuming nonparallel baseline trends. The estimates for institutional services are very similar, but for all other services the nonparallel models indicate much larger and statistically significant effects, rather than small and not statistically significant impacts that were in the same directions.

Exhibit MA-8. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in Massachusetts under different model assumptions

Outcome	Parallel trends assumption	Main analysis: Regression-adjusted relative difference (%) (90% C.I.)	Sensitivity analysis: Regression-adjusted relative difference (%) (90% C.I.)
Any SUD-related Institutional Service	Main: Parallel Sensitivity: Not parallel	24.60*** (16.83, 32.82)	15.70*** (6.84, 24.82)
Any SUD-related outpatient Service	Main: Parallel Sensitivity: Not parallel	-1.69 (-7.34, 3.90)	-18.79 *** (-25.21, -12.51)
Any WM	Main: Parallel Sensitivity: Not parallel	1.08 (-15.85, 18.16)	32.49*** (17.59, 50.00)
Any MAT	Main: Parallel Sensitivity: Not parallel	-1.60 (-4.07, 0.76)	-12.80*** (-15.73, -9.98)

* p<0.10; ** p<0.05; *** p<0.01.

Notes: C.I. = confidence interval; DID = difference-in-differences

Source: RTI analysis of TAF RIF data

Michigan

Trends in SUD-Related Treatment Outcomes

Exhibits MI-1 and MI-2 show weight-adjusted trends in the number of beneficiaries treated for SUD and beneficiaries treated for SUD as a percentage of all Medicaid beneficiaries in Michigan and its comparison group for 2016-2020.

Exhibit MI-1. Number of Medicaid beneficiaries treated for SUD in Michigan, 2016–2020

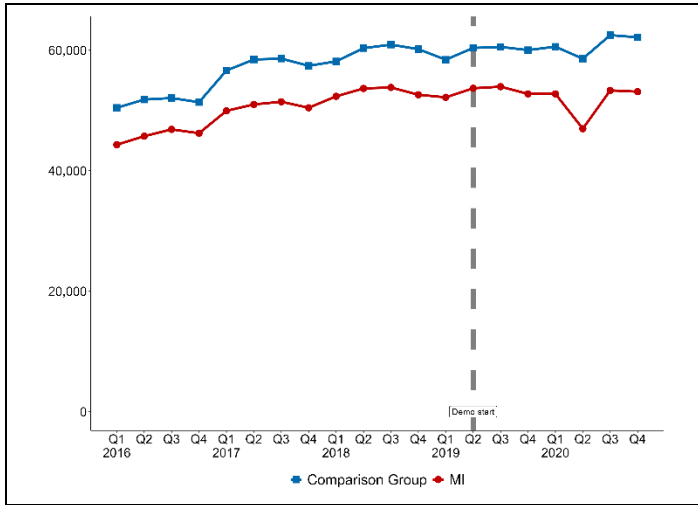
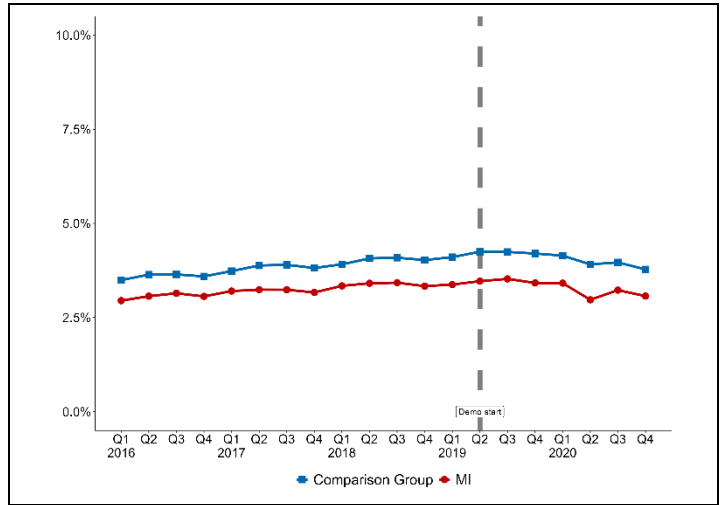


Exhibit MI-2. Beneficiaries treated for SUD as a percent of Medicaid beneficiaries in Michigan, 2016–2020



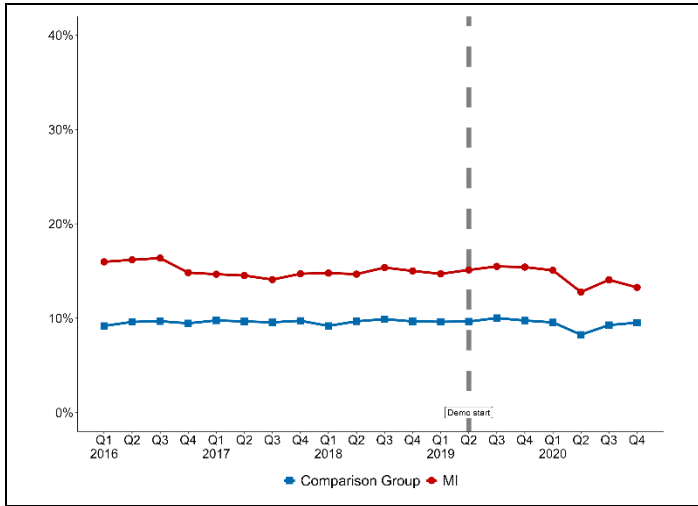
Notes: SUD = Substance Use Disorder

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare

Source: RTI analysis of TAF RIF data

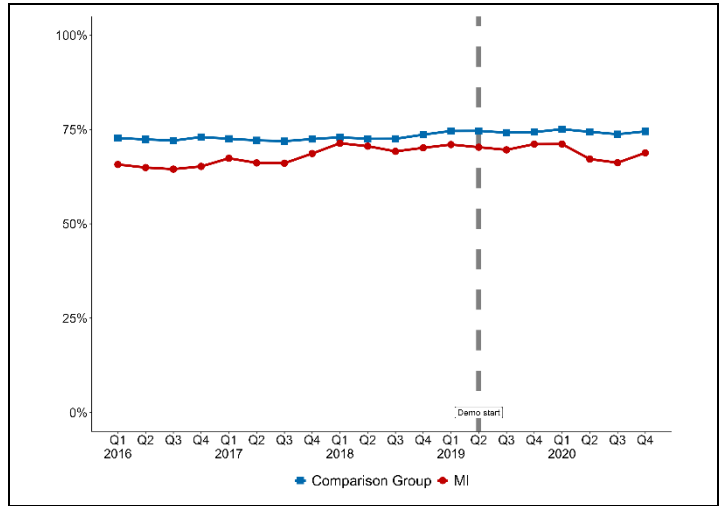
Exhibits MI-3 through MI-6 present weight-adjusted trends for the percentages of beneficiaries treated for SUD receiving any SUD-related institutional service, any SUD-related outpatient service, any WM, and any MAT in Michigan and its comparison group for 2016-2020.

Exhibit MI-3. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related institutional services in Michigan, 2016–2020



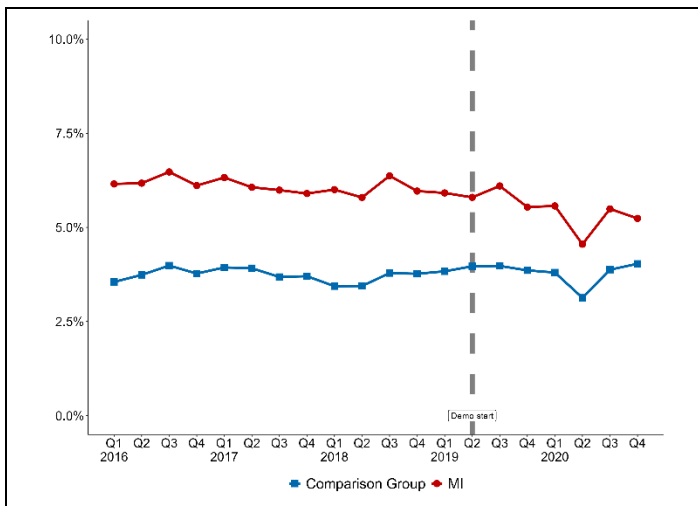
Notes: SUD = Substance Use Disorder; Michigan's demonstration expanded Medicaid coverage for institutional services.
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

Exhibit MI-4. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related outpatient services in Michigan, 2016–2020



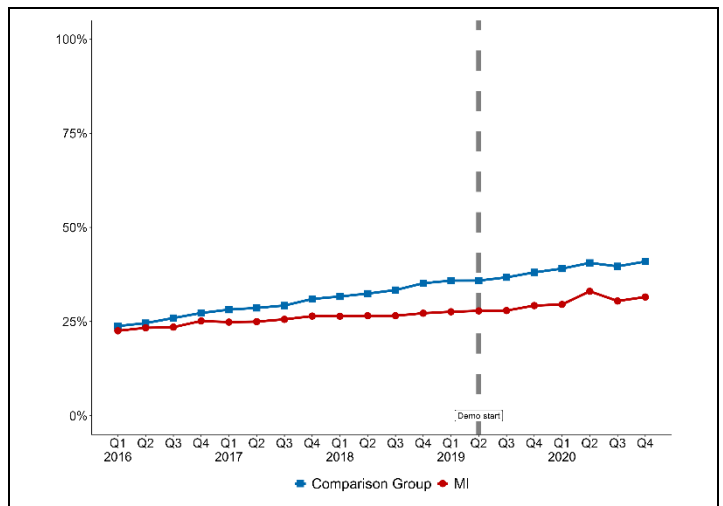
Notes: SUD = Substance Use Disorder
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

Exhibit MI-5. Percent of Medicaid beneficiaries treated for SUD receiving WM services in Michigan, 2016–2020



Notes: SUD = Substance Use Disorder; Michigan's demonstration expanded Medicaid coverage for WM services.
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

Exhibit MI-6. Percent of Medicaid beneficiaries treated for SUD receiving MAT services in Michigan, 2016–2020



Notes: MAT = Medication-assisted treatment; SUD = Substance Use Disorder Michigan's demonstration added residential MAT requirements.
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

Michigan SUD Demonstration Impact Results

Exhibit MI-7 shows the estimates of any SUD-related institutional service, any SUD-related outpatient service, WM, and MAT for Medicaid beneficiaries in Michigan relative to individuals in the comparison group.

Exhibit MI-7. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in Michigan

Outcome	Regression-adjusted DID (percentage points)	90% confidence interval	Relative difference (%)	p-value
Use of institutional services				
Q2 2019	0.00	(-0.01, 0.01)	0.18	0.96
Q3 2019	-0.00	(-0.01, 0.01)	-1.95	0.58
Q4 2019	0.00	(-0.01, 0.01)	0.17	0.96
Q1 2020	0.00	(-0.01, 0.01)	0.45	0.92
Q2 2020	-0.01	(-0.02, 0.01)	-3.33	0.52
Q3 2020	-0.01	(-0.02, 0.00)	-6.12	0.26
Q4 2020	-0.02	(-0.03, -0.01)	-12.44	0.02
Overall	-0.01	(-0.02, 0.01)	-3.29	0.45
Use of outpatient services				
Q2 2019	0.00	(-0.01, 0.02)	0.29	0.81
Q3 2019	0.00	(-0.01, 0.02)	0.34	0.78
Q4 2019	0.02	(0.00, 0.03)	2.49	0.05
Q1 2020	0.02	(0.00, 0.03)	2.54	0.04
Q2 2020	-0.02	(-0.04, 0.01)	-2.19	0.28
Q3 2020	-0.02	(-0.04, -0.00)	-2.99	0.06
Q4 2020	0.00	(-0.02, 0.02)	-0.41	0.79
Overall	0.00	(-0.02, 0.02)	0.04	0.98

Outcome	Regression-adjusted DID (percentage points)	90% confidence interval	Relative difference (%)	p-value
Use of WM services				
Q2 2019	-0.01	(-0.02, 0.00)	-12.06	0.21
Q3 2019	0.00	(-0.01, 0.00)	-8.89	0.19
Q4 2019	-0.01	(-0.02, -0.00)	-15.73	0.05
Q1 2020	-0.01	(-0.02, -0.00)	-21.08	0.04
Q2 2020	-0.01	(-0.02, -0.00)	-17.79	0.09
Q3 2020	-0.01	(-0.02, -0.00)	-20.81	0.09
Q4 2020	-0.02	(-0.03, -0.00)	-28.72	0.02
Overall	-0.01	(-0.02, -0.00)	-17.84	0.07
Use of MAT services				
Q2 2019	0.00	(-0.00, 0.01)	1.49	0.25
Q3 2019	0.00	(-0.01, 0.01)	0.71	0.67
Q4 2019	0.01	(0.00, 0.02)	4.21	0.05
Q1 2020	-0.01	(-0.02, 0.00)	-3.70	0.22
Q2 2020	0.02	(0.01, 0.04)	8.23	0.02
Q3 2020	0.02	(0.00, 0.04)	6.55	0.10
Q4 2020	0.02	(0.00, 0.04)	8.55	0.04
Overall	0.01	(-0.00, 0.02)	3.64	0.20

DID = difference-in-differences.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD in Michigan and its comparison group.

Methods: A logistic regression model was used to obtain estimates. Results are weighted by the fraction of time the beneficiary was enrolled in Medicaid (eligibility fraction) and the propensity score weight. DID models for all outcomes assumed parallel trends in the baseline period except for MAT, for which nonparallel trends were assumed. Appendix A details the methods.

How to interpret the results: The relative difference is the DID estimate as a percentage of the demonstration state's baseline period adjusted mean. A *negative* value for the relative difference 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 state than in the comparison group.

Note: In Michigan, Medicaid coverage for residential services and WM services was expanded under the demonstration. Residential standards requiring access to MAT were added under the demonstration.

Source: RTI analysis of TAF RIF data

Sensitivity Analysis

Exhibit MI-8 shows how the impact estimates for Michigan’s outcomes differ when DID models that we ran assuming parallel trends were rerun assuming nonparallel baseline trends. We did not conduct a sensitivity analysis for outcomes where the main model assumed nonparallel baseline trends. Effects for institutional services are small and not statistically significant in either version, reinforcing the finding of no measurable impact. For outpatient the nonparallel model indicates a small decrease in the percentage of beneficiaries using services in Michigan relative to its comparison group rather than no measurable impact. For WM, the nonparallel model suggests that there is more uncertainty that there was a decrease in use, relative to the comparison group.

Exhibit MI-8. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in Michigan under different model assumptions

Outcome	Parallel trends assumption	Main analysis: Regression-adjusted relative difference (%) (90% C.I.)	Sensitivity analysis: Regression-adjusted relative difference (%) (90% C.I.)
Any SUD-related Institutional Service	Main: Parallel	-3.29 (-10.58, 3.74)	4.73 (-4.11, 13.62)
Any SUD-related outpatient Service	Main: Parallel	0.04 (-2.37, 2.42)	-6.14** (-9.49, -2.73)
Any WM	Main: Parallel	-17.84* (-34.98, -1.37)	-12.69 (-28.71, 2.81)

* p<0.10; ** p<0.05; *** p<0.01.

Notes: C.I. = confidence interval; DID = difference-in-differences.

Source: RTI analysis of TAF RIF data

North Carolina

Trends in SUD-Related Treatment Outcomes

Exhibits NC-1 and NC-2 show weight-adjusted trends in the number of beneficiaries treated for SUD and beneficiaries treated for SUD as a percentage of all Medicaid beneficiaries in North Carolina and its comparison group for 2016-2020.

Exhibit NC-1. Number of Medicaid beneficiaries treated for SUD in North Carolina, 2016–2020

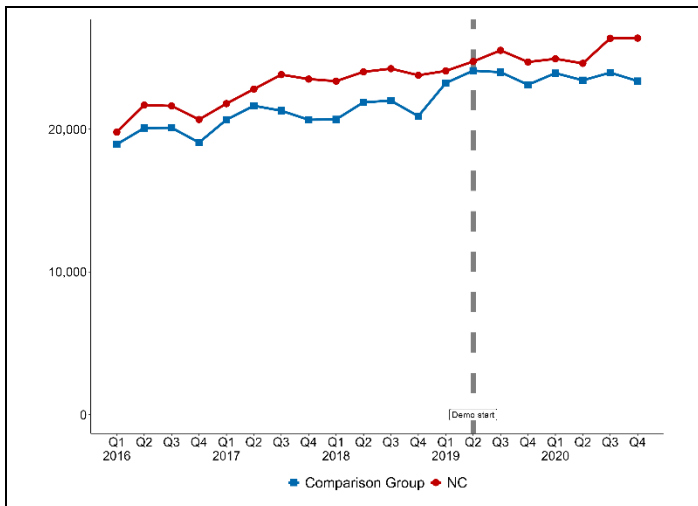
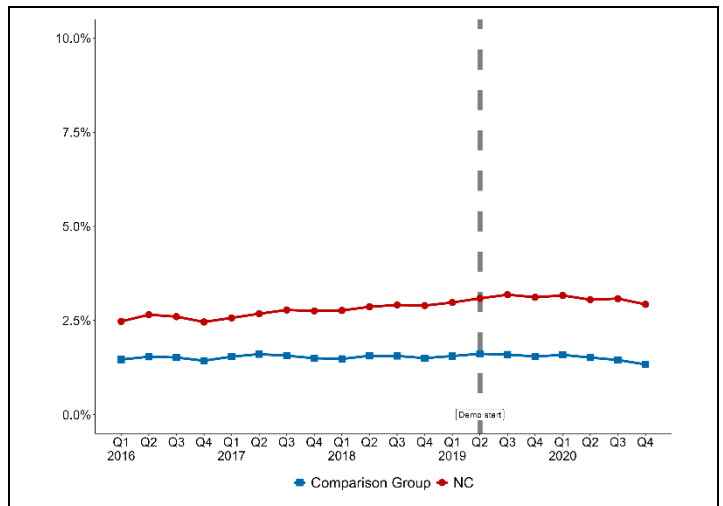


Exhibit NC-2. Beneficiaries treated for SUD as a percent of Medicaid beneficiaries in North Carolina, 2016–2020



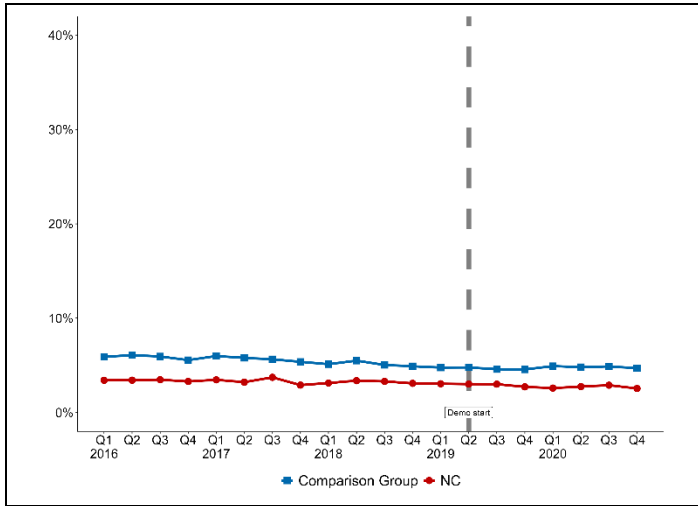
Notes: SUD = Substance Use Disorder

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare

Source: RTI analysis of TAF RIF data

Exhibits NC-3 through NC-6 present weight-adjusted trends for the percentages of beneficiaries treated for SUD receiving any SUD-related institutional service, any SUD-related outpatient service, any WM, and any MAT in North Carolina and its comparison group for 2016-2020.

