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The Effect of the Drug Medi-Cal Organized Delivery System 1115 Demonstration Waiver on Substance Use Disorder Treatment Access: Evidence from California☆

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ABSTRACT

Background: In August 2015, the California Department of Health Care Services created the Drug Medi-Cal Organized Delivery System 1115 demonstration waiver (DMC-ODS waiver) to improve service delivery to Medi-Cal-eligible individuals with a substance use disorder (SUD). We examine if implementing the DMC-ODS waiver across California counties improved patient access to SUD treatment services.

Methods: We use administrative data from 2016 to 2020 from a reporting system for all publicly-funded SUD treatment services delivered in California and employ difference-in-differences and event study empirical strategies exploiting the differential timing of DMC-ODS waiver adoption across counties.

Results: Event study analyses show that eleven or more months after the introduction of the DMC-ODS waiver, the number of unique patient admissions significantly increase by nearly 20%. Residential treatment admissions significantly increase by roughly 25% in all months post-waiver introduction.

Conclusions: This study provides valuable information for policymakers about implementing 1115 waivers, and the important public health implications. California's DMC-ODS waiver has demonstrated that 1115 waivers similar to it can likely increase access to SUD treatment.

1. Introduction

According to the American Psychiatric Association, a substance use disorder (SUD) is defined as the persistent use of drugs and/or alcohol despite harmful consequences and occurs when the repeated use of drugs and/or alcohol causes significant problems (Najavits, 2017). Low-income individuals are seemingly disproportionately affected by substance use disorders (Bassuk, 1998; Baptiste-Roberts, 2018). In California, Medi-Cal (California's version of Medicaid) eligible individuals account for nearly 40% of the 2.9 million with an SUD (Bass et al., 2022). Given that close to half of those with an SUD are Medi-Cal beneficiaries, in 1980, the California Department of Health Care Services (DHCS) established the Drug Medi-Cal (DMC) Program, which provides medically necessary SUD treatment services to eligible Medi-Cal beneficiaries with an SUD diagnosis (DHCS, 2021). In 2019, there were 1,754 SUD treatment facilities in California, 928 (53%) of which were publicly funded and a certified DMC program (DHCS, 2021). Among these DMC-certified treatment facilities, 82% of clients were Medi-Cal beneficiaries.

To improve previously existing issues within the DMC system, DHCS created the Drug Medi-Cal Organized Delivery System 1115 demonstration waiver (henceforth referred to as the DMC-ODS waiver) in August 2015. The DMC-ODS waiver intended to improve service delivery to Medi-Cal-eligible individuals with an SUD, and expand services for eligible individuals. Specifically, in addition to all services provided in the State Plan DMC program, the DMC-ODS waiver included multiple levels of residential SUD treatment that were no longer limited to perinatal women nor restricted by the 16-bed limitation of the Institutions for Mental Disease exclusion. The waiver also expanded coverage to all FDA-approved medications for SUD, and added levels of withdrawal management, recovery services, case management, and physician consultation. In this paper, we examine if implementing the

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DMC-ODS waiver across California counties improved patient access to services, the main goal of this demonstration project.

Notably, California's DMC-ODS waiver served as a template for developing the Centers for Medicare and Medicaid Services (CMS) guidance for other states to change their SUD service delivery systems through 1115 waivers. After lengthy discussions between California and CMS to develop DMC-ODS, CMS released guidance to the other states on applying for similar 1115 waivers while acknowledging California as the first state to receive a waiver under the new guidance (Wachino, 2015). Since the introduction of DMC-ODS, a growing number of states have applied for their own 1115 waivers (as of June 28, 2021, thirty-two states had 1115 waivers approved (Henery, 2019; Miles, 2019). Therefore, examining the association between access and participation in DMC-ODS waivers is essential to inform states adopting 1115 waivers in the future.

The DMC-ODS waiver contains provisions related to facilitating access to SUD treatment, including expanded coverage for treatment in residential facilities institutions for mental diseases and requirements for 24-hour beneficiary access lines. Therefore, it may be expected that access, measured by unique individuals receiving services, would increase. However, the DMC-ODS waiver also included an array of changes meant to increase oversight, local control, and quality, including new requirements for American Society of Addiction Medicine (ASAM) assessments, quality improvement, hiring of medical directors and other licensed practitioners, use of evidence-based practices, and program certification. Although these changes are intended to improve treatment quality, they may also present new barriers to service expansion and access (Cunningham et al., 2020; Crable et al., 2022).

In California, counties are responsible for delivering SUD treatment through county-owned providers or contracting with providers, implementing and maintaining a system of fiscal disbursements and controls, processing claims for reimbursement, and ensuring reimbursements are within established rates. The state is responsible for administrative and fiscal oversight, monitoring, and auditing, including onsite reviews of DMC providers (DHCS, 2023a). Counties wishing to participate in DMC-ODS must submit an implementation plan and undergo an approval process by both DHCS and CMS before they can begin providing DMC-ODS services (DHCS, 2023b). Participating counties act as Prepaid Inpatient Health Plans for SUD treatment (DHCS, 2019).

California counties began opting into the waiver after its introduction, with Riverside and San Mateo counties adopting the DMC-ODS waiver first in February 2017 and Sacramento, San Benito, and Tulare being the most recent to adopt the waiver as individual counties in July 2019. By the end of 2020, the DMC-ODS waiver had been implemented in 37 counties containing the vast majority (nearly 96%) of California's population. See Supplemental Table 1 for the implementation dates of all 37 counties.

Previous research on evaluating the effect of 1115 waivers related to SUD service delivery has been limited. Though not evaluating the effect of 1115 waivers on access, Maclean et al. (2021) find an increased acceptance of Medicaid at SUD treatment facilities following implementation of 1115 waivers. Additionally, Tormohlen et al. (2020) examine the impact of general Section 1115 waivers on Medicaid coverage and opioid agonist therapy utilization among substance use treatment admissions. The authors find that 1115 waiver implementation was associated with an increase in the proportion of all admissions with Medicaid and an increase among opioid outpatient admissions. Currently, there is no causal evidence regarding the relationship between 1115 waivers specific to SUD service delivery and patient access to care.

In this paper, we address this gap in the literature by using administrative data from a reporting system for all publicly funded SUD treatment services delivered in California and employing a difference-in-differences empirical strategy exploiting the differential timing of DMC-ODS waiver adoption across counties. The administrative data used in this paper represents the universe of treatment admissions to publicly-funded SUD treatment in California between CY 2016 and CY 2020. Using this data, we compare the unique number of patients receiving services in DMC-ODS waiver counties to the unique number of patients receiving services in non-waiver counties both pre and post-implementation.

2. Data

Our primary analysis will use data from the California Outcomes Measurement System Treatment data (CalOMS-Tx) from January 1, 2016 - December 31, 2020 to measure the effect of the introduction of the DMC-ODS on SUD treatment admissions. CalOMS-Tx is a reporting system for all publicly funded SUD treatment services delivered in California, and represents California's implementation of data collection conducted in each state for the Treatment Episode Dataset maintained by SAMHSA. Providers that deliver publicly funded SUD services collect data from all clients receiving treatment, whether the client's treatment is publicly funded or not, at admission, and discharge (or administrative discharge), plus annual updates for clients in treatment over twelve months. Providers collect these data each month and send them to the California Department of Health Care Services, which manages the CalOMS-Tx system. The CalOMS-Tx data used in this paper is not publicly available, as they were obtained from the California Department of Health Care Services as part of an interagency agreement and business associate agreement with UCLA.

The CalOMS-Tx data are well suited for this study for two reasons. First, the CalOMS-Tx data represent the universe of client admissions to publicly funded SUD treatment in California. Publicly-funded SUD treatment providers account for nearly 53% of all treatment providers in California,[1] and we estimate they serve nearly 82%[2] of all clients receiving SUD treatment. Therefore, we are able to capture the majority of clients seeking SUD treatment in California. The administrative CalOMS-Tx data is also less subject to concerns typically present in survey data, including small sample sizes, and self-reported responses that may bias estimation results. Importantly, admission to SUD treatment in CalOMS-Tx is not selfreported, nor is the level of care the patient receives, thus alleviating concerns of self-reported response bias in our estimates.

Second, CalOMS-Tx collects information on the type of SUD treatment service being provided to the client. Specifically, we are able to identify if a client was receiving outpatient services (OP), intensive outpatient services (IOP), residential treatment services, or opioid treatment program (OTP) services. With this information, we are able to uncover heterogeneous effects of the DMC-ODS waiver on type of treatment services received and determine if some treatment types were more affected than others.