Exhibit NC-3. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related institutional services in North Carolina, 2016–2020

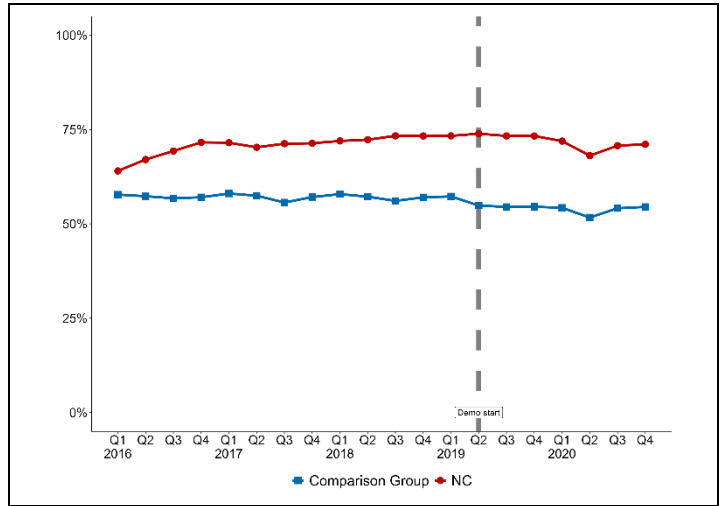


Notes: SUD = Substance Use Disorder; North Carolina’s demonstration added Medicaid coverage for residential services.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD

Source: RTI analysis of TAF RIF data

Exhibit NC-4. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related outpatient services in North Carolina, 2016–2020

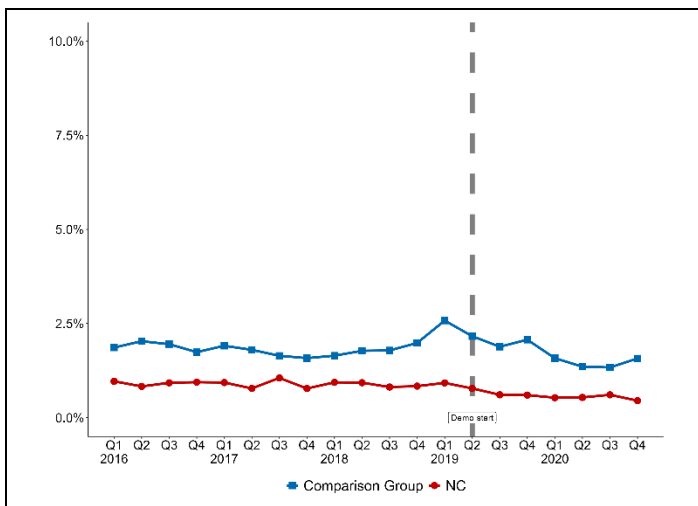


Notes: SUD = Substance Use Disorder; North Carolina’s demonstration expanded Medicaid coverage for intensive outpatient and partial hospitalization services.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD

Source: RTI analysis of TAF RIF data

Exhibit NC-5. Percent of Medicaid beneficiaries treated for SUD receiving WM services in North Carolina, 2016–2020

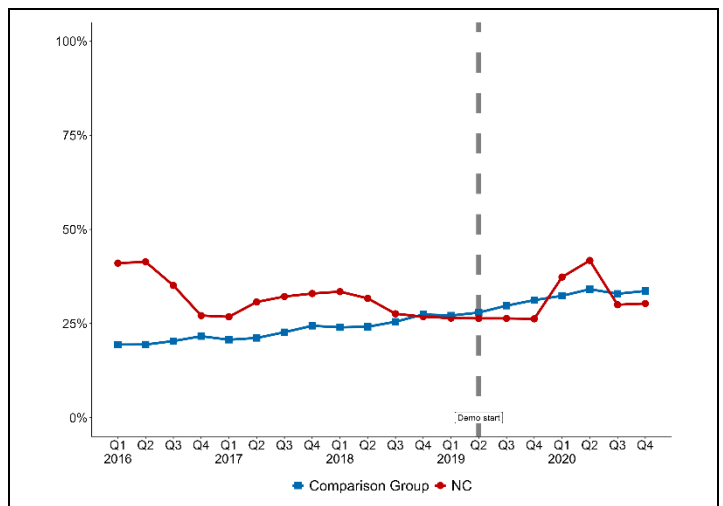


Notes: SUD = Substance Use Disorder; North Carolina’s demonstration added Medicaid coverage for WM.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD

Source: RTI analysis of TAF RIF data

Exhibit NC-6. Percent of Medicaid beneficiaries treated for SUD receiving MAT services in North Carolina, 2016–2020



Notes: MAT = Medication-assisted treatment; SUD = Substance Use Disorder; North Carolina’s demonstration updated residential MAT requirements and expanded Medicaid coverage for methadone.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD

Source: RTI analysis of TAF RIF data

North Carolina SUD Demonstration Impact Results

Exhibit NC-7 shows the estimates of use of any SUD-related Institutional service, any SUD-related outpatient service, WM, and MAT for Medicaid beneficiaries in North Carolina relative to individuals in the comparison group.

Exhibit NC-7. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in North Carolina

Outcome	Regression-adjusted DID (percentage points)	90% confidence interval	Relative difference (%)	p-value
Use of any SUD-related institutional services				
Q2 2019	0.00	(-0.00, 0.00)	2.08	0.78
Q3 2019	0.00	(-0.00, 0.01)	6.56	0.36
Q4 2019	-0.00	(-0.00, 0.00)	-0.64	0.93
Q1 2020	-0.00	(-0.01, -0.00)	-13.34	0.09
Q2 2020	-0.00	(-0.01, 0.00)	-5.12	0.53
Q3 2020	-0.00	(-0.01, 0.00)	-1.76	0.84
Q4 2020	-0.00	(-0.01, 0.00)	-7.58	0.27
Overall	-0.00	(-0.00, 0.00)	-2.83	0.71
Use of any SUD-related outpatient services				
Q2 2019	0.04	(0.03, 0.06)	6.20	0.00
Q3 2019	0.05	(0.03, 0.06)	6.36	0.00
Q4 2019	0.05	(0.03, 0.06)	6.93	0.00
Q1 2020	0.04	(0.02, 0.06)	4.67	0.00
Q2 2020	0.01	(-0.01, 0.03)	1.95	0.26
Q3 2020	0.03	(0.01, 0.05)	3.66	0.02
Q4 2020	0.03	(0.01, 0.05)	4.01	0.04
Overall	0.03	(0.02, 0.05)	4.81	0.00

Outcome	Regression-adjusted DID (percentage points)	90% confidence interval	Relative difference (%)	p-value
Use of any SUD-related WM services				
Q2 2019	-0.00	(-0.01, 0.00)	-22.51	0.50
Q3 2019	-0.00	(-0.01, 0.00)	-28.50	0.26
Q4 2019	-0.00	(-0.01, 0.00)	-41.80	0.12
Q1 2020	-0.00	(-0.00, 0.00)	-23.95	0.13
Q2 2020	-0.00	(-0.00, 0.00)	-11.54	0.45
Q3 2020	-0.00	(-0.00, 0.00)	-7.11	0.70
Q4 2020	-0.00	(-0.01, -0.00)	-38.43	0.04
Overall	-0.00	(-0.01, 0.00)	-24.82	0.26
Use of any SUD-related MAT services				
Q2 2019	0.00	(-0.01, 0.01)	0.69	0.59
Q3 2019	0.01	(-0.00, 0.02)	1.93	0.17
Q4 2019	0.01	(-0.00, 0.02)	1.53	0.32
Q1 2020	0.13	(0.10, 0.16)	27.65	0.00
Q2 2020	0.17	(0.13, 0.21)	36.77	0.00
Q3 2020	0.09	(0.07, 0.11)	19.02	0.00
Q4 2020	0.1	(0.08, 0.12)	20.33	0.00
Overall	0.07	(0.06, 0.09)	15.44	0.00

DID = difference-in-differences.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD in North Carolina and its comparison group.

Methods: A logistic regression model was used to obtain estimates. Results are weighted by the fraction of time the beneficiary was enrolled in Medicaid (eligibility fraction) and the propensity score weight. DID models for all outcomes assumed parallel trends in the baseline period except for MAT, for which nonparallel trends were assumed. Appendix A details the methods.

How to interpret the results: The relative difference is the DID estimate as a percentage of the demonstration state's baseline period adjusted mean. A *negative* value for the relative difference 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 state than in the comparison group.

Note: In North Carolina, Medicaid coverage for methadone, residential services, intensive outpatient services, partial hospitalization services, and WM services was added or expanded under the demonstration. Residential standards requiring access to MAT were updated under the demonstration.

Source: RTI analysis of TAF RIF data

Sensitivity Analysis

Exhibit NC-8 shows how the impact estimates for North Carolina’s outcomes differ when DID models that we ran assuming parallel trends were rerun assuming nonparallel baseline trends. We did not conduct a sensitivity analysis for outcomes where the main model assumed nonparallel baseline trends. Estimates for institutional and WM are not statistically significant regardless of the DID model form, which reinforces the lack of measurable impacts on these services in North Carolina relative to the comparison group. For outpatient services, the nonparallel model suggests the impact may be in the opposite direction, although the size of the impact is relatively small in both models.

Exhibit NC-8. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in North Carolina under different model assumptions

Outcome	Parallel trends assumption	Main analysis: Regression-adjusted relative difference (%) (90% C.I.)	Sensitivity analysis: Regression-adjusted relative difference (%) (90% C.I.)
Any SUD-related Institutional Service	Main: Parallel Sensitivity: Not parallel	-2.83 (-15.74, 9.72)	-12.79 (-29.45, 3.06)
Any SUD-related outpatient Service	Main: Parallel Sensitivity: Not parallel	4.81*** (2.38, 7.27)	-3.77* (-7.14, -0.50)
Any WM	Main: Parallel Sensitivity: Not parallel	-24.82 (-67.48, 11.37)	-20.36 (-73.03, 20.87)

* p<0.10; ** p<0.05; *** p<0.01.

Notes: C.I. = confidence interval; DID = difference-in-differences

Source: RTI analysis of TAF RIF data

New Hampshire

Trends in SUD-Related Treatment Outcomes

Exhibits NH-1 and NH-2 show weight-adjusted trends in the number of beneficiaries treated for SUD and beneficiaries treated for SUD as a percentage of all Medicaid beneficiaries in New Hampshire and its comparison group for 2016-2020.

Exhibit NH-1. Number of Medicaid beneficiaries treated for SUD in New Hampshire, 2016–2020

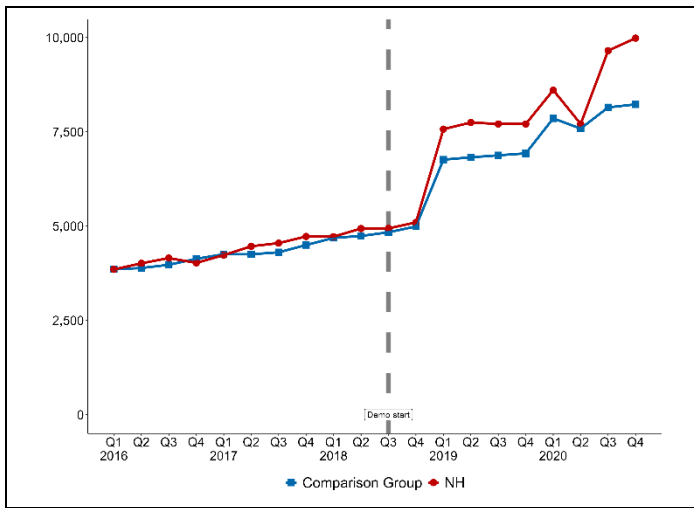
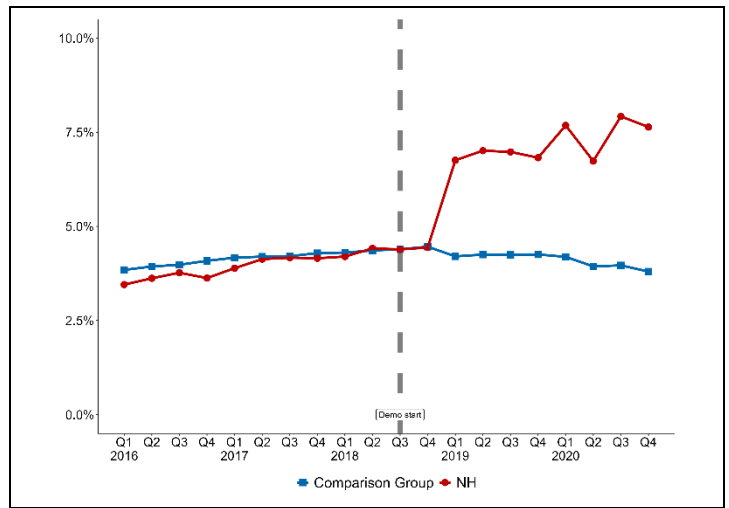


Exhibit NH-2. Beneficiaries treated for SUD as a percent of Medicaid beneficiaries in New Hampshire, 2016–2020



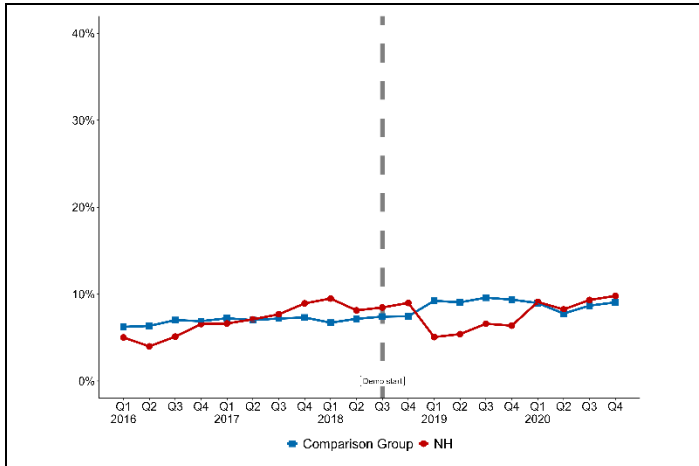
Notes: SUD = Substance Use Disorder

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare

Source: RTI analysis of TAF RIF data

Exhibits NH-3 through NH-6 present weight-adjusted trends for the percentages of beneficiaries treated for SUD receiving any SUD-related institutional service, any SUD-related outpatient service, any WM, and any MAT in New Hampshire and its comparison group for 2016-2020.

Exhibit NH-3. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related institutional services in New Hampshire, 2016–2020

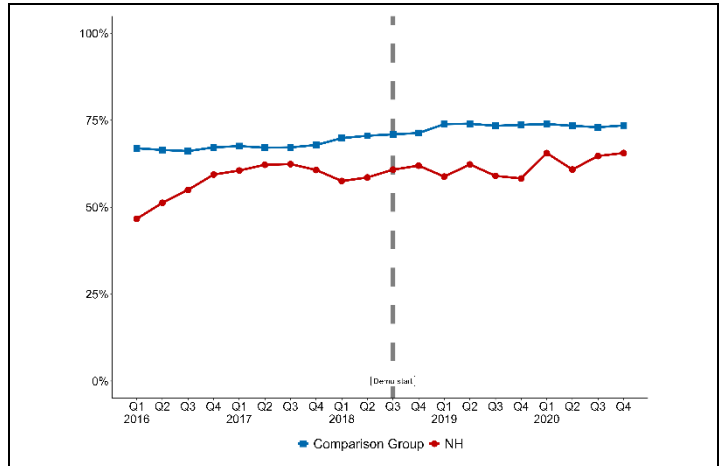


Notes: SUD = Substance Use Disorder; New Hampshire’s demonstration expanded Medicaid coverage of residential services. In New Hampshire, the completeness of inpatient (IP) claims and encounters was rated high concern in 2016-2019 and completeness of long-term care (LT) claims was rated high concern in 2016-2018, always due to low volumes. These potential shortcomings could lead to underestimated institutional service use.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD

Source: RTI analysis of TAF RIF data

Exhibit NH-4. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related outpatient services in New Hampshire, 2016–2020

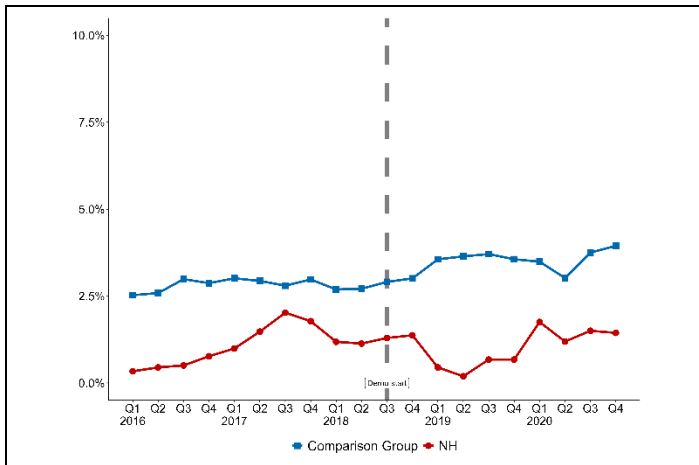


Notes: SUD = Substance Use Disorder

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD

Source: RTI analysis of TAF RIF data

Exhibit NH-5. Percent of Medicaid beneficiaries treated for SUD receiving WM services in New Hampshire, 2016–2020

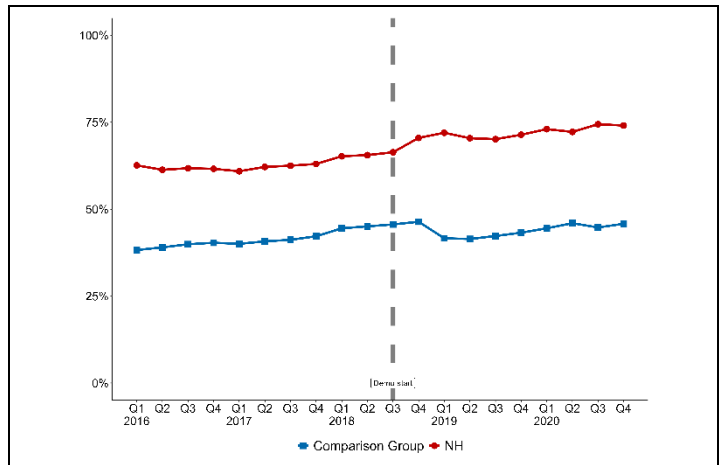


Notes: SUD = Substance Use Disorder. In New Hampshire, the completeness of inpatient (IP) claims and encounters was rated high concern in 2016-2019 and completeness of long-term care (LT) claims was rated high concern in 2016-2018, always due to low volumes. These potential shortcomings could lead to underestimated WM use.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD

Source: RTI analysis of TAF RIF data

Exhibit NH-6. Percent of Medicaid beneficiaries treated for SUD receiving MAT services in New Hampshire, 2016–2020



Notes: MAT = Medication-assisted treatment; SUD = Substance Use Disorder; New Hampshire’s demonstration updated residential MAT requirements.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD

Source: RTI analysis of TAF RIF data

New Hampshire SUD Demonstration Impact Results

Exhibit NH-7 shows the estimates of any SUD-related institutional service, any SUD-related outpatient service, WM, and MAT for Medicaid beneficiaries in New Hampshire relative to individuals in the comparison group.

Exhibit NH-7. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in New Hampshire

Outcome	Regression-adjusted DID (percentage points)	90% confidence interval	Relative difference (%)	p-value
Use of any SUD-related institutional services				
Q3 2018	-0.02	(-0.03, -0.01)	-29.46	0.00
Q4 2018	-0.03	(-0.04, -0.01)	-37.01	0.00
Q1 2019	-0.09	(-0.11, -0.06)	-118.26	0.00
Q2 2019	-0.09	(-0.12, -0.06)	-121.15	0.00
Q3 2019	-0.09	(-0.13, -0.06)	-132.01	0.00
Q4 2019	-0.10	(-0.13, -0.07)	-140.62	0.00
Q1 2020	-0.07	(-0.10, -0.03)	-90.93	0.00
Q2 2020	-0.05	(-0.08, -0.02)	-69.60	0.00
Q3 2020	-0.06	(-0.09, -0.02)	-78.08	0.01
Q4 2020	-0.07	(-0.11, -0.03)	-96.64	0.01
Overall	-0.07	(-0.10, -0.04)	-95.24	0.00
Use of any SUD-related outpatient services				
Q3 2018	0.00	(-0.03, 0.03)	-0.22	0.94
Q4 2018	0.00	(-0.01, 0.02)	0.72	0.68
Q1 2019	-0.05	(-0.06, -0.03)	-7.18	0.00
Q2 2019	-0.01	(-0.04, 0.02)	-1.95	0.50
Q3 2019	-0.04	(-0.07, -0.01)	-5.85	0.03
Q4 2019	-0.05	(-0.08, -0.02)	-8.13	0.01
Q1 2020	0.03	(0.00, 0.06)	4.85	0.09
Q2 2020	0.00	(-0.04, 0.05)	0.70	0.88
Q3 2020	0.05	(0.01, 0.09)	8.03	0.02
Q4 2020	0.05	(0.02, 0.08)	7.90	0.01
Overall	0.00	(-0.03, 0.03)	0.38	0.90

Outcome	Regression-adjusted DID (percentage points)	90% confidence interval	Relative difference (%)	p-value
Use of any SUD-related WM services				
Q3 2018	0.00	(-0.00, 0.00)	-2.24	0.81
Q4 2018	0.00	(-0.00, 0.00)	-9.13	0.16
Q1 2019	-0.01	(-0.01, -0.01)	-61.27	0.00
Q2 2019	-0.01	(-0.02, -0.01)	-80.44	0.00
Q3 2019	-0.01	(-0.01, -0.01)	-59.25	0.00
Q4 2019	-0.01	(-0.01, -0.00)	-56.68	0.00
Q1 2020	0.00	(0.00, 0.01)	27.07	0.02
Q2 2020	0.00	(-0.00, 0.00)	3.99	0.63
Q3 2020	0.00	(-0.00, 0.00)	9.88	0.45
Q4 2020	-0.00	(-0.00, 0.00)	-2.54	0.86
Overall	-0.00	(-0.01, -0.00)	-22.22	0.10
Use of any SUD-related MAT services				
Q3 2018	0.00	(-0.01, 0.02)	0.53	0.77
Q4 2018	0.04	(0.01, 0.06)	6.34	0.01
Q1 2019	0.08	(0.05, 0.12)	14.47	0.00
Q2 2019	0.07	(0.03, 0.11)	12.40	0.01
Q3 2019	0.06	(0.03, 0.10)	10.64	0.00
Q4 2019	0.07	(0.03, 0.10)	11.47	0.00
Q1 2020	0.06	(0.01, 0.11)	10.82	0.04
Q2 2020	0.03	(-0.01, 0.07)	5.45	0.23
Q3 2020	0.06	(0.01, 0.12)	10.76	0.05
Q4 2020	0.06	(0.01, 0.11)	10.08	0.06
Overall	0.06	(0.02, 0.10)	9.78	0.02

DID = difference-in-differences.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD in New Hampshire and its comparison group.

Methods: A logistic regression model was used to obtain estimates. Results are weighted by the fraction of time the beneficiary was enrolled in Medicaid (eligibility fraction) and the propensity score weight. DID models for all outcomes assumed parallel trends in the baseline period except for institutional services, for which nonparallel trends were assumed. Appendix A details the methods.

How to interpret the results: The relative difference is the DID estimate as a percentage of the demonstration state's baseline period adjusted mean. A *negative* value for the relative difference 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 state than in the comparison group.

Note: In New Hampshire, Medicaid coverage for residential services was expanded under the demonstration. Residential standards requiring access to MAT were updated under the demonstration.

Source: RTI analysis of TAF RIF data

Sensitivity Analysis

Exhibit NH-8 shows how the impact estimates for New Hampshire’s outcomes differ when DID models that we ran assuming parallel trends were rerun assuming nonparallel baseline trends. We did not conduct a sensitivity analysis for outcomes where the main model assumed nonparallel baseline trends. In all cases, the nonparallel models indicate that there were much larger, statistically significant impacts on service used by beneficiaries treated for SUD in New Hampshire, relative to the comparison group.

Exhibit NH-8. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in New Hampshire under different model assumptions

Outcome	Parallel trends assumption	Main analysis: Regression-adjusted relative difference (%) (90% C.I.)	Sensitivity analysis: Regression-adjusted relative difference (%) (90% C.I.)
Any SUD-related outpatient Service	Main: Parallel Sensitivity: Not parallel	0.38 (-4.35, 5.30)	-11.15*** (-17.89, -4.60)
Any WM	Main: Parallel Sensitivity: Not parallel	-22.22* (-62.87, 0.36)	-374.31** (-950.96, -112.78)
Any MAT	Main: Parallel Sensitivity: Not parallel	9.78** (2.63, 17.00)	12.36*** (6.26, 18.60)

* p<0.10; ** p<0.05; *** p<0.01.

Notes: C.I. = confidence interval; DID = difference-in-differences

Source: RTI analysis of TAF RIF data

New Jersey

Trends in SUD-Related Treatment Outcomes

Exhibits NJ-1 and NJ-2 show weight-adjusted trends in the number of beneficiaries treated for SUD and beneficiaries treated for SUD as a percentage of all Medicaid beneficiaries in New Jersey and its comparison group for 2016-2020.

Exhibit NJ-1. Number of Medicaid beneficiaries treated for SUD in New Jersey, 2016-2020

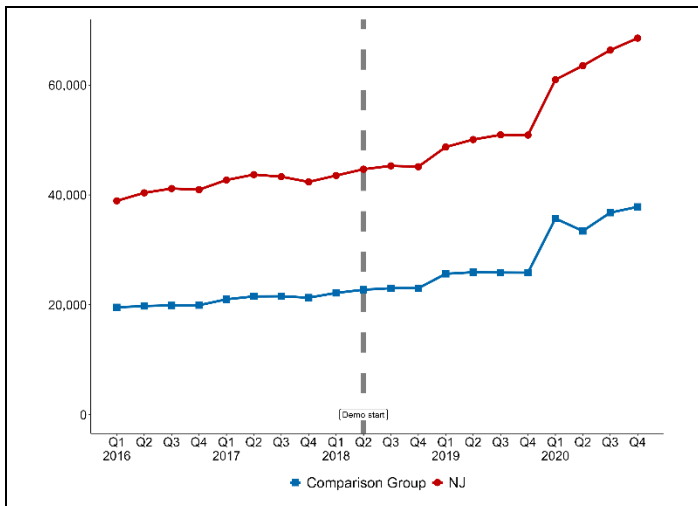
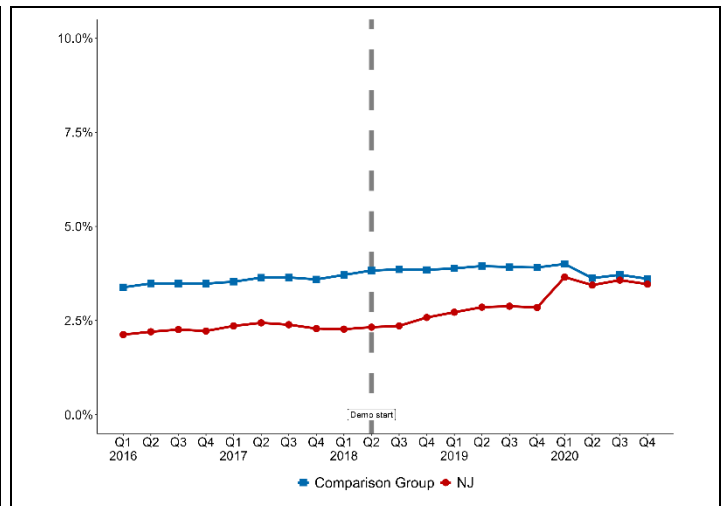


Exhibit NJ-2. Beneficiaries treated for SUD as a percent of Medicaid beneficiaries in New Jersey, 2016-2020



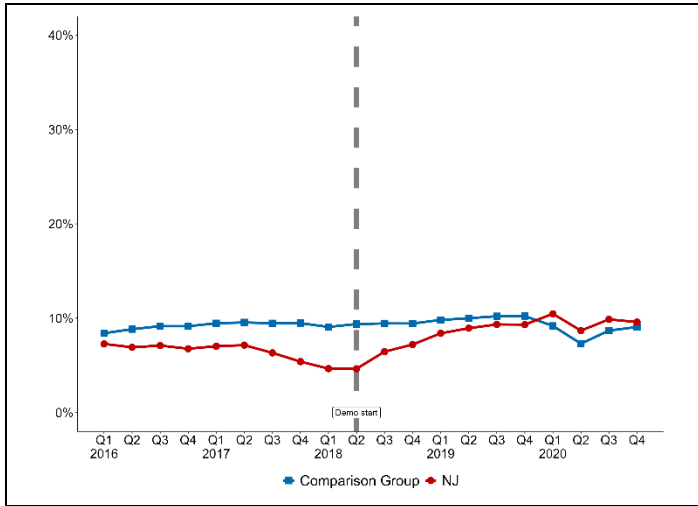
Notes: SUD = Substance Use Disorder

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare

Source: RTI analysis of TAF RIF data

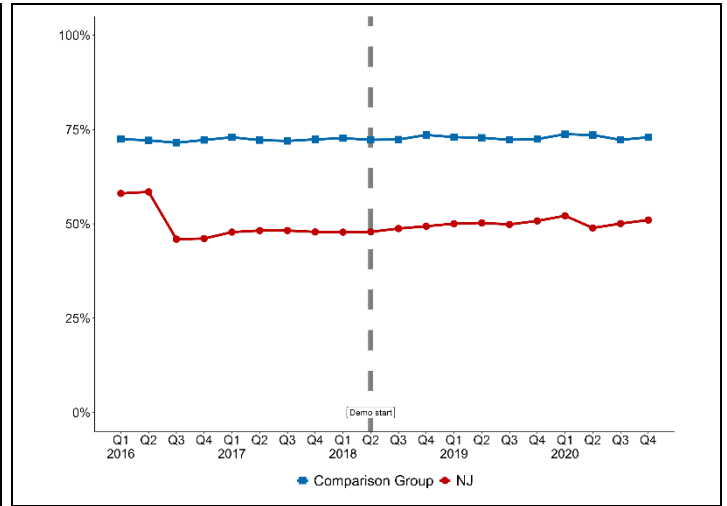
Exhibits NJ-3 through NJ-6 present weight-adjusted trends for the percentages of beneficiaries treated for SUD receiving any SUD-related institutional service, any SUD-related outpatient service, any WM, and any MAT in New Jersey and its comparison group for 2016-2020.

Exhibit NJ-3. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related institutional services in New Jersey, 2016–2020



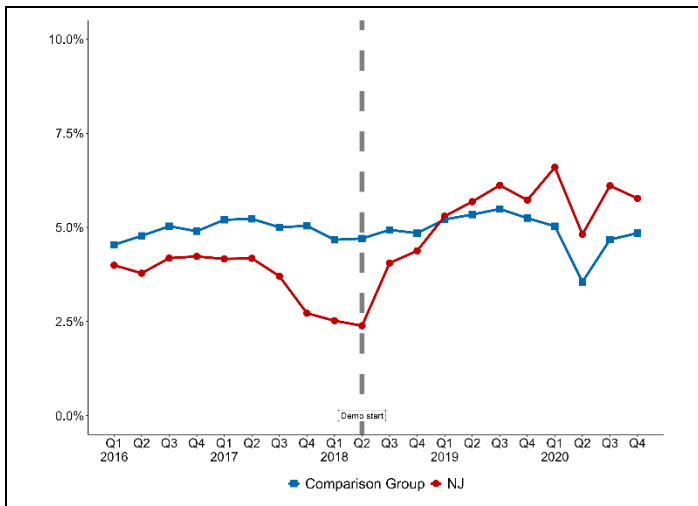
Notes: SUD = Substance Use Disorder; New Jersey’s demonstration added Medicaid coverage for residential services.
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

Exhibit NJ-4. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related outpatient services in New Jersey, 2016–2020



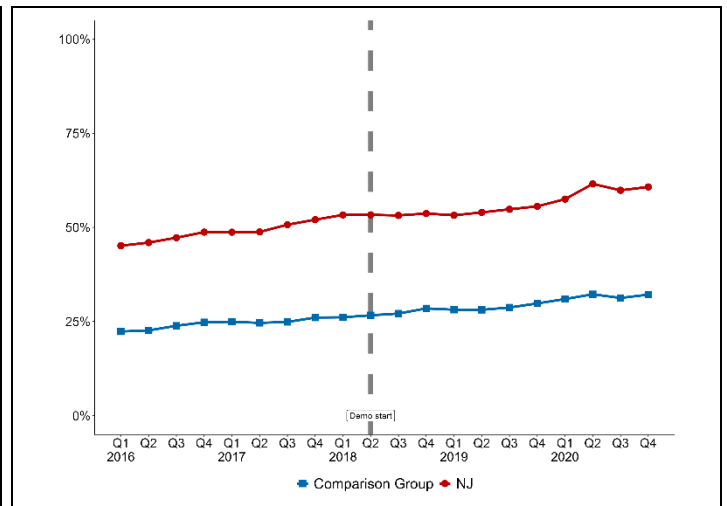
Notes: SUD = Substance Use Disorder; New Jersey’s demonstration expanded Medicaid coverage for intensive outpatient and partial hospitalization services.
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

Exhibit NJ-5. Percent of Medicaid beneficiaries treated for SUD receiving WM services in New Jersey, 2016–2020



Notes: SUD = Substance Use Disorder; New Jersey’s demonstration expanded Medicaid coverage for WM services.
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

Exhibit NJ-6. Percent of Medicaid beneficiaries treated for SUD receiving MAT services in New Jersey, 2016–2020



Notes: MAT = Medication-assisted treatment; SUD = Substance Use Disorder; New Jersey’s demonstration added residential MAT requirements.
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

New Jersey SUD Demonstration Impact Results

Exhibit NJ-7 shows the estimates of any SUD-related institutional service, any SUD-related outpatient service, WM, and MAT for Medicaid beneficiaries in New Jersey relative to individuals in the comparison group.

Exhibit NJ-7. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in New Jersey

Outcome	Regression-adjusted DID (percentage points)	90% confidence interval	Relative difference (%)	p-value
Use of institutional services				
Q2 2018	-0.00	(-0.01, -0.00)	-5.42	0.09
Q3 2018	0.01	(0.01, 0.02)	16.31	0.00
Q4 2018	0.02	(0.02, 0.02)	22.34	0.00
Q1 2019	0.03	(0.03, 0.04)	38.85	0.00
Q2 2019	0.04	(0.03, 0.05)	46.23	0.00
Q3 2019	0.05	(0.03, 0.06)	51.06	0.00
Q4 2019	0.04	(0.03, 0.05)	48.65	0.00
Q1 2020	0.07	(0.05, 0.08)	74.88	0.00
Q2 2020	0.06	(0.04, 0.07)	63.04	0.00
Q3 2020	0.06	(0.05, 0.08)	71.03	0.00
Q4 2020	0.06	(0.04, 0.07)	64.45	0.00
Overall	0.04	(0.03, 0.05)	49.15	0.00
Use of outpatient services				
Q2 2018	-0.01	(-0.03, 0.00)	-2.10	0.25
Q3 2018	0.00	(-0.02, 0.01)	-0.46	0.81
Q4 2018	-0.01	(-0.03, 0.01)	-1.66	0.53
Q1 2019	0.01	(-0.01, 0.03)	1.38	0.59
Q2 2019	0.01	(-0.01, 0.03)	2.19	0.45
Q3 2019	0.01	(-0.01, 0.04)	2.71	0.33
Q4 2019	0.02	(-0.01, 0.04)	3.32	0.26
Q1 2020	0.01	(-0.01, 0.03)	1.88	0.52
Q2 2020	-0.02	(-0.05, 0.01)	-3.55	0.30
Q3 2020	0.01	(-0.02, 0.03)	1.19	0.72
Q4 2020	0.00	(-0.02, 0.03)	0.69	0.82
Overall	0.00	(-0.02, 0.03)	0.54	0.85

Outcome	Regression-adjusted DID (percentage points)	90% confidence interval	Relative difference (%)	p-value
Use of WM services				
Q2 2018	0.00	(-0.01, 0.00)	-7.74	0.13
Q3 2018	0.01	(0.01, 0.02)	29.75	0.00
Q4 2018	0.01	(0.01, 0.02)	32.45	0.00
Q1 2019	0.03	(0.02, 0.03)	62.65	0.00
Q2 2019	0.03	(0.02, 0.04)	70.07	0.00
Q3 2019	0.03	(0.03, 0.04)	81.37	0.00
Q4 2019	0.03	(0.02, 0.04)	71.79	0.00
Q1 2020	0.04	(0.03, 0.05)	105.18	0.00
Q2 2020	0.03	(0.03, 0.04)	78.15	0.00
Q3 2020	0.04	(0.03, 0.05)	95.69	0.00
Q4 2020	0.04	(0.03, 0.04)	85.54	0.00
Overall	0.03	(0.02, 0.04)	69.49	0.00
Use of MAT services				
Q2 2018	0.01	(-0.01, 0.03)	2.16	0.32
Q3 2018	0.00	(-0.02, 0.02)	0.50	0.84
Q4 2018	0.00	(-0.03, 0.02)	-0.92	0.72
Q1 2019	-0.01	(-0.03, 0.01)	-2.21	0.33
Q2 2019	0.00	(-0.02, 0.01)	-0.93	0.67
Q3 2019	-0.01	(-0.02, 0.01)	-1.26	0.59
Q4 2019	0.00	(-0.03, 0.02)	-0.81	0.77
Q1 2020	0.00	(-0.02, 0.03)	0.91	0.75
Q2 2020	0.03	(0.00, 0.05)	5.65	0.07
Q3 2020	0.02	(-0.00, 0.05)	4.82	0.14
Q4 2020	0.03	(-0.00, 0.05)	5.42	0.10
Overall	0.01	(-0.01, 0.03)	1.65	0.55

DID = difference-in-differences.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD in New Jersey and its comparison group.

Methods: A logistic regression model was used to obtain estimates. Results are weighted by the fraction of time the beneficiary was enrolled in Medicaid (eligibility fraction) and the propensity score weight. DID models for all outcomes assumed parallel trends in the baseline period except for institutional services and WM, for which nonparallel trends were assumed. Appendix A details the methods.

How to interpret the results: The relative difference is the DID estimate as a percentage of the demonstration state's baseline period adjusted mean. A *negative* value for the relative difference 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 state than in the comparison group.

Note: In New Jersey, Medicaid coverage for residential services, intensive outpatient services, partial hospitalization services, and WM services was added or expanded under the demonstration. Residential standards requiring access to MAT were added under the demonstration.

Source: RTI analysis of TAF RIF data

Sensitivity Analysis

Exhibit NJ-8 shows how the impact estimates for New Jersey's outcomes differ when DID models that we ran assuming parallel trends were rerun assuming nonparallel baseline trends. We did not conduct a sensitivity analysis for outcomes where the main model assumed nonparallel baseline trends. For outpatient services, the nonparallel model suggests a larger, statistically significant increase in use relative to the comparison group. For MAT, both models produce small estimates that are not statistically significant, which reinforces the lack of measurable impacts on use of MAT by beneficiaries in New Jersey relative to the comparison group.

Exhibit NJ-8. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in New Jersey under different model assumptions

Outcome	Parallel trends assumption	Main analysis: Regression-adjusted relative difference (%) (90% C.I.)	Sensitivity analysis: Regression-adjusted relative difference (%) (90% C.I.)
Any SUD-related outpatient Service	Main: Parallel Sensitivity: Not parallel	0.54 (-4.20, 5.15)	15.94*** (5.99, 26.20)
Any MAT	Main: Parallel Sensitivity: Not parallel	1.65 (-2.77, 6.20)	-0.99 (-7.32, 5.28)

* p<0.10; ** p<0.05; *** p<0.01.

Notes: C.I. = confidence interval; DID = difference-in-differences

Source: RTI analysis of TAF RIF data

New Mexico

Trends in SUD-Related Treatment Outcomes

Exhibits NM-1 and NM-2 show weight-adjusted trends in the number of beneficiaries treated for SUD and beneficiaries treated for SUD as a percentage of all Medicaid beneficiaries in New Mexico and its comparison group for 2016-2020.