Importantly, prior to the introduction of the DMC-ODS waiver, OP, IOP, and OTP services were included as State Plan benefits, but only residential treatment for a relatively small number of perinatal clients was covered (CMS, 2015). We would expect the effect of the introduction of the DMC-ODS waiver to be concentrated around residential treatment admissions, and not OP, IOP, or OTP admissions, since these services were already covered prior to the waiver introduction. Therefore, the estimated impact of the DMC-ODS waiver on OP, IOP, and OTP treatment admissions can be considered falsification tests, since these services should be unaffected by the implementation of the DMC-ODS

[1] In 2019, there were 1754 SUD treatment facilities in California, 928 of which were publicly funded and a certified DMC program (or 53 %) (DHCS, 2021).

[2] The National Survey of Substance Abuse Treatment Services estimates that 96,600 clients were receiving any type (publicly or privately funded) SUD treatment in California in 2019. The total number of unique clients receiving SUD treatment during 2019 according to our CalOMS-Tx data is 78,984, representing nearly 82 % of all clients receiving SUD treatment.

waiver.

Data on all covariates used in the analyses come from multiple sources. Data on countylevel demographic treatment admission controls are from the CalOMS-Tx data, and economic controls for 2016–2020 are from the 1-year American Community Survey estimates, except for 2020 data, which come from the 5-year American Community Survey estimates. Novel data on county-level COVID-19 policy controls for 2020 were provided by the University of Arizona's Research on COVID-19 Interventions and Impacts group. Table 1 presents descriptive statistics for all analysis variables for 2016–2020.

3. Methods

To determine the effect of the DMC-ODS waiver on access to SUD treatment services received, we estimate a difference-in-difference model that takes the following form:

$$Y_{ct} = \alpha + \beta Waiver_{ct} + \gamma X_{ct} + \delta_t + \theta_c + \varepsilon_{ct} \quad (1)$$

Table 1
Descriptive statistics for analysis variables, 2016–2020.

	Waiver= 1 (1)	Waiver= 0 (2)	*p-value* (3)	Full Sample (4)
Outcomes				
Admissions	303.1	113.0	0.00	166.8
Residential Admissions	81.9	22.1	0.00	39.0
Outpatient Admissions	101.0	45.9	0.00	61.8
Intensive Outpatient Admissions	25.4	6.2	0.00	11.6
OTP Admissions	43.8	18.2	0.00	25.6
Demographic and Economic Controls				
Percent Age 18–25	0.17	0.21	0.00	0.20
Percent Age 26–65	0.90	0.82	0.00	0.84
Percent Age 66+	0.01	0.01	0.00	0.01
Percent Male	0.64	0.58	0.00	0.60
Percent Other Race	0.09	0.11	0.00	0.10
Percent White	0.50	0.61	0.00	0.58
Percent Black	0.10	0.05	0.00	0.06
Percent Hispanic	0.39	0.27	0.00	0.31
Percent with High School Degree or More	0.85	0.84	0.05	0.85
Unemployment Rate	0.07	0.07	0.75	0.07
Poverty Rate	0.12	0.14	0.00	0.14
COVID-19 Policy Controls				
K-12 School Closure	0.14	0.02	0.00	0.05
Release of Specific Prison Offenders Required	0.02	0.00	0.00	0.00
Mental Health Facilities Open on a Limited Basis	0.02	0.00	0.00	0.01
Bars Allowed to be Open	0.04	0.01	0.00	0.02
Restaurants Allowed to be Open	0.05	0.02	0.00	0.03
State of Emergency Declared	0.34	0.09	0.00	0.16
Stay-at-Home Order	0.33	0.08	0.00	0.15
Observations	958	2,357		3,315

Notes: Data on county-level treatment admission outcomes and demographic controls come from CalOMS-Tx from January 1, 2016 - December 31, 2020, data on county-level economic controls for 2016–2019 come from the 1 year American Community Survey estimates and data from 2020 come from the 5 year American Community Survey estimates. Data on COVID-19 policy controls for 2020 were provided by the University of Arizona's Research on COVID-19 Interventions and Impacts group. Means are presented in column 1 for all counties with the DMC-ODS waiver in effect for any part of the year and in column 2 for all counties with the DMC-ODS waiver not in effect for any part of the year. Column 3 presents the p-value from a two-sample t-test of columns 1 and 2. Column 4 presents the means for all analysis variables for the full sample. COVID-19 policy controls are county-level indicators, and equal 1 for any part of the year with the policy in effect in that county, and 0 otherwise. "OTP" = Opioid Treatment Program.

where c indexes the county and t indexes the month-year. Y_{ct} represents our main outcome of interest: unique number of SUD treatment patient admissions. In our preferred specification, the outcome of interest is logged given the discrete nature of treatment services received. $Waiver_{ct}$ is an indicator equal to 1 in each month-year the waiver is in effect in each county, and 0 otherwise. X_{ct} is a vector of county-specific, time varying demographic and economic controls, including the percentage of the treatment admission population that is male, white, black, hispanic, or other race, 18–25 years old, 26–65 years old and 66 + years old, the unemployment rate, the percentage of the population with a high school degree or more, and the poverty rate. X_{ct} also includes county-specific, time varying COVID-19 policy controls, including indicators for K-12 school closures, release of specific prison offenders required, mental health facilities open on a limited basis, bars allowed to be open, restaurants allowed to be open, county-level state of emergency declared, and a county-level stay-at-home order. δ_t represent month-year fixed effects, and θ_c represent county fixed effects. Standard errors are clustered at the county level, and all models are weighted by the county-level population.

Identification of the parameter of interest, β, comes from within-county variation in DMC-ODS waiver adoption during the 2016–2020 sample period. Estimates of β in Eq. (1) will only be unbiased if county-specific time-varying unobservables are uncorrelated with the adoption of the DMC-ODS waiver, and if counties are not enacting the waiver in response to unfavorable trends in SUD treatment services received.

To ensure that pre-treatment trends were similar in non-waiver adopting and adopting counties in the months prior to the implementation of the DMC-ODS waiver, we estimate an event study specification that takes the following form:

$$Y_{ct} = \alpha + \sum_{\phi \leq -12}^{\phi=-2} \sigma_\phi Waiver_{c,t+\phi} + \sum_{\mu=0}^{\mu \geq 12} \eta_\mu Waiver_{c,t+\mu} + \gamma X_{ct} + \delta_t + \theta_c + \varepsilon_{ct} \quad (2)$$

where all variables are the same as above, and ϕ and μ represent the event-study coefficients of interest. If pre-treatment trends (the ϕ coefficients, or up to 12 or more months prior to the introduction of the DMC-ODS waiver) are similar among non-adopting and adopting counties, this would support the claim that post-waiver implementation breaks in treatment admission trends were likely caused by the DMC-ODS waiver. An additional advantage of the event study specification is that we can observe how the effects of the DMC-ODS waiver on SUD treatment services unfold over time. It may be the case that the waiver immediately affected services received, or the impact of the waiver on treatment admissions took time to unfold.

In addition to the estimating the event study regressions to account for potential policy endogeneity, we also modify Eq. (1) to include county-specific linear time trends to control for county-level unobservables that evolve linearly over time, such as sentiment towards substance use disorder treatment. We also explore the sensitivity of our results to alternative specifications of Eq. (1). Specifically, we estimate Eq. (1) using the inverse hyperbolic sine (the inverse hyperbolic sine (IHS) of admissions takes the following form: $\sinh_z^{-1} = \ln(z + \sqrt{1+z^2})$) of treatment admissions to account for observations with zero admissions. We also drop Los Angeles County from the analysis since the County accounts for about one quarter of the state's population and nearly one-fifth of CalOMS-Tx data observations, and can have an outsized effect on the results. Finally, we drop twelve counties (Alpine, Colusa, Inyo, Lassen, Modoc, Mono, Plumas, Sierra, Sutter, Mariposa, Siskiyou, and Trinity) from the analysis that have missing treatment admissions data, and we estimate Eq. (1) without weighting by the county-level population.

4. Results

The difference-in-difference results for the effect of the introduction of the DMC-ODS waiver on substance use disorder (SUD) treatment

admissions are presented in Tables 2 and 3. To begin our analysis, we estimate Eq. (1) in the text using the aggregate number of SUD treatment admissions by county-month-year as our main outcome of interest, and then disaggregate by treatment modality. We then estimate Eq. (2) in the text and present the event study estimates, showing the estimates on the 12 or more months before and after implementation of the waiver.

Specifically, in Table 2, we present weighted least squares (WLS) results, weighting by the county-level population, using the natural log of treatment admissions for all outcomes. In Panel I, we present results without demographic, economic, or COVID-19 policy controls, in Panel II we present results with all demographic, economic, and COVID-19 policy controls, and in Panel III we present results with all controls plus a county-specific linear time trend. Column 1 presents the aggregated results for all SUD treatment admissions, and columns 2–5 disaggregate the results by treatment modality. In Table 3 we present the event study estimates from Eq. (2) in the text. For brevity, all odd-numbered month estimates are omitted from Table 3, but estimates for all months are presented in Fig. 1.