Exhibit NM-1. Number of Medicaid beneficiaries treated for SUD in New Mexico, 2016–2020

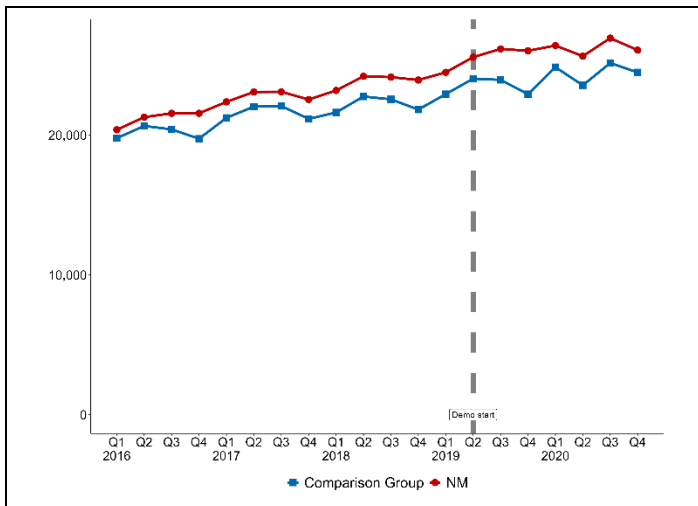
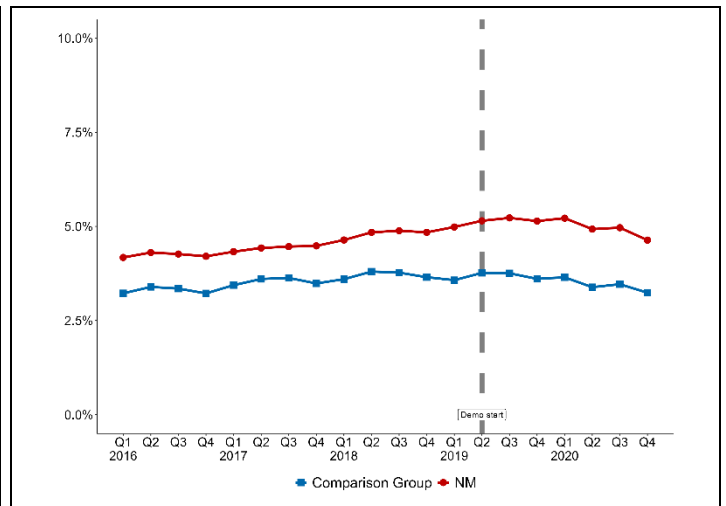


Exhibit NM-2. Beneficiaries treated for SUD as a percent of Medicaid beneficiaries in New Mexico, 2016–2020



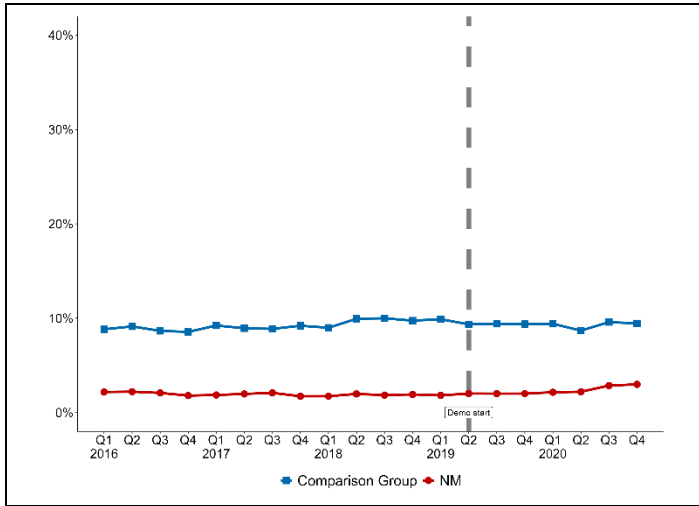
Notes: SUD = Substance Use Disorder

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare

Source: RTI analysis of TAF RIF data

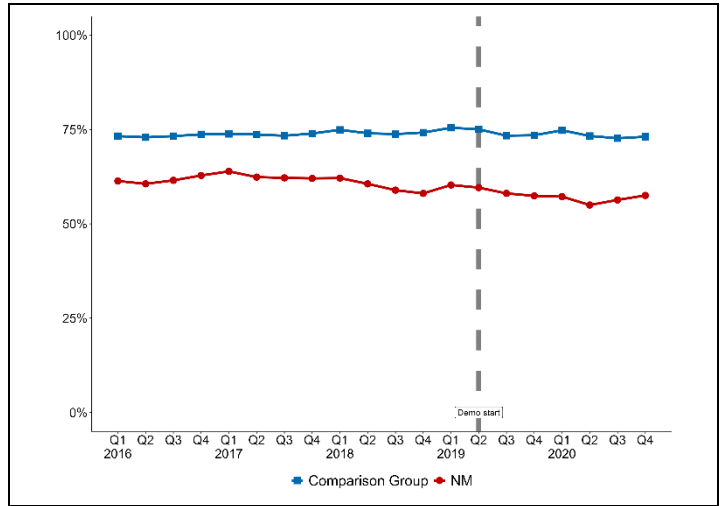
Exhibits NM-3 through NM-6 present weight-adjusted trends for the percentages of beneficiaries treated for SUD receiving any SUD-related institutional service, any SUD-related outpatient service, any WM, and any MAT in New Mexico and its comparison group for 2016-2020.

Exhibit NM-3. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related institutional services in New Mexico, 2016–2020



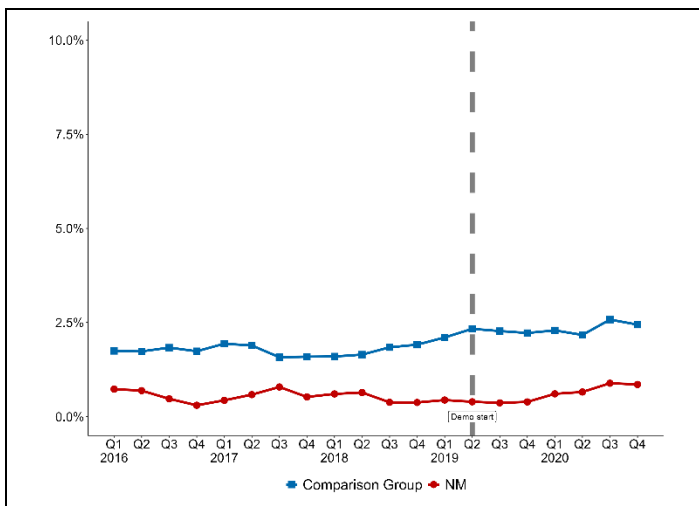
Notes: SUD = Substance Use Disorder; New Mexico’s demonstration expanded Medicaid coverage for residential services.
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

Exhibit NM-4. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related outpatient services in New Mexico, 2016–2020



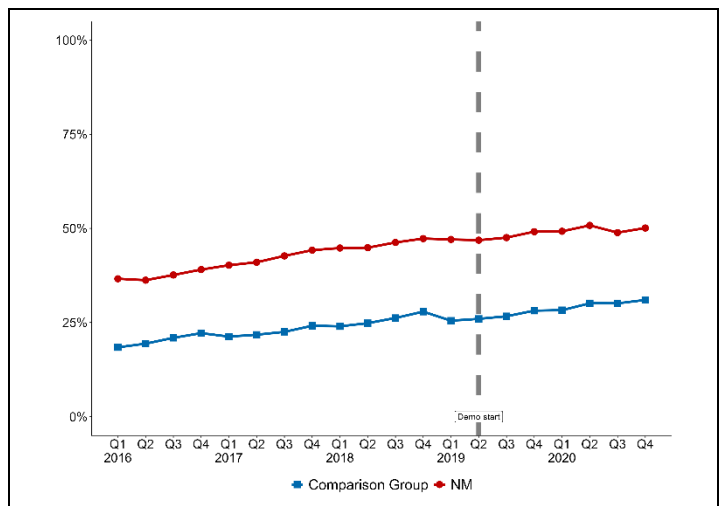
Notes: SUD = Substance Use Disorder; New Mexico’s demonstration expanded Medicaid coverage for intensive outpatient and partial hospitalization services.
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

Exhibit NM-5. Percent of Medicaid beneficiaries treated for SUD receiving WM services in New Mexico, 2016–2020



Notes: SUD = Substance Use Disorder; New Mexico’s demonstration added Medicaid coverage for WM services.
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

Exhibit NM-6. Percent of Medicaid beneficiaries treated for SUD receiving MAT services in New Mexico, 2016–2020



Notes: MAT = Medication-assisted treatment; SUD = Substance Use Disorder; New Mexico’s demonstration added residential MAT requirements.
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

New Mexico SUD Demonstration Impact Results

Exhibit NM-7 shows the estimates of any SUD-related institutional service, any SUD-related outpatient service, WM, and MAT for Medicaid beneficiaries in New Mexico relative to individuals in the comparison group.

Exhibit NM-7. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in New Mexico

Outcome	Regression-adjusted DID (percentage points)	90% confidence interval	Relative difference (%)	p-value
Use of institutional services				
Q2 2019	0.00	(-0.00, 0.00)	0.13	0.98
Q3 2019	0.00	(-0.00, 0.00)	0.17	0.97
Q4 2019	0.00	(-0.00, 0.00)	-0.51	0.90
Q1 2020	0.00	(-0.00, 0.00)	3.11	0.35
Q2 2020	0.00	(0.00, 0.01)	12.36	0.00
Q3 2020	0.01	(0.00, 0.01)	24.52	0.00
Q4 2020	0.01	(0.00, 0.01)	23.60	0.00
Overall	0.00	(0.00, 0.01)	9.13	0.07
Use of outpatient services				
Q2 2019	-0.03	(-0.05, -0.02)	-4.65	0.00
Q3 2019	-0.03	(-0.04, -0.01)	-3.86	0.01
Q4 2019	-0.04	(-0.06, -0.01)	-5.33	0.01
Q1 2020	-0.04	(-0.07, -0.01)	-5.66	0.04
Q2 2020	-0.04	(-0.07, -0.01)	-5.63	0.04
Q3 2020	-0.01	(-0.04, 0.01)	-2.15	0.40
Q4 2020	-0.03	(-0.05, -0.01)	-4.81	0.01
Overall	-0.03	(-0.05, -0.01)	-4.57	0.03

Outcome	Regression-adjusted DID (percentage points)	90% confidence interval	Relative difference (%)	p-value
Use of WM services				
Q2 2019	-0.00	(-0.00, -0.00)	-27.43	0.00
Q3 2019	-0.00	(-0.00, -0.00)	-28.68	0.00
Q4 2019	-0.00	(-0.00, -0.00)	-26.60	0.00
Q1 2020	-0.00	(-0.00, 0.00)	-8.39	0.36
Q2 2020	0.00	(-0.00, 0.00)	1.49	0.86
Q3 2020	0.00	(-0.00, 0.00)	8.47	0.54
Q4 2020	0.00	(-0.00, 0.00)	2.21	0.86
Overall	-0.00	(-0.00, 0.00)	-11.17	0.23
Use of MAT services				
Q2 2019	0.00	(-0.02, 0.01)	-1.07	0.66
Q3 2019	-0.01	(-0.02, 0.01)	-1.47	0.60
Q4 2019	0.00	(-0.02, 0.01)	-1.25	0.64
Q1 2020	-0.03	(-0.05, -0.00)	-6.77	0.07
Q2 2020	-0.04	(-0.07, -0.01)	-11.24	0.02
Q3 2020	-0.06	(-0.09, -0.03)	-16.79	0.00
Q4 2020	-0.03	(-0.05, 0.00)	-7.29	0.11
Overall	-0.02	(-0.05, -0.00)	-6.60	0.07

DID = difference-in-differences.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD in New Mexico and its comparison group.

Methods: A logistic regression model was used to obtain estimates. Results are weighted by the fraction of time the beneficiary was enrolled in Medicaid (eligibility fraction) and the propensity score weight. DID models for all outcomes assumed parallel trends in the baseline period. Appendix A details the methods.

How to interpret the results: The relative difference is the DID estimate as a percentage of the demonstration state's baseline period adjusted mean. A *negative* value for the relative difference 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 state than in the comparison group.

Note: In New Mexico, Medicaid coverage for residential services, intensive outpatient services, partial hospitalization services, and WM services was added or expanded under the demonstration. Residential standards requiring access to MAT were added under the demonstration.

Source: RTI analysis of TAF RIF data

Sensitivity Analysis

Exhibit NM-8 shows how the impact estimates for New Mexico's outcomes differ when DID models that we ran assuming parallel trends were rerun assuming nonparallel baseline trends. The nonparallel model estimated a larger increase in institutional service use relative to the comparison group. For all other outcomes, the estimates from the nonparallel models are not statistically significant. For outpatient and MAT, these findings suggest that there is some uncertainty about whether there were decreases in use relative to the comparison group.

Exhibit NM-8. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in New Mexico under different model assumptions

Outcome	Parallel trends assumption	Main analysis: Regression-adjusted relative difference (%) (90% C.I.)	Sensitivity analysis: Regression-adjusted relative difference (%) (90% C.I.)
Any SUD-related Institutional Service	Main: Parallel Sensitivity: Not parallel	9.13* (1.00, 20.13)	17.22*** (10.06, 29.46)
Any SUD-related outpatient Service	Main: Parallel Sensitivity: Not parallel	-4.57** (-8.11, -1.10)	0.23 (-2.91, 3.27)
Any WM	Main: Parallel Sensitivity: Not parallel	-11.17 (-48.05, 5.97)	4.10 (-10.79, 25.94)
Any MAT	Main: Parallel Sensitivity: Not parallel	-6.60* (-12.63, -0.71)	-4.98 (-11.75, 1.51)

* p<0.10; ** p<0.05; *** p<0.01.

Notes: C.I. = confidence interval; DID = difference-in-differences

Source: RTI analysis of TAF RIF data

Pennsylvania

Trends in SUD-Related Treatment Outcomes

Exhibits PA-1 and PA-2 show weight-adjusted trends in the number of beneficiaries treated for SUD and beneficiaries treated for SUD as a percentage of all Medicaid beneficiaries in Pennsylvania and its comparison group for 2016-2020.

Exhibit PA-1. Number of Medicaid beneficiaries treated for SUD in Pennsylvania, 2016-2020

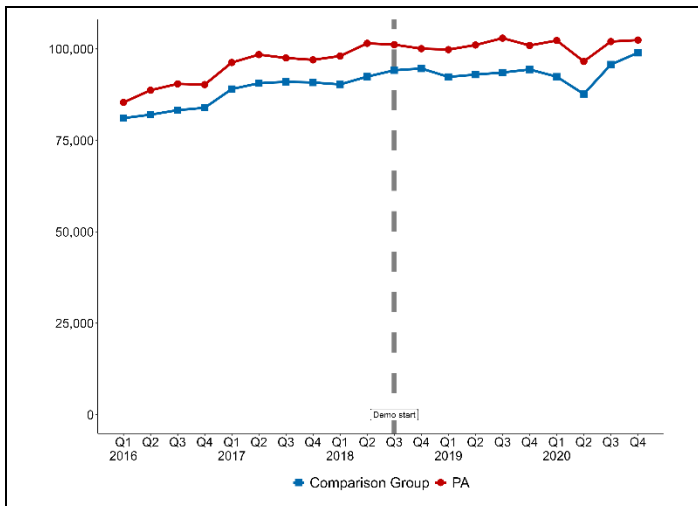
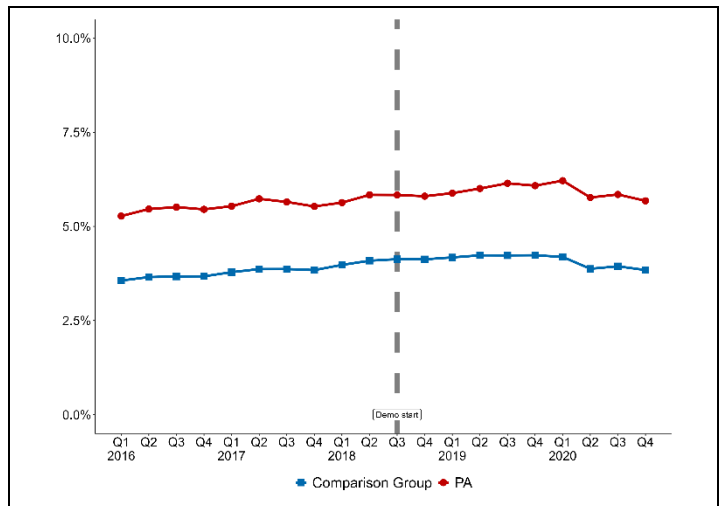


Exhibit PA-2. Beneficiaries treated for SUD as a percent of Medicaid beneficiaries in Pennsylvania, 2016-2020



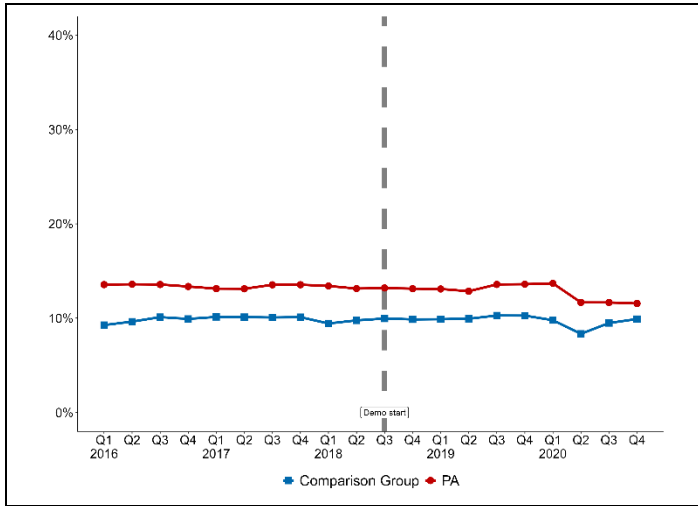
Notes: SUD = Substance Use Disorder

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare

Source: RTI analysis of TAF RIF data

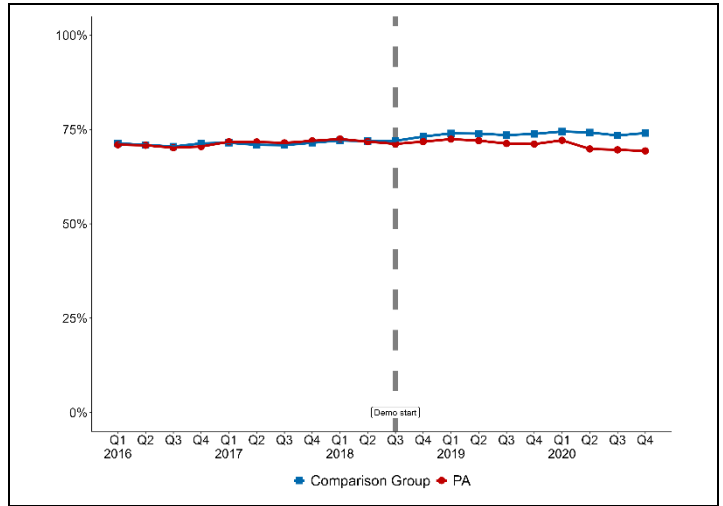
Exhibits PA-3 through PA-6 present weight-adjusted trends for the percentages of beneficiaries treated for SUD receiving any SUD-related institutional service, any SUD-related outpatient service, any WM, and any MAT in Pennsylvania and its comparison group for 2016-2020.