Across all specifications, the results in Table 2 indicate that the introduction of the DMC-ODS waiver had no statistically significant impact on SUD treatment admissions overall, or across modality, except for residential treatment. In Panel II (our preferred specification), we find a marginally significant (statistically significant at the 10% level) 22% increase in residential treatment admissions after the introduction of the DMC-ODS waiver. This result is consistent with the hypothesis that only residential treatment admissions should be affected by the introduction of the DMC-ODS waiver, since outpatient (OP), intensive outpatient (IOP), and opioid treatment program (OTP) services were already covered before waiver introduction (CMS, 2015). Therefore, the OP, IOP, and OTP results can be interpreted as falsification tests, supporting a causal interpretation of the presented results.

In Supplemental Table 2, we assess the sensitivity of the results in Table 2 with a number of additional specifications. Again, we find no statistically significant effect of the introduction of the DMC-ODS waiver on SUD treatment admissions overall, or by treatment modality, with the exception of residential treatment admissions. The estimates across all specifications in Panels I-III remain quantitatively similar to those in Table 2. In Panel IV, we drop Los Angeles County, and find that the significant impact of the DMC-ODS waiver on residential treatment admissions is driven by Los Angeles. This is not surprising, as Los Angeles County accounts for about one-quarter of the state's population and nearly one-fifth of all CalOMS-Tx treatment admissions.

We also explore heterogeneity in the effect of the introduction of the DMC-ODS waiver on SUD treatment admissions by patient race/ethnicity and gender. As shown in Supplemental Table 3, across both subgroups, the estimates are statistically insignificant, suggesting the implementation of the waiver had no differential impact on admissions by race/ethnicity or gender.

To determine if pre-treatment trends were similar in non-adopting and adopting counties in the months prior to DMC-ODS waiver introduction, we present results from the event study analysis in Table 3. The analogous event-study estimates are also presented visually in Fig. 1. To aid in interpreting the event study figures, each dot represents the point estimate for that specific month relative to the DMC-ODS waiver implementation date. The month before the waiver's implementation is omitted and is the reference time period. The lines extending from each dot represent the 95% confidence interval for this estimate. Lines that cross the horizontal red line (0) mean the point estimate is statistically insignificant at the 95% level. Lines that do not cross the horizontal red line mean the point estimate is significant at the 95% level. The "− 12″ and "12″ month dots represent 12+ months before waiver implementation, and 12+ months after waiver implementation, respectively. That is, the "−12″ and "12″ estimates are the aggregated effects of the waiver 12 or more months before and 12 or more months after, relative to waiver implementation.

Table 3 and Fig. 1 show that across all outcomes, pre-treatment trends in SUD treatment admissions in adopting and non-adopting counties were similar (i.e., the estimated coefficients on all months prior to waiver implementation are statistically insignificant at conventional levels). Trends only appear to consistently diverge in the months following waiver implementation for residential treatment admissions, again consistent with the hypothesis that only residential treatment admissions should be affected by the introduction of the DMC-ODS waiver.

In addition to assessing the parallel trends assumption of difference-in-differences, the event study specification allows us to see how the effect of the waiver on SUD treatment admissions unfolds over time. For overall treatment admissions, Column 1 in Table 3 and Panel (a) in Fig. 1 show that eleven or more months after the introduction of the DMC-ODS waiver, the number of unique patient admissions appears to significantly and consistently increase by nearly 20%. This result appears to be driven by residential treatment admissions. Column 2 in Table 3 and Panel (b) in Fig. 1 clearly show a consistent and significant increase in residential treatment admissions around 25% in all months after the introduction of the DMC-ODS waiver.

Columns 3–5 of Table 3 and Panels (c)–(e) of Fig. 1 show the event

Table 2
DMC-ODS waiver and SUD treatment admissions - difference-in-difference estimates.