Exhibit PA-3. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related institutional services in Pennsylvania, 2016–2020



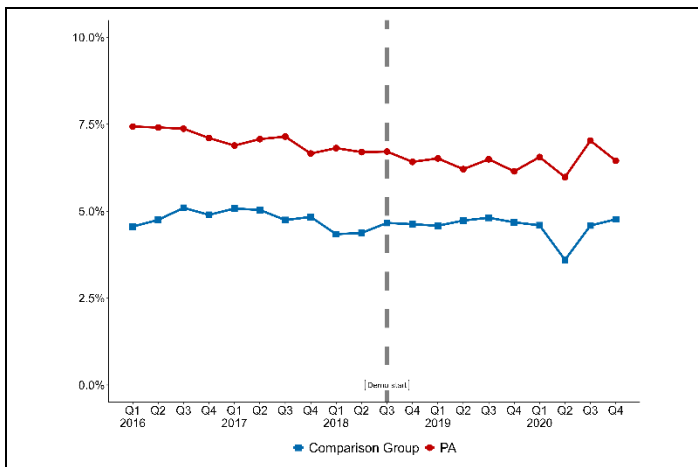
Notes: SUD = Substance Use Disorder; Pennsylvania’s demonstration expanded Medicaid coverage for residential services.
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

Exhibit PA-4. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related outpatient services in Pennsylvania, 2016–2020



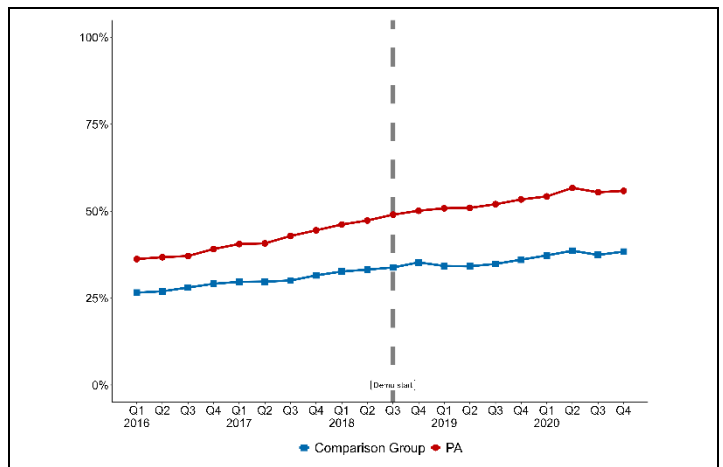
Notes: SUD = Substance Use Disorder; Pennsylvania’s demonstration expanded Medicaid coverage for intensive outpatient and partial hospitalization services. We may have slightly underestimated outpatient service use for Pennsylvania in 2016-2018 because of missing procedure codes on facility claims in the Other Services (OT) files, because some services require a procedure code for identification. Any bias in DID models was likely minimal.
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

Exhibit PA-5. Percent of Medicaid beneficiaries treated for SUD receiving WM services in Pennsylvania, 2016–2020



Notes: SUD = Substance Use Disorder; Pennsylvania’s demonstration expanded Medicaid coverage for WM services.
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

Exhibit PA-6. Percent of Medicaid beneficiaries treated for SUD receiving MAT services in Pennsylvania, 2016–2020



Notes: Medication-assisted treatment; SUD = Substance Use Disorder; Pennsylvania’s demonstration updated residential MAT requirements.
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

Pennsylvania SUD Demonstration Impact Results

Exhibit PA-7 shows the estimates of use of any SUD-related institutional service, any SUD-related outpatient service, WM, and MAT for Medicaid beneficiaries in Pennsylvania relative to individuals in the comparison group.

Exhibit PA-7. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in Pennsylvania

Outcome	Regression-adjusted DID (percentage points)	90% confidence interval	Relative difference (%)	p-value
Use of institutional services				
Q3 2018	-0.01	(-0.01, 0.00)	-3.67	0.25
Q4 2018	-0.01	(-0.01, 0.00)	-4.02	0.22
Q1 2019	0.00	(-0.01, 0.00)	-3.17	0.32
Q2 2019	-0.01	(-0.02, 0.00)	-4.48	0.22
Q3 2019	-0.01	(-0.02, 0.00)	-3.81	0.34
Q4 2019	-0.01	(-0.02, 0.00)	-4.41	0.34
Q1 2020	0.01	(-0.01, 0.02)	3.77	0.48
Q2 2020	0.00	(-0.01, 0.01)	1.40	0.67
Q3 2020	-0.02	(-0.03, -0.01)	-13.60	0.00
Q4 2020	-0.03	(-0.04, -0.02)	-17.70	0.00
Overall	-0.01	(-0.02, 0.00)	-5.01	0.19
Use of outpatient services				
Q3 2018	0.00	(-0.01, 0.01)	-0.28	0.72
Q4 2018	0.00	(-0.02, 0.01)	-0.69	0.44
Q1 2019	-0.01	(-0.03, -0.00)	-2.05	0.03
Q2 2019	-0.01	(-0.03, -0.00)	-2.05	0.08
Q3 2019	-0.02	(-0.03, -0.01)	-2.83	0.01
Q4 2019	-0.02	(-0.04, -0.01)	-3.28	0.01
Q1 2020	-0.02	(-0.04, -0.00)	-3.12	0.06
Q2 2020	-0.04	(-0.07, -0.01)	-5.72	0.02
Q3 2020	-0.03	(-0.06, -0.00)	-4.46	0.08
Q4 2020	-0.04	(-0.07, -0.01)	-5.65	0.02
Overall	-0.02	(-0.04, -0.00)	-3.01	0.05
Use of WM services				
Q3 2018	-0.00	(-0.01, 0.00)	-3.95	0.44
Q4 2018	-0.00	(-0.01, 0.00)	-6.22	0.17
Q1 2019	-0.00	(-0.01, 0.00)	-5.27	0.21
Q2 2019	-0.01	(-0.01, -0.00)	-10.81	0.03
Q3 2019	-0.01	(-0.01, -0.00)	-9.43	0.04
Q4 2019	-0.01	(-0.01, -0.00)	-11.47	0.01
Q1 2020	-0.00	(-0.01, 0.01)	-4.44	0.50
Q2 2020	0.00	(-0.00, 0.01)	5.96	0.33
Q3 2020	-0.00	(-0.01, 0.01)	-2.04	0.77
Q4 2020	-0.01	(-0.02, -0.00)	-12.43	0.08
Overall	-0.00	(-0.01, 0.00)	-6.07	0.27
Use of MAT services				
Q3 2018	0.03	(0.02, 0.04)	7.39	0.00
Q4 2018	0.03	(0.01, 0.04)	6.75	0.00
Q1 2019	0.05	(0.03, 0.06)	10.85	0.00
Q2 2019	0.05	(0.04, 0.06)	11.14	0.00
Q3 2019	0.05	(0.04, 0.07)	11.70	0.00
Q4 2019	0.05	(0.04, 0.07)	12.11	0.00
Q1 2020	0.06	(0.04, 0.07)	12.44	0.00
Q2 2020	0.06	(0.04, 0.08)	13.80	0.00
Q3 2020	0.05	(0.04, 0.07)	11.86	0.00
Q4 2020	0.05	(0.03, 0.07)	10.51	0.00
Overall	0.05	(0.03, 0.06)	10.85	0.00

DID = difference-in-differences.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD in Pennsylvania and its comparison group.

Methods: A logistic regression model was used to obtain estimates. Results are weighted by the fraction of time the beneficiary was enrolled in Medicaid (eligibility fraction) and the propensity score weight. DID models for all outcomes assumed parallel trends in the baseline period. Appendix A details the methods.

How to interpret the results: The relative difference is the DID estimate as a percentage of the demonstration state's baseline period adjusted mean. A *negative* value for the relative difference 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 state than in the comparison group.

Note: In Pennsylvania, Medicaid coverage for residential services, intensive outpatient services, partial hospitalization services, and WM services was added or expanded under the demonstration. Residential standards requiring access to MAT were updated under the demonstration.

Source: RTI analysis of TAF RIF data

Sensitivity Analysis

Exhibit PA-8 shows how the impact estimates for Pennsylvania’s outcomes differ when DID models that we ran assuming parallel trends were rerun assuming nonparallel baseline trends. All estimates for these outcomes are not statistically significant regardless of the DID model form, which reinforces the lack of measurable impacts on the types of services used by beneficiaries treated for SUD in Alaska relative to the comparison group.

Exhibit PA-8. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in Pennsylvania under different model assumptions

Outcome	Parallel trends assumption	Main analysis: Regression-adjusted relative difference (%) (90% C.I.)	Sensitivity analysis: Regression-adjusted relative difference (%) (90% C.I.)
Any SUD-related Institutional Service	Main: Parallel Sensitivity: Not parallel	-5.01 (-11.59, 1.40)	0.95 (-6.15, 8.02)
Any SUD-related outpatient Service	Main: Parallel Sensitivity: Not parallel	-3.01** (-5.60, -0.53)	-7.45*** (-10.98, -4.01)
Any WM	Main: Parallel Sensitivity: Not parallel	-6.07 (-15.48, 2.94)	0.10 (-8.62, 8.85)
Any MAT	Main: Parallel Sensitivity: Not parallel	10.85*** (7.24, 14.68)	-0.08 (-4.18, 3.89)

* p<0.10; ** p<0.05; *** p<0.01.

Notes: C.I. = confidence interval; DID = difference-in-differences

Source: RTI analysis of TAF RIF data

Utah

Trends in SUD-Related Treatment Outcomes

Exhibits UT-1 and **UT-2** show weight-adjusted trends in the number of beneficiaries treated for SUD and beneficiaries treated for SUD as a percentage of all Medicaid beneficiaries in Utah and its comparison group for 2016-2020. In Utah, procedure codes were missing on roughly one-third of all records in the Other Services (OT) files for 2017-2020. It is very likely that we significantly underestimated the number of beneficiaries receiving treatment for SUD and especially outpatient, institutional, and WM services in those years. MAT use may also be underestimated, but to a lesser extent because MAT is often captured by RX claims. These issues could have introduced bias into our DID models if the degree of undercounting varied over time, but the direction or size of any bias is uncertain.

Exhibit UT-1. Number of Medicaid beneficiaries treated for SUD in Utah, 2016–2020

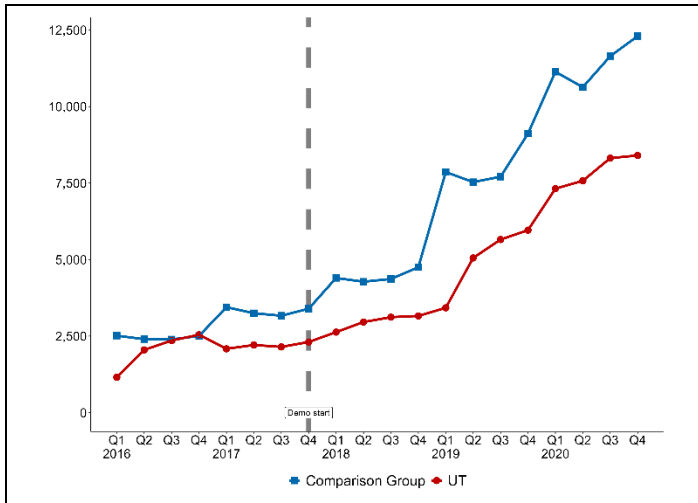
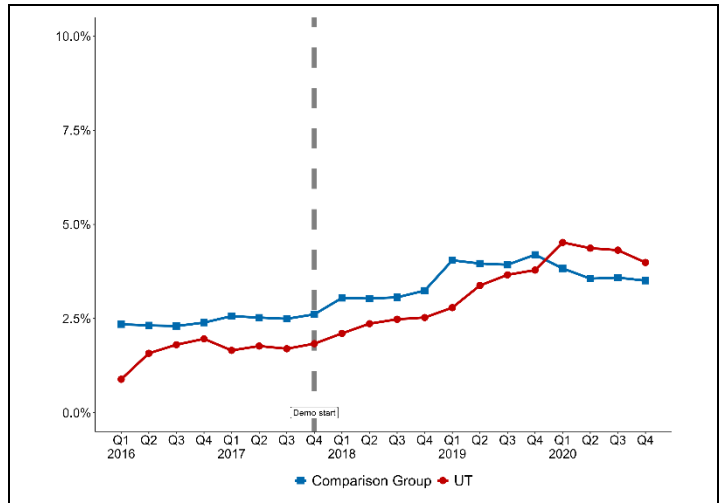


Exhibit UT-2. Beneficiaries treated for SUD as a percent of Medicaid beneficiaries in Utah, 2016–2020



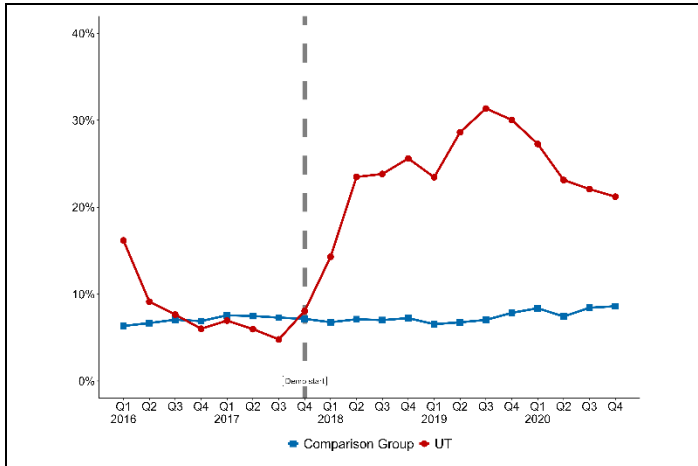
Notes: SUD = Substance Use Disorder; In Utah, the DQ Atlas rated completeness of OT claims “high concern” in 2016 due to low volume. The low volume appeared to be concentrated in the first two quarters of the year for our study population, which would cause us to underestimate the number of service users.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare

Source: RTI analysis of TAF RIF data

Exhibits UT-3 through **UT-6** present weight-adjusted trends for the percentages of beneficiaries treated for SUD receiving any SUD-related institutional service, any SUD-related outpatient service, any WM, and any MAT in Utah and its comparison group for 2016-2020.

Exhibit UT-3. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related institutional services in Utah, 2016–2020

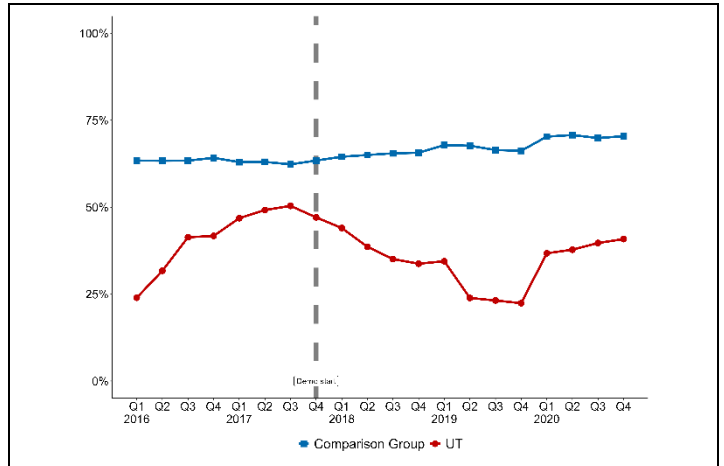


Notes: SUD = Substance Use Disorder; Utah’s demonstration expanded Medicaid coverage for residential services. In Utah, completeness of OT claims was rated “high concern” in 2016 due to low volume. For our study population, this low volume appeared to concentrate in the first two quarters of the year, so we excluded those quarters from the baseline for DID models to mitigate potential bias.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD

Source: RTI analysis of TAF RIF data

Exhibit UT-4. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related outpatient services in Utah, 2016–2020

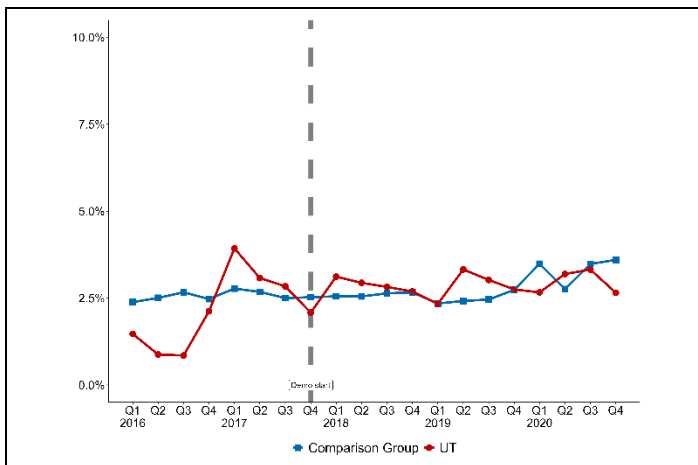


Notes: SUD = Substance Use Disorder; In Utah, completeness of OT claims was rated “high concern” in 2016 due to low volume. For our study population, this low volume appeared to concentrate in the first two quarters of the year, so we excluded those quarters from the baseline for DID models to mitigate potential bias.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD

Source: RTI analysis of TAF RIF data

Exhibit UT-5. Percent of Medicaid beneficiaries treated for SUD receiving WM services in Utah, 2016–2020

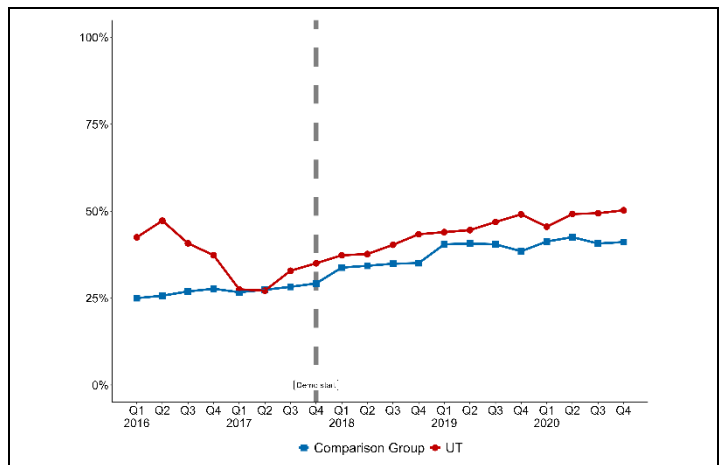


Notes: SUD = Substance Use Disorder; Utah’s demonstration added Medicaid coverage for WM services. In Utah, completeness of OT claims was rated “high concern” in 2016 due to low volume. For our study population, this low volume appeared to concentrate in the first two quarters of the year, so we excluded those quarters from the baseline for DID models to mitigate potential bias.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD

Source: RTI analysis of TAF RIF data

Exhibit UT-6. Percent of Medicaid beneficiaries treated for SUD receiving MAT services in Utah, 2016–2020



Notes: MAT = Medication-assisted treatment; SUD = Substance Use Disorder. In Utah, completeness of OT claims was rated “high concern” in 2016 due to low volume. For our study population, this low volume appeared to concentrate in the first two quarters of the year, so we excluded those quarters from the baseline for DID models to mitigate potential bias.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD

Source: RTI analysis of TAF RIF data

Utah SUD Demonstration Impact Results

Exhibit UT-7 shows the estimates of use of any SUD-related institutional service, any SUD-related outpatient service, WM, and MAT for Medicaid beneficiaries in Utah relative to individuals in the comparison group. Due to concerns about data quality (see Limitations in Appendix A), we excluded the first two quarters of data for Utah from the baseline trend.

Exhibit UT-7. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in Utah

Outcome	Regression-adjusted DID (percentage points)	90% confidence interval	Relative difference (%)	p-value
Use of institutional services				
Q4 2017	0.00	(-0.01, 0.00)	-1.53	0.27
Q1 2018	0.10	(0.07, 0.12)	45.15	0.00
Q2 2018	0.16	(0.13, 0.20)	75.86	0.00
Q3 2018	0.15	(0.11, 0.18)	67.65	0.00
Q4 2018	0.14	(0.11, 0.18)	66.88	0.00
Q1 2019	0.18	(0.14, 0.22)	82.86	0.00
Q2 2019	0.21	(0.16, 0.26)	98.62	0.00
Q3 2019	0.23	(0.18, 0.28)	107.65	0.00
Q4 2019	0.21	(0.16, 0.25)	96.06	0.00
Q1 2020	0.19	(0.14, 0.23)	87.23	0.00
Q2 2020	0.16	(0.12, 0.20)	75.59	0.00
Q3 2020	0.13	(0.10, 0.16)	61.38	0.00
Q4 2020	0.12	(0.09, 0.14)	53.68	0.00
Overall	0.16	(0.12, 0.20)	74.35	0.00
Use of outpatient services				
Q4 2017	0.03	(-0.00, 0.07)	9.97	0.12
Q1 2018	-0.06	(-0.10, -0.02)	-17.98	0.01
Q2 2018	-0.09	(-0.14, -0.04)	-26.63	0.00
Q3 2018	-0.11	(-0.12, -0.08)	-32.27	0.00
Q4 2018	-0.11	(-0.16, -0.07)	-33.43	0.00
Q1 2019	-0.19	(-0.24, -0.14)	-56.44	0.00
Q2 2019	-0.24	(-0.29, -0.19)	-70.89	0.00
Q3 2019	-0.22	(-0.29, -0.17)	-67.17	0.00
Q4 2019	-0.24	(-0.29, -0.18)	-70.69	0.00
Q1 2020	-0.13	(-0.18, -0.08)	-38.27	0.00
Q2 2020	-0.14	(-0.20, -0.09)	-42.51	0.00
Q3 2020	-0.10	(-0.15, -0.06)	-30.84	0.00
Q4 2020	-0.10	(-0.14, -0.05)	-29.40	0.00
Overall	-0.14	(-0.19, -0.09)	-42.01	0.00
Use of WM services				
Q4 2017	-0.00	(-0.01, -0.00)	-10.30	0.08
Q1 2018	0.01	(0.00, 0.02)	36.72	0.01
Q2 2018	0.01	(0.00, 0.01)	27.90	0.01
Q3 2018	0.01	(0.00, 0.01)	18.75	0.04
Q4 2018	0.01	(0.00, 0.01)	18.87	0.02
Q1 2019	0.00	(-0.00, 0.01)	7.06	0.48
Q2 2019	0.01	(0.01, 0.02)	41.50	0.00
Q3 2019	0.01	(0.01, 0.01)	35.14	0.00
Q4 2019	0.00	(-0.00, 0.01)	15.51	0.13
Q1 2020	-0.01	(-0.01, -0.00)	-25.36	0.05
Q2 2020	0.00	(-0.00, 0.01)	13.09	0.42
Q3 2020	0.00	(-0.01, 0.01)	-5.63	0.74
Q4 2020	-0.01	(-0.02, -0.00)	-36.63	0.02
Overall	0.00	(-0.00, 0.01)	5.43	0.67
Use of MAT services				
Q4 2017	-0.01	(-0.05, 0.03)	-3.33	0.63
Q1 2018	-0.03	(-0.07, 0.01)	-7.70	0.28
Q2 2018	-0.03	(-0.09, 0.03)	-9.79	0.35
Q3 2018	-0.01	(-0.08, 0.05)	-4.12	0.72
Q4 2018	0.00	(-0.06, 0.07)	0.99	0.93
Q1 2019	-0.01	(-0.09, 0.06)	-3.99	0.76
Q2 2019	-0.01	(-0.10, 0.08)	-3.68	0.82
Q3 2019	0.01	(-0.09, 0.11)	2.33	0.90
Q4 2019	0.02	(-0.06, 0.10)	5.84	0.69
Q1 2020	-0.01	(-0.08, 0.07)	-2.09	0.87
Q2 2020	0.01	(-0.04, 0.07)	3.60	0.71
Q3 2020	0.04	(-0.01, 0.08)	10.85	0.19
Q4 2020	0.03	(-0.02, 0.08)	9.19	0.32
Overall	0.01	(-0.06, 0.07)	1.95	0.87

DID = difference-in-differences.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD in Utah and its comparison group.

Methods: A logistic regression model was used to obtain estimates. Results are weighted by the fraction of time the beneficiary was enrolled in Medicaid (eligibility fraction) and the propensity score weight. DID models for all outcomes assumed parallel trends in the baseline period. Appendix A details the methods.

How to interpret the results: The relative difference is the DID estimate as a percentage of the demonstration state's baseline period adjusted mean. A *negative* value for the relative difference 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 state than in the comparison group.

Note: In Utah, Medicaid coverage for residential services and WM services was added or expanded under the demonstration.

Source: RTI analysis of TAF RIF data

Sensitivity Analysis

Exhibit UT-8 shows how the impact estimates for Utah’s outcomes differ when DID models that we ran assuming parallel trends are rerun assuming nonparallel baseline trends. We assumed parallel trends for all the main DID analyses in Utah because the erratic trends led to rather unbelievable results using nonparallel DID models. Use of outpatient services may also be underestimated due to missing data (see Limitations, Appendix A). Consequently, readers are cautioned that the direction of effect is probably more reliable than the size of impact in the results below, and all results are highly uncertain with the possible exception of the increase in use of institutional services, relative to the comparison group.

Exhibit UT-8. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in Utah under different model assumptions

Outcome	Parallel trends assumption	Main analysis: Regression-adjusted relative difference (%) (90% C.I.)	Sensitivity analysis: Regression-adjusted relative difference (%) (90% C.I.)
Any SUD-related Institutional Service	Main: Parallel Sensitivity: Not parallel	74.35*** (not estimated)	71.64*** (40.64, 160.08)
Any SUD-related outpatient Service	Main: Parallel Sensitivity: Not parallel	-42.01** (-66.17, -26.47)	-198.62*** (-490.44, -109.75)
Any WM	Main: Parallel Sensitivity: Not parallel	5.43 (-16.67, 30.71)	-1102.57** (-2589.90, -319.99)
Any MAT	Main: Parallel Sensitivity: Not parallel	1.95 (-17.94, 21.80)	62.04*** (41.77, 92.27)

* p<0.10; ** p<0.05; *** p<0.01.

Notes: DID = difference-in-differences; Confidence intervals were not estimated for some outcomes because the p-value was so low that our calculation software set the p-value = 0.

Source: RTI analysis of TAF RIF data

Vermont

Trends in SUD-Related Treatment Outcomes

Exhibits VT-1 and VT-2 show weight-adjusted trends in the number of beneficiaries treated for SUD and beneficiaries treated for SUD as a percentage of all Medicaid beneficiaries in Vermont for 2016-2020. We were unable to identify a suitable comparison group due to missing data and other limitations (see Limitations, Appendix A).

Exhibit VT-1. Number of Medicaid beneficiaries treated for SUD in Vermont, 2016–2020

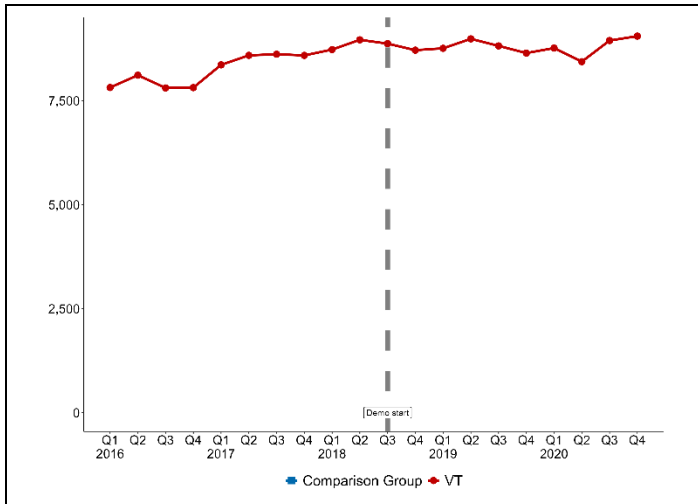
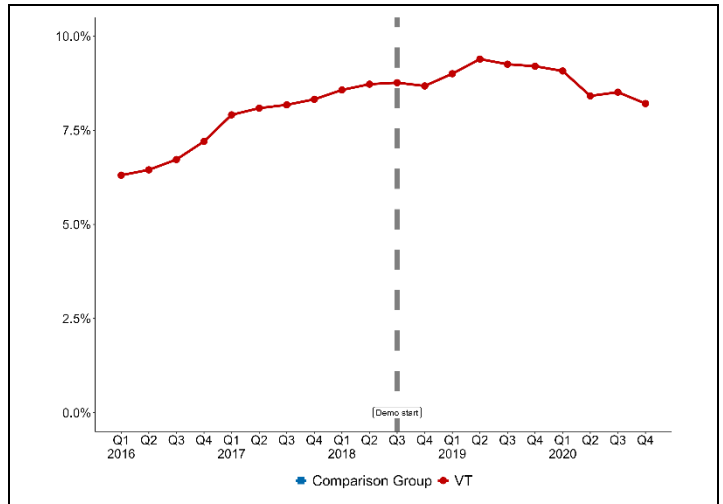


Exhibit VT-2. Beneficiaries treated for SUD as a percent of Medicaid beneficiaries in Vermont, 2016–2020



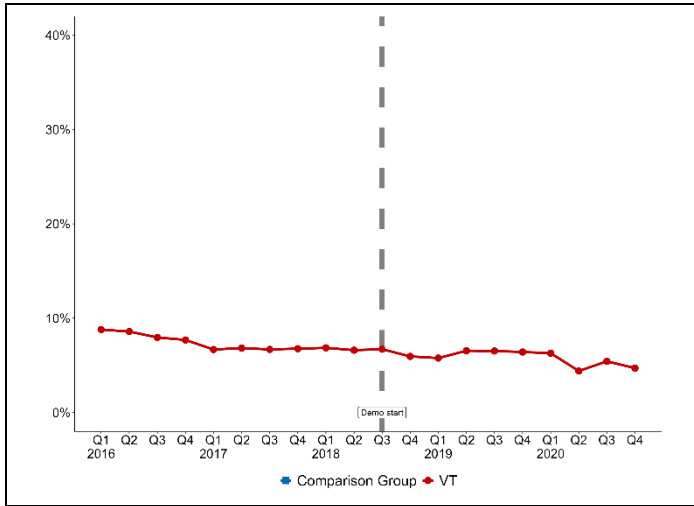
Notes: SUD = Substance Use Disorder

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare

Source: RTI analysis of TAF RIF data

Exhibits VT-3 through VT-6 present weight-adjusted trends for the percentages of beneficiaries treated for SUD receiving any SUD-related institutional service, any SUD-related outpatient service, any WM, and any MAT in Vermont for 2016-2020.

Exhibit VT-3. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related institutional services in Vermont, 2016–2020



Notes: SUD = Substance Use Disorder

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD

Source: RTI analysis of TAF RIF data

Exhibit VT-4. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related outpatient services in Vermont, 2016–2020

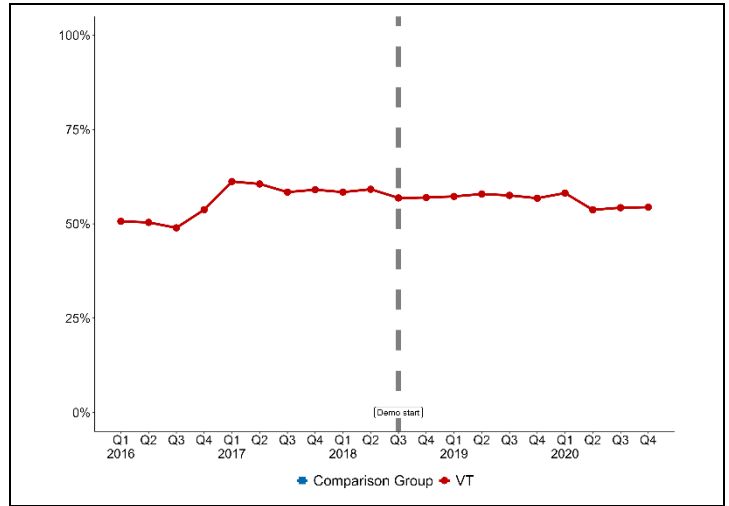
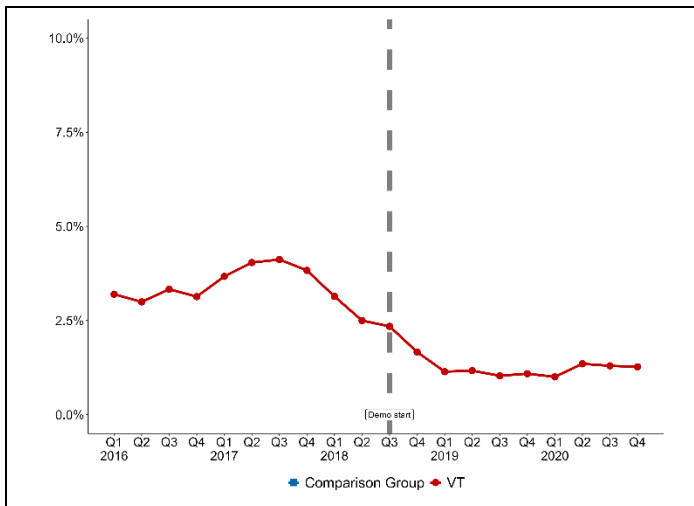


Exhibit VT-5. Percent of Medicaid beneficiaries treated for SUD receiving WM services in Vermont, 2016–2020

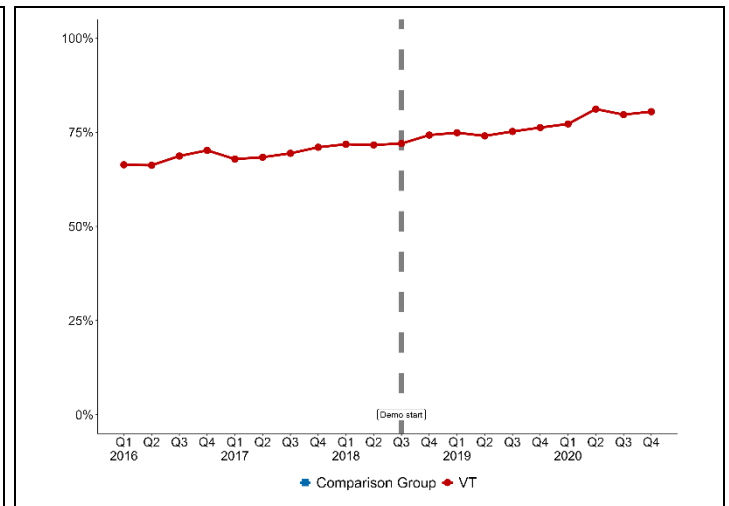


Notes: SUD = Substance Use Disorder

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD

Source: RTI analysis of TAF RIF data

Exhibit VT-6. Percent of Medicaid beneficiaries treated for SUD receiving MAT services in Vermont, 2016–2020



Notes: MAT = Medication-assisted treatment; SUD = Substance Use Disorder

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD

Source: RTI analysis of TAF RIF data

Vermont SUD Demonstration Impact Results

No demonstration impacts were estimated for Vermont due to the lack of a suitable comparison group.

Virginia

Trends in SUD-Related Treatment Outcomes

Exhibits VA-1 and VA-2 show weight-adjusted trends in the number of beneficiaries treated for SUD and beneficiaries treated for SUD as a percentage of all Medicaid beneficiaries in Virginia and its comparison group for 2016-2020.

Exhibit VA-1. Number of Medicaid beneficiaries treated for SUD in Virginia, 2016–2020

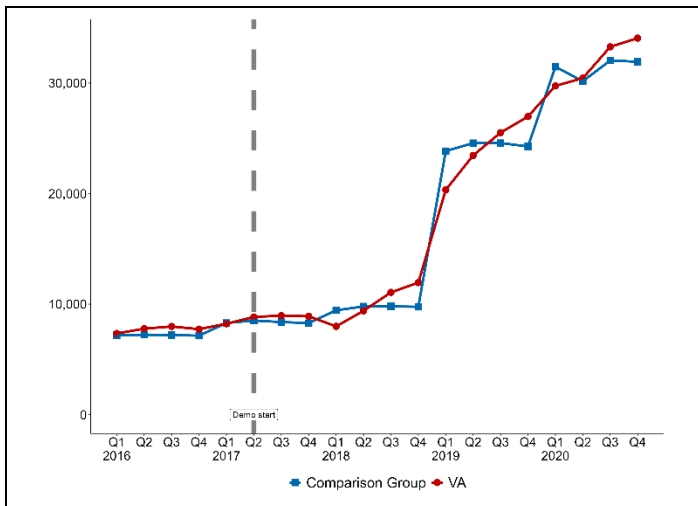
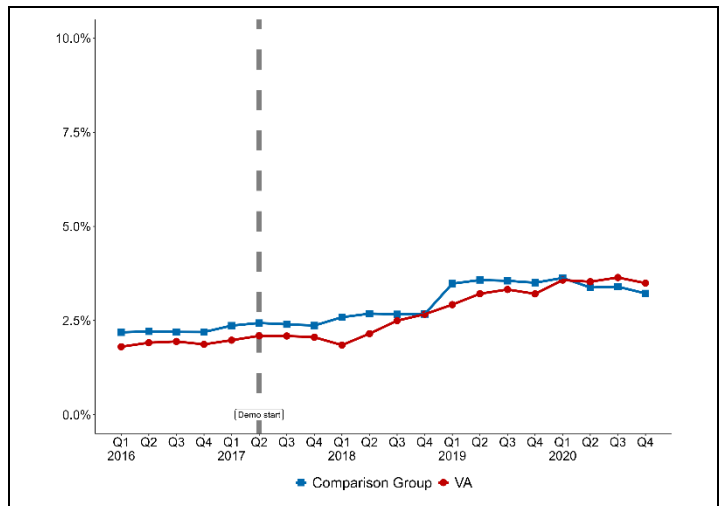


Exhibit VA-2. Beneficiaries treated for SUD as a percent of Medicaid beneficiaries in Virginia, 2016–2020



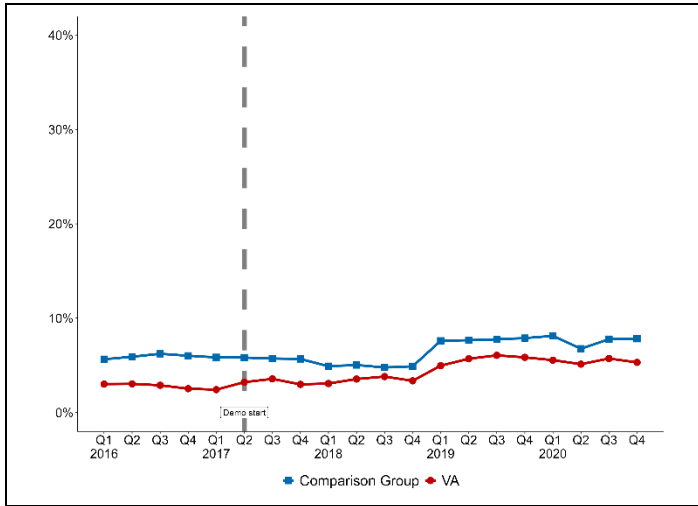
Notes: SUD = Substance Use Disorder

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare

Source: RTI analysis of TAF RIF data

Exhibits VA-3 through VA-6 present weight-adjusted trends for the percentages of beneficiaries treated for SUD receiving any SUD-related institutional service, any SUD-related outpatient service, any WM, and any MAT in Virginia and its comparison group for 2016-2020.

Exhibit VA-3. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related institutional services in Virginia, 2016–2020

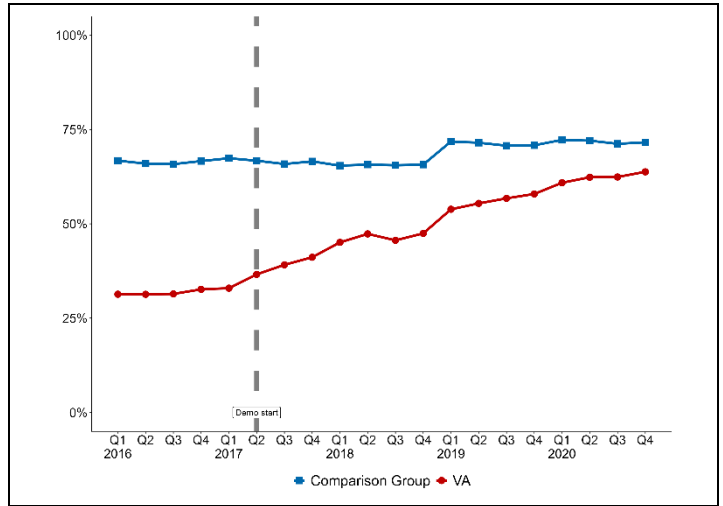


Notes: SUD = Substance Use Disorder; Virginia’s demonstration added Medicaid coverage for residential services.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD

Source: RTI analysis of TAF RIF data

Exhibit VA-4. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related outpatient services in Virginia, 2016–2020

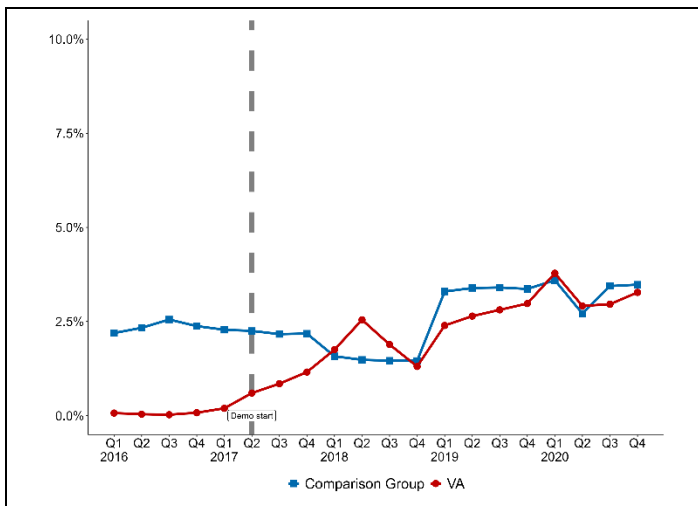


Notes: SUD = Substance Use Disorder

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD

Source: RTI analysis of TAF RIF data

Exhibit VA-5. Percent of Medicaid beneficiaries treated for SUD receiving WM services in Virginia, 2016–2020

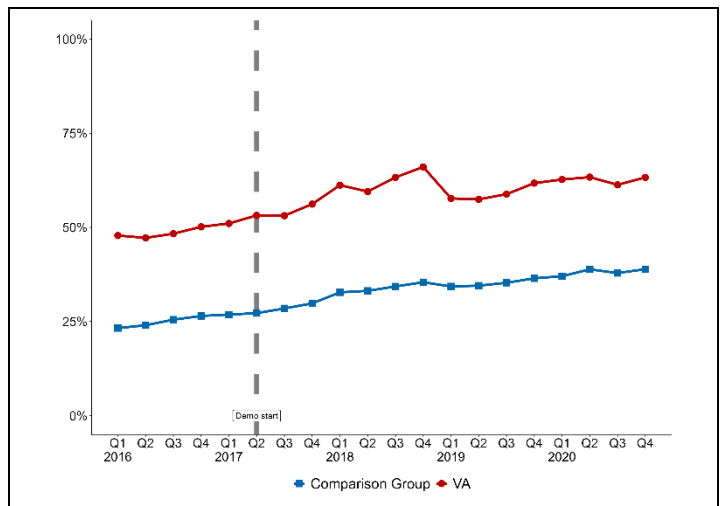


Notes: SUD = Substance Use Disorder; Virginia’s demonstration added Medicaid coverage for WM services.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD

Source: RTI analysis of TAF RIF data

Exhibit VA-6. Percent of Medicaid beneficiaries treated for SUD receiving MAT services in Virginia, 2016–2020



Notes: MAT = Medication-assisted treatment; SUD = Substance Use Disorder; Virginia’s demonstration added residential MAT requirements.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD

Source: RTI analysis of TAF RIF data

Virginia SUD Demonstration Impact Results

Exhibit VA-7 shows the estimates of use of any SUD-related institutional service, any SUD-related outpatient service, WM, and MAT for Medicaid beneficiaries in Virginia relative to individuals in the comparison group.

Exhibit VA-7. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in Virginia

Outcome	Regression-adjusted DID (percentage points)	90% confidence interval	Relative difference (%)	p-value
Use of institutional services				
Q2 2017	0.00	(0.00, 0.01)	11.65	0.10
Q3 2017	0.01	(0.00, 0.01)	24.08	0.00
Q4 2017	0.00	(-0.00, 0.01)	10.95	0.15
Q1 2018	0.01	(0.00, 0.01)	17.39	0.01
Q2 2018	0.01	(0.01, 0.01)	30.68	0.00
Q3 2018	0.02	(0.01, 0.02)	45.58	0.00
Q4 2018	0.01	(0.01, 0.02)	31.95	0.00
Q1 2019	0.01	(0.01, 0.02)	30.39	0.00
Q2 2019	0.02	(0.01, 0.02)	47.97	0.00
Q3 2019	0.02	(0.01, 0.03)	57.63	0.00
Q4 2019	0.02	(0.01, 0.03)	53.29	0.00
Q1 2020	0.01	(0.00, 0.02)	27.24	0.02
Q2 2020	0.01	(0.01, 0.02)	39.21	0.00
Q3 2020	0.01	(0.01, 0.02)	39.16	0.00
Q4 2020	0.01	(0.00, 0.02)	28.94	0.01
Overall	0.01	(0.01, 0.02)	36.69	0.00
Use of outpatient services				
Q2 2017	0.05	(0.03, 0.08)	15.89	0.00
Q3 2017	0.09	(0.06, 0.12)	27.22	0.00
Q4 2017	0.11	(0.08, 0.14)	32.86	0.00
Q1 2018	0.15	(0.11, 0.18)	44.29	0.00
Q2 2018	0.18	(0.14, 0.21)	52.88	0.00
Q3 2018	0.17	(0.13, 0.20)	49.62	0.00
Q4 2018	0.19	(0.14, 0.23)	55.51	0.00
Q1 2019	0.18	(0.14, 0.22)	54.16	0.00
Q2 2019	0.20	(0.16, 0.25)	60.51	0.00
Q3 2019	0.23	(0.17, 0.28)	67.81	0.00
Q4 2019	0.24	(0.18, 0.30)	71.87	0.00
Q1 2020	0.25	(0.19, 0.30)	73.65	0.00
Q2 2020	0.26	(0.20, 0.32)	78.79	0.00
Q3 2020	0.28	(0.21, 0.34)	82.49	0.00
Q4 2020	0.29	(0.22, 0.35)	85.94	0.00
Overall	0.22	(0.17, 0.27)	65.97	0.00
Use of management services				
Q2 2017	0.01	(0.00, 0.01)	555.35	0.01
Q3 2017	0.01	(0.01, 0.01)	811.87	0.00
Q4 2017	0.01	(0.01, 0.02)	1155.93	0.00
Q1 2018	0.02	(0.01, 0.02)	1761.52	0.00
Q2 2018	0.03	(0.02, 0.03)	2619.72	0.00
Q3 2018	0.02	(0.01, 0.02)	1949.95	0.00
Q4 2018	0.01	(0.01, 0.02)	1324.09	0.00
Q1 2019	0.02	(0.02, 0.03)	2400.07	0.00
Q2 2019	0.03	(0.02, 0.03)	2630.55	0.00
Q3 2019	0.03	(0.02, 0.03)	2778.45	0.00
Q4 2019	0.03	(0.02, 0.03)	2903.70	0.00
Q1 2020	0.04	(0.03, 0.05)	3796.19	0.00
Q2 2020	0.03	(0.02, 0.03)	2905.33	0.00
Q3 2020	0.03	(0.02, 0.03)	2907.33	0.00
Q4 2020	0.03	(0.02, 0.04)	3261.22	0.00
Overall	0.03	(0.02, 0.03)	2638.29	0.00
Use of MAT services				
Q2 2017	0.02	(0.01, 0.03)	4.23	0.01
Q3 2017	0.01	(-0.01, 0.02)	1.55	0.45
Q4 2017	0.02	(-0.00, 0.04)	3.49	0.16
Q1 2018	0.06	(0.03, 0.09)	12.06	0.00
Q2 2018	0.03	(0.00, 0.06)	6.65	0.09
Q3 2018	0.05	(0.02, 0.09)	10.82	0.01
Q4 2018	0.06	(0.03, 0.09)	12.68	0.00
Q1 2019	0.01	(-0.03, 0.04)	1.29	0.76
Q2 2019	0.01	(-0.03, 0.04)	1.79	0.67
Q3 2019	0.02	(-0.02, 0.05)	3.26	0.42
Q4 2019	0.03	(-0.00, 0.07)	6.35	0.14
Q1 2020	0.04	(0.01, 0.08)	9.00	0.03
Q2 2020	0.03	(-0.00, 0.06)	5.94	0.15
Q3 2020	0.02	(-0.01, 0.05)	3.90	0.35
Q4 2020	0.03	(-0.01, 0.06)	5.77	0.18
Overall	0.03	(-0.00, 0.06)	5.53	0.16

DID = difference-in-differences.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD in Virginia and its comparison group.

Methods: A logistic regression model was used to obtain estimates. Results are weighted by the fraction of time the beneficiary was enrolled in Medicaid (eligibility fraction) and the propensity score weight. DID models for all outcomes assumed parallel trends in the baseline period. **Appendix A** details the methods.

How to interpret the results: The relative difference is the DID estimate as a percentage of the demonstration state's baseline period adjusted mean. A *negative* value for the relative difference 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 state than in the comparison group.

Note: In Virginia, Medicaid coverage of residential services and WM services was added or expanded under the demonstration. Residential standards requiring access to MAT were added under the demonstration.

Source: RTI analysis of TAF RIF data

Sensitivity Analysis

Exhibit VA-8 shows how the impact estimates for Virginia’s outcomes differ when DID models that we ran assuming parallel trends were rerun assuming nonparallel baseline trends. The nonparallel models produced similar findings for institutional and outpatient service use, reinforcing the findings of increased service use for beneficiaries treated for SUD in Virginia, relative to the comparison group. The nonparallel model for MAT suggests a somewhat larger and statistically significant impact on MAT use in Virginia, relative to the comparison group. The WM results from the nonparallel DID model are not believable.

Exhibit VA-8. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in Virginia under different model assumptions

Outcome	Parallel trends assumption	Main analysis: Regression-adjusted relative difference (%) (90% C.I.)	Sensitivity analysis: Regression-adjusted relative difference (%) (90% C.I.)
Any SUD-related Institutional Service	Main: Parallel Sensitivity: Not parallel	36.69*** (18.95, 54.48)	76.27** (52.10, 111.62)
Any SUD-related outpatient Service	Main: Parallel Sensitivity: Not parallel	65.97*** (not estimated)	48.36*** (26.32, 71.68)
Any WM	Main: Parallel Sensitivity: Not parallel	2,638.29*** (not estimated)	-81,634.35 (-665,477.47, 438,407.34)
Any MAT	Main: Parallel Sensitivity: Not parallel	5.53 (-1.06, 12.32)	12.00* (1.46, 22.80)

* p<0.10; ** p<0.05; *** p<0.01.

Notes: DID = difference-in-differences; Confidence intervals were not estimated for some outcomes because the underlying p-value was so small that our calculation software set the p-value = 0.

Source: RTI analysis of TAF RIF data

Washington

Trends in SUD-Related Treatment Outcomes

Exhibits WA-1 and WA-2 show weight-adjusted trends in the number of beneficiaries treated for SUD and beneficiaries treated for SUD as a percentage of all Medicaid beneficiaries in Washington and its comparison group for 2016-2020.

Exhibit WA-1. Number of Medicaid beneficiaries treated for SUD in Washington, 2016–2020

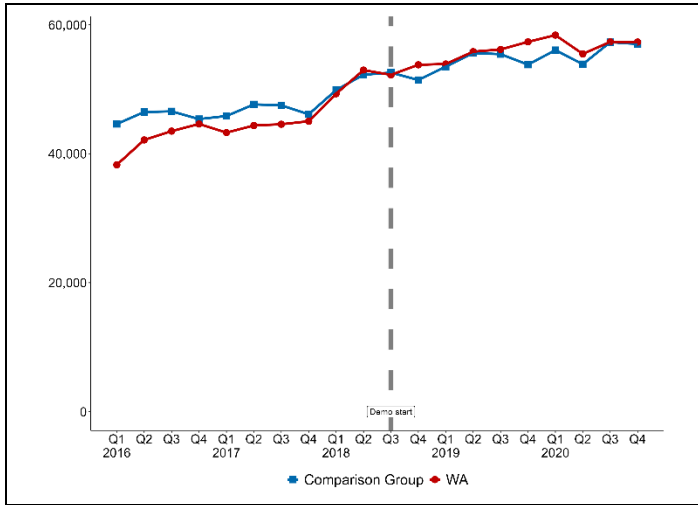
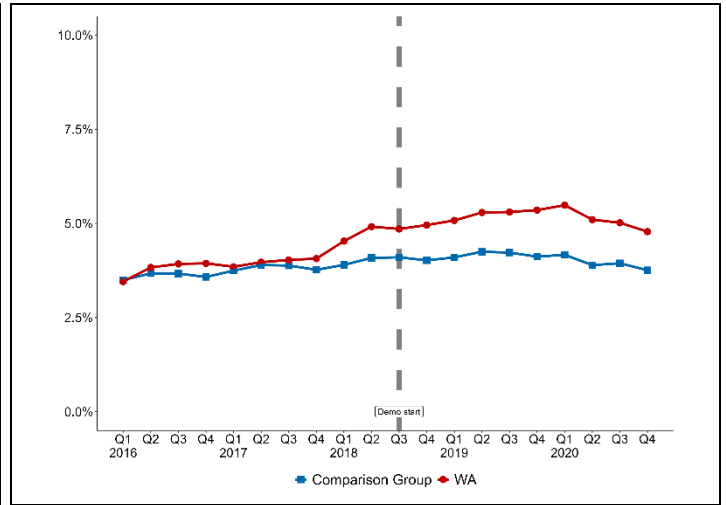


Exhibit WA-2. Beneficiaries treated for SUD as a percent of Medicaid beneficiaries in Washington, 2016–2020



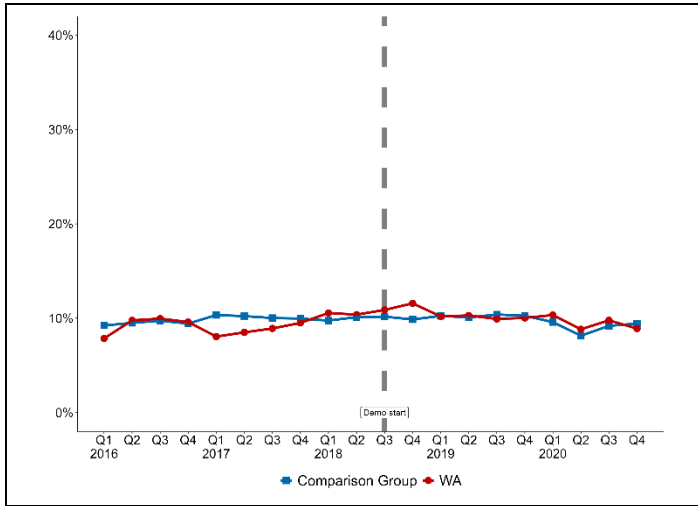
Notes: SUD = Substance Use Disorder

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare

Source: RTI analysis of TAF RIF data

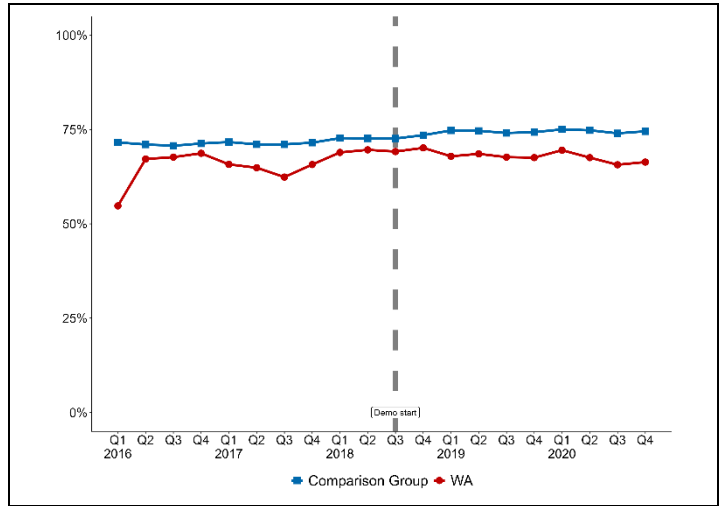
Exhibits WA-3 through WA-6 present weight-adjusted trends for the percentages of beneficiaries treated for SUD receiving any SUD-related institutional service, any SUD-related outpatient service, any WM, and any MAT in Washington and its comparison group for 2016-2020.

Exhibit WA-3. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related institutional services in Washington, 2016-2020



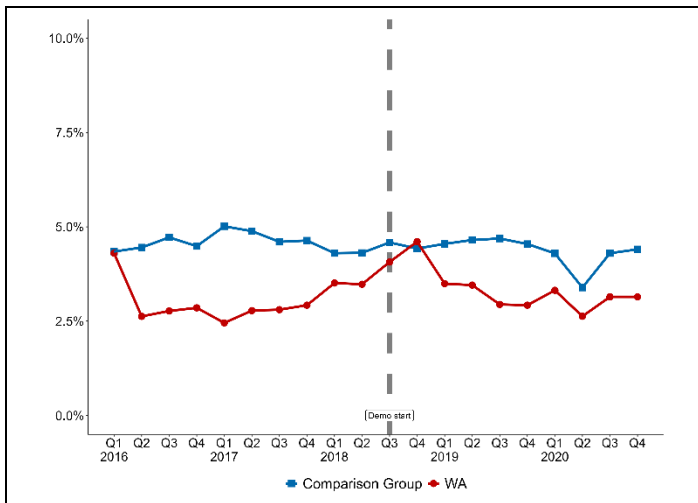
Notes: SUD = Substance Use Disorder
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

Exhibit WA-4. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related outpatient services in Washington, 2016-2020



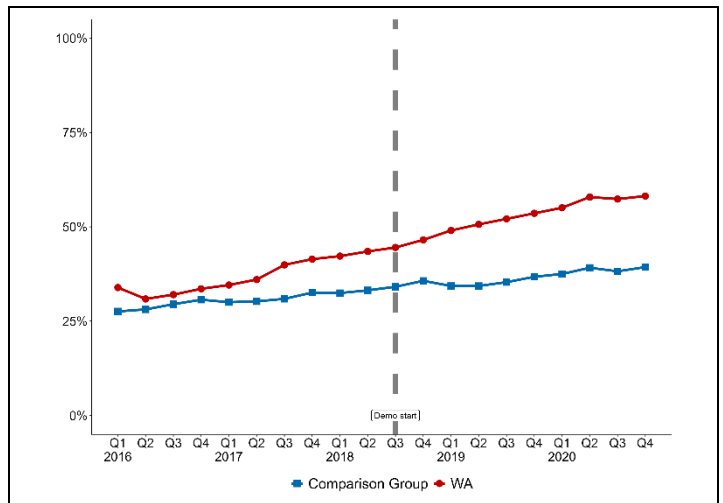
Notes: SUD = Substance Use Disorder; Partial hospitalization services were not covered by Medicaid in Washington, either before or during the demonstration.
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

Exhibit WA-5. Percent of Medicaid beneficiaries treated for SUD receiving WM services in Washington, 2016-2020



Notes: SUD = Substance Use Disorder
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

Exhibit WA-6. Percent of Medicaid beneficiaries treated for SUD receiving MAT services in Washington, 2016-2020



Notes: MAT = Medication-assisted treatment; SUD = Substance Use Disorder; Washington's demonstration added residential MAT requirements.
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

Washington SUD Demonstration Impact Results

Exhibit WA-7 shows the estimates of use of any SUD-related institutional service, any SUD-related outpatient service, WM, and MAT for Medicaid beneficiaries in Washington relative to individuals in the comparison group.

Exhibit WA-7. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in Washington

Outcome	Regression-adjusted DID (percentage points)	90% confidence interval	Relative difference (%)	p-value
Use of institutional services				
Q3 2018	0.01	(-0.00, 0.02)	8.90	0.15
Q4 2018	0.02	(0.01, 0.03)	16.55	0.00
Q1 2019	0.00	(-0.00, 0.01)	3.82	0.44
Q2 2019	0.01	(-0.01, 0.02)	4.83	0.41
Q3 2019	0.00	(-0.01, 0.01)	-2.48	0.58
Q4 2019	0.00	(-0.01, 0.01)	-0.51	0.91
Q1 2020	0.01	(0.00, 0.02)	10.99	0.02
Q2 2020	0.01	(0.00, 0.02)	11.22	0.01
Q3 2020	0.01	(-0.00, 0.02)	5.79	0.31
Q4 2020	0.00	(-0.01, 0.01)	-3.61	0.54
Overall	0.01	(-0.00, 0.02)	5.47	0.28
Use of outpatient services				
Q3 2018	0.01	(-0.03, 0.05)	1.94	0.57
Q4 2018	0.02	(-0.02, 0.05)	2.27	0.49
Q1 2019	-0.02	(-0.07, 0.02)	-3.10	0.43
Q2 2019	-0.01	(-0.06, 0.03)	-2.07	0.59
Q3 2019	-0.02	(-0.06, 0.02)	-2.50	0.47
Q4 2019	-0.02	(-0.06, 0.02)	-3.15	0.36
Q1 2020	-0.01	(-0.05, 0.04)	-0.85	0.84
Q2 2020	-0.02	(-0.07, 0.03)	-2.24	0.60
Q3 2020	-0.04	(-0.08, 0.00)	-5.55	0.12
Q4 2020	-0.03	(-0.08, 0.01)	-4.88	0.20
Overall	-0.01	(-0.06, 0.03)	-2.06	0.58

Outcome	Regression-adjusted DID (percentage points)	90% confidence interval	Relative difference (%)	p-value
Use of WM services				
Q3 2018	0.01	(0.00, 0.02)	37.73	0.03
Q4 2018	0.02	(0.01, 0.02)	56.23	0.00
Q1 2019	0.01	(-0.00, 0.02)	23.65	0.34
Q2 2019	0.00	(-0.01, 0.02)	16.93	0.48
Q3 2019	0.00	(-0.01, 0.01)	-4.19	0.83
Q4 2019	0.00	(-0.01, 0.01)	-2.78	0.85
Q1 2020	0.01	(0.00, 0.01)	26.32	0.10
Q2 2020	0.01	(-0.00, 0.01)	17.53	0.27
Q3 2020	0.01	(-0.00, 0.01)	17.77	0.30
Q4 2020	0.00	(-0.00, 0.01)	12.52	0.46
Overall	0.01	(-0.00, 0.01)	19.84	0.27
Use of assisted treatment services				
Q3 2018	-0.02	(-0.02, -0.01)	-5.62	0.00
Q4 2018	-0.02	(-0.03, -0.01)	-6.92	0.00
Q1 2019	0.01	(-0.01, 0.02)	1.90	0.50
Q2 2019	0.01	(-0.01, 0.03)	3.31	0.31
Q3 2019	0.00	(-0.02, 0.02)	-0.02	1.00
Q4 2019	-0.01	(-0.03, 0.01)	-2.35	0.55
Q1 2020	-0.02	(-0.05, 0.01)	-6.19	0.26
Q2 2020	-0.02	(-0.05, 0.01)	-7.04	0.25
Q3 2020	-0.02	(-0.06, 0.01)	-8.25	0.20
Q4 2020	-0.04	(-0.07, -0.00)	-12.27	0.07
Overall	-0.01	(-0.03, 0.01)	-4.38	0.30

DID = difference-in-differences.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD in Washington and its comparison group.

Methods: A logistic regression model was used to obtain estimates. Results are weighted by the fraction of time the beneficiary was enrolled in Medicaid (eligibility fraction) and the propensity score weight. DID models for all outcomes assumed parallel trends in the baseline period except for MAT, for which nonparallel trends were assumed. Appendix A details the methods.

How to interpret the results: The relative difference is the DID estimate as a percentage of the demonstration state's baseline period adjusted mean. A *negative* value for the relative difference 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 state than in the comparison group.

Note: In Washington, residential standards requiring access to MAT were added under the demonstration.

Source: RTI analysis of TAF RIF data

Sensitivity Analysis

Exhibit WA-8 shows how the impact estimates for Washington’s outcomes differ when DID models that we ran assuming parallel trends were rerun assuming nonparallel baseline trends. We did not conduct a sensitivity analysis for outcomes where the main model assumed nonparallel baseline trends. All estimates for these outcomes are not statistically significant regardless of the DID model form, which reinforces the lack of measurable impacts on the types of services used by beneficiaries treated for SUD in Washington relative to the comparison group.

Exhibit WA-8. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in Washington under different model assumptions

Outcome	Parallel trends assumption	Main analysis: Regression-adjusted relative difference (%) (90% C.I.)	Sensitivity analysis: Regression-adjusted relative difference (%) (90% C.I.)
Any SUD-related Institutional Service	Main: Parallel Sensitivity: Not parallel	5.47 (-3.15, 14.27)	0.85 (-11.64, 13.32)
Any SUD-related outpatient Service	Main: Parallel Sensitivity: Not parallel	-2.06 (-8.23, 4.17)	-2.65 (-8.74, 3.46)
Any WM	Main: Parallel Sensitivity: Not parallel	19.84 (-9.55, 54.58)	43.42 (-129.71, 19.13)

* p<0.10; ** p<0.05; *** p<0.01.

Notes: C.I. = confidence interval; DID = difference-in-differences

Source: RTI analysis of TAF RIF data

West Virginia

Trends in SUD-Related Treatment Outcomes

Exhibits WV-1 and WV-2 show weight-adjusted trends in the number of beneficiaries treated for SUD and beneficiaries treated for SUD as a percentage of all Medicaid beneficiaries in West Virginia and its comparison group for 2016-2020.

Exhibit WV-1. Number of Medicaid beneficiaries treated for SUD in West Virginia, 2016–2020

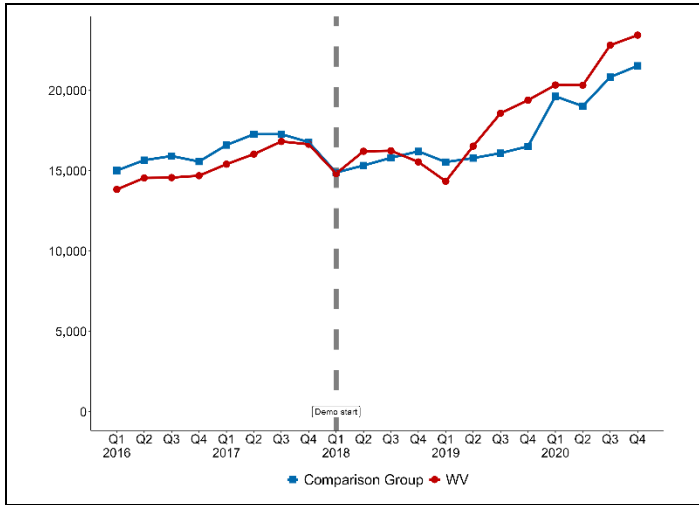
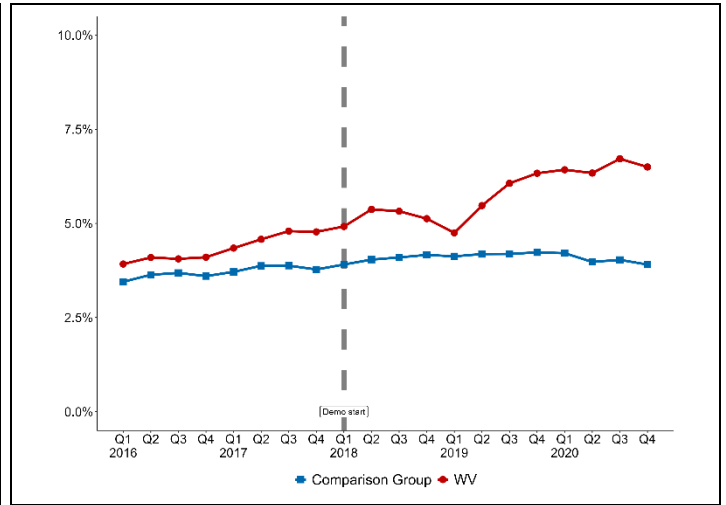


Exhibit WV-2. Beneficiaries treated for SUD as a percent of Medicaid beneficiaries in West Virginia, 2016–2020



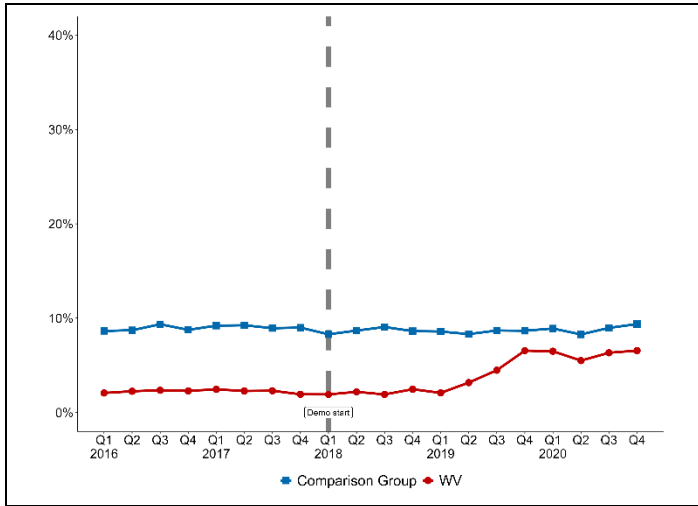
Notes: SUD = Substance Use Disorder

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare

Source: RTI analysis of TAF RIF data

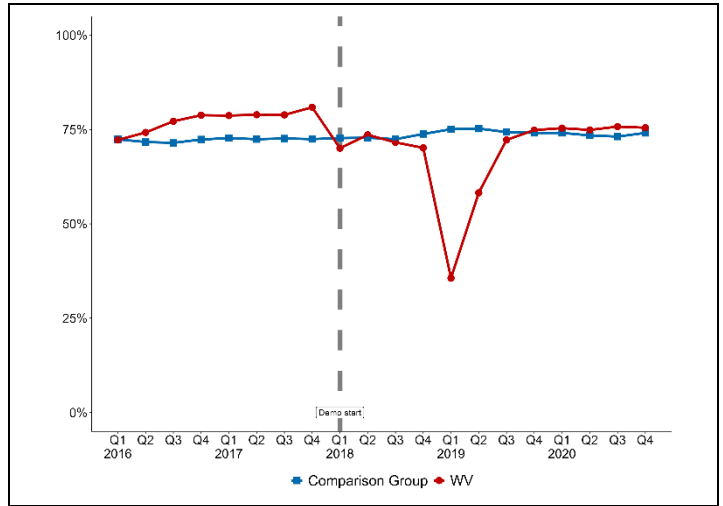
Exhibits WV-3 through WV-6 present weight-adjusted trends for the percentages of beneficiaries treated for SUD receiving any SUD-related institutional service, any SUD-related outpatient service, any WM, and any MAT in West Virginia and its comparison group for 2016-2020.

Exhibit WV-3. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related institutional services in West Virginia, 2016–2020



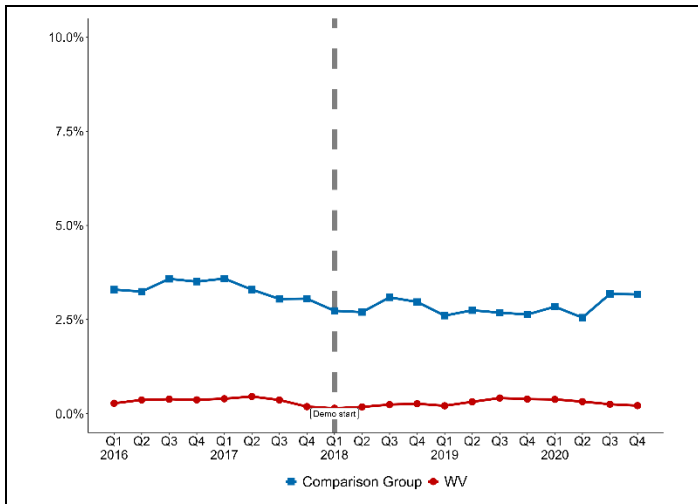
Notes: SUD = Substance Use Disorder; West Virginia’s demonstration added Medicaid coverage for residential services.
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

Exhibit WV-4. Percent of Medicaid beneficiaries treated for SUD receiving SUD-related outpatient services in West Virginia, 2016–2020



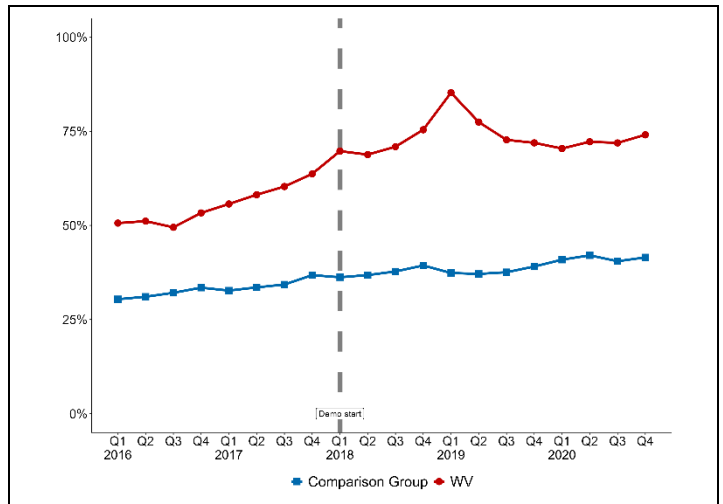
Notes: SUD = Substance Use Disorder
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

Exhibit WV-5. Percent of Medicaid beneficiaries treated for SUD receiving WM services in West Virginia, 2016–2020



Notes: SUD = Substance Use Disorder; West Virginia’s demonstration added Medicaid coverage for WM services.
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

Exhibit WV-6. Percent of Medicaid beneficiaries treated for SUD receiving MAT services in West Virginia, 2016–2020



Notes: MAT = Medication-assisted treatment; SUD = Substance Use Disorder; West Virginia’s demonstration added Medicaid coverage for methadone and added residential MAT requirements.
Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD
Source: RTI analysis of TAF RIF data

West Virginia SUD Demonstration Impact Results

Exhibit WV-7 shows the estimates of beneficiaries treated for SUD, any SUD treatment, any SUD-related institutional service, any SUD-related outpatient service, WM, and MAT for Medicaid beneficiaries in West Virginia relative to individuals in the comparison group. As noted above, Q1 and Q2 of 2019 were excluded from all models due to missing data.

Exhibit WV-7. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in West Virginia

Outcome	Regression-adjusted DID (percentage points)	90% confidence interval	Relative difference (%)	p-value
Use of institutional services				
Q1 2018	0.00	(-0.00, 0.00)	-6.16	0.43
Q2 2018	0.00	(-0.00, 0.00)	2.33	0.80
Q3 2018	0.00	(-0.01, 0.00)	-13.52	0.24
Q4 2018	0.00	(-0.00, 0.01)	10.08	0.59
Q1 2019				
Q2 2019				
Q3 2019	0.02	(0.01, 0.03)	96.10	0.00
Q4 2019	0.04	(0.03, 0.05)	181.95	0.00
Q1 2020	0.04	(0.03, 0.05)	188.75	0.00
Q2 2020	0.03	(0.03, 0.04)	150.58	0.00
Q3 2020	0.04	(0.03, 0.05)	172.53	0.00
Q4 2020	0.04	(0.03, 0.05)	169.71	0.00
Overall	0.02	(0.02, 0.03)	106.60	0.00
Use of outpatient services				
Q1 2018	-0.08	(-0.10, -0.06)	-10.25	0.00
Q2 2018	-0.05	(-0.07, -0.03)	-6.08	0.00
Q3 2018	-0.07	(-0.09, -0.04)	-8.07	0.00
Q4 2018	-0.09	(-0.11, -0.06)	-10.64	0.00
Q1 2019				
Q2 2019				
Q3 2019	-0.07	(-0.09, -0.05)	-9.10	0.00
Q4 2019	-0.05	(-0.07, -0.02)	-5.72	0.00
Q1 2020	-0.04	(-0.07, -0.02)	-5.47	0.00
Q2 2020	-0.04	(-0.07, -0.02)	-5.48	0.01
Q3 2020	-0.05	(-0.07, -0.02)	-5.92	0.00
Q4 2020	-0.06	(-0.08, -0.03)	-6.95	0.00
Overall	-0.06	(-0.08, -0.03)	-7.18	0.00

Outcome	Regression-adjusted DID (percentage points)	90% confidence interval	Relative difference (%)	p-value
Use of WM services				
Q1 2018	-0.00	(-0.00, -0.00)	-38.71	0.01
Q2 2018	-0.00	(-0.00, -0.00)	-27.03	0.09
Q3 2018	-0.00	(-0.00, 0.00)	-19.20	0.28
Q4 2018	-0.00	(-0.00, -0.00)	-22.17	0.08
Q1 2019				
Q2 2019				
Q3 2019	0.00	(0.00, 0.00)	26.14	0.03
Q4 2019	0.00	(0.00, 0.00)	24.95	0.09
Q1 2020	0.00	(-0.00, 0.00)	18.15	0.29
Q2 2020	0.00	(-0.00, 0.00)	9.98	0.63
Q3 2020	-0.00	(-0.00, 0.00)	-27.23	0.20
Q4 2020	-0.00	(-0.00, -0.00)	-36.81	0.02
Overall	-0.00	(-0.00, 0.00)	-8.58	0.60
Use of MAT services				
Q1 2018	0.05	(0.03, 0.07)	10.53	0.00
Q2 2018	0.02	(0.00, 0.05)	5.08	0.09
Q3 2018	0.02	(-0.00, 0.05)	5.15	0.10
Q4 2018	0.04	(0.02, 0.07)	8.58	0.01
Q1 2019				
Q2 2019				
Q3 2019	0.03	(-0.01, 0.06)	5.36	0.23
Q4 2019	-0.01	(-0.04, 0.03)	-1.70	0.72
Q1 2020	-0.05	(-0.09, -0.01)	-10.37	0.05
Q2 2020	-0.05	(-0.09, -0.01)	-10.86	0.04
Q3 2020	-0.05	(-0.09, -0.01)	-11.02	0.04
Q4 2020	-0.05	(-0.09, -0.01)	-10.14	0.06
Overall	-0.01	(-0.04, 0.02)	-2.12	0.63

DID = difference-in-differences.

Sample: Medicaid beneficiaries ages 12-64, eligible for full benefits, not dually enrolled in Medicare, treated for SUD in West Virginia and its comparison group.

Methods: A logistic regression model was used to obtain estimates. Results are weighted by the fraction of time the beneficiary was enrolled in Medicaid (eligibility fraction) and the propensity score weight. DID models for all outcomes assumed parallel trends in the baseline period except for MAT, for which nonparallel trends were assumed. Appendix A details the methods.

How to interpret the results: The relative difference is the DID estimate as a percentage of the demonstration state's baseline period adjusted mean. A *negative* value for the relative difference 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 state than in the comparison group.

Note: In West Virginia, Medicaid coverage for methadone, residential services, and WM services was added or expanded under the demonstration. Residential standards requiring access to MAT were added under the demonstration.

Source: RTI analysis of TAF RIF data

Sensitivity Analysis

Exhibit WV-8 shows how the impact estimates for West Virginia’s outcomes differ when DID models that we ran assuming parallel trends were rerun assuming nonparallel baseline trends. We did not conduct a sensitivity analysis for outcomes where the main model assumed nonparallel baseline trends. All estimates from the nonparallel models are consistent with the results of the main analyses. These results provide a higher level of confidence that use of institutional services increased, outpatient services decreased, and there was no discernible impact of use of WM, relative to the comparison group.

Exhibit WV-8. Impacts of section 1115 SUD demonstration on use of SUD treatment services among Medicaid beneficiaries treated for SUD in West Virginia under different model assumptions

Outcome	Parallel trends assumption	Main analysis: Regression-adjusted relative difference (%) (90% C.I.)	Sensitivity analysis: Regression-adjusted relative difference (%) (90% C.I.)
Any SUD-related Institutional Service	Main: Parallel Sensitivity: Not parallel	106.60*** (69.67, 157.31)	110.43** (75.22, 165.60)
Any SUD-related outpatient Service	Main: Parallel Sensitivity: Not parallel	-7.18*** (-10.19, -4.20)	-17.57*** (not estimated)
Any WM	Main: Parallel Sensitivity: Not parallel	-8.58 (-54.32, 24.12)	-4.19 (-46.55, 33.39)

* p<0.10; ** p<0.05; *** p<0.01.

Notes: C.I. = confidence interval; DID = difference-in-differences; Confidence intervals were not estimated for some outcomes because the underlying p-value was so small that our calculation software set the p-value = 0.

Source: RTI analysis of TAF RIF data