	All	Residential	Outpatient	Intensive Outpatient	OTP
	(1)	(2)	(3)	(4)	(5)
			Panel I: No controls		
Waiver	0.03	0.19	0.00	-0.29	0.08
	(0.06)	(0.13)	(0.07)	(0.28)	(0.13)
	[− 0.09,0.15]	[− 0.06,0.45]	[− 0.13,0.14]	[− 0.85,0.28]	[− 0.18,0.34]
Panel II: With controls					
Waiver	0.06	0.22*	0.02	-0.27	0.09
	(0.06)	(0.13)	(0.07)	(0.29)	(0.12)
	[− 0.06,0.18]	[− 0.04,0.48]	[− 0.11,0.15]	[− 0.85,0.32]	[− 0.15,0.33]
Panel III: II + county linear time trend					
Waiver	-0.01	0.19	-0.06	-0.28	0.06
	(0.06)	(0.13)	(0.07)	(0.20)	(0.11)
	[− 0.13,0.12]	[− 0.07,0.45]	[− 0.20,0.08]	[− 0.69,0.13]	[− 0.16,0.28]
Observations	3,315	3,315	3,315	3,315	3,315

Notes: Difference-in-difference estimates from Eq. (1) in the text are presented. Observations are at the county month-year level. Each column is a separate regression, with the natural log of treatment admissions being used for all outcomes. "OTP" = Opioid Treatment Program. All regressions include month-year, and county fixed effects, and are weighted by the county population. Panel I presents estimates without county-specific demographic, economic, and COVID-19 policy controls, Panel II presents estimates with county-specific demographic, economic, and COVID-19 policy controls, and Panel III presents estimates with all controls in Panel II plus county-specific linear time trends. Standard errors clustered at the county level are reported in parentheses, and 95 % confidence intervals are in brackets. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 3
DMC-ODS waiver and SUD treatment admissions - event study estimates.

	All (1)	Residential (2)	Outpatient (3)	Intensive Outpatient (4)	OTP (5)
12+ mths before	0.05	0.16	0.07	0.70	-0.02
	(0.07)	(0.14)	(0.07)	(0.43)	(0.10)
	[− 0.08,0.19]	[− 0.13,0.44]	[− 0.08,0.21]	[− 0.15,1.55]	[− 0.22,0.17]
10 mths before	0.06	0.10	0.02	0.53	0.12*
	(0.06)	(0.14)	(0.07)	(0.36)	(0.06)
	[− 0.06,0.18]	[− 0.18,0.38]	[− 0.12,0.16]	[− 0.18,1.25]	[− 0.01,0.24]
8 mths before	0.04	0.09	0.03	0.39	0.08
	(0.06)	(0.14)	(0.07)	(0.31)	(0.08)
	[− 0.08,0.16]	[− 0.18,0.37]	[− 0.11,0.16]	[− 0.23,1.02]	[− 0.09,0.25]
6 mths before	0.06	0.11	0.05	0.30	0.14
	(0.06)	(0.13)	(0.06)	(0.31)	(0.13)
	[− 0.06,0.18]	[− 0.14,0.37]	[− 0.08,0.17]	[− 0.33,0.93]	[− 0.13,0.40]
4 mths before	0.07	0.15	0.04	0.49*	0.22*
	(0.06)	(0.12)	(0.06)	(0.28)	(0.12)
	[− 0.05,0.18]	[− 0.09,0.39]	[− 0.08,0.16]	[− 0.07,1.06]	[− 0.02,0.46]
2 mths before	0.02	0.14*	0.01	-0.04	0.04
	(0.03)	(0.07)	(0.03)	(0.07)	(0.07)
	[− 0.04,0.08]	[− 0.00,0.28]	[− 0.05,0.08]	[− 0.18,0.10]	[− 0.11,0.19]
Mth of Waiver Imp.	0.11***	0.27***	0.05	0.25*	0.12*
	(0.04)	(0.07)	(0.08)	(0.15)	(0.07)
	[0.03,0.19]	[0.12,0.42]	[− 0.11,0.20]	[− 0.05,0.54]	[− 0.02,0.25]
2 mths after	0.11**	0.37**	0.10	-0.02	0.21*
	(0.05)	(0.15)	(0.08)	(0.11)	(0.12)
	[0.00,0.22]	[0.06,0.67]	[− 0.06,0.27]	[− 0.24,0.21]	[− 0.02,0.44]
4 mths after	0.10*	0.35**	0.04	-0.06	0.08
	(0.06)	(0.15)	(0.08)	(0.13)	(0.12)
	[− 0.02,0.22]	[0.04,0.66]	[− 0.11,0.20]	[− 0.32,0.19]	[− 0.17,0.33]
6 mths after	0.05	0.28**	0.03	-0.07	0.09
	(0.06)	(0.13)	(0.08)	(0.15)	(0.13)
	[− 0.08,0.17]	[0.02,0.54]	[− 0.12,0.19]	[− 0.37,0.24]	[− 0.17,0.35]
8 mths after	0.08	0.26**	0.07	0.06	0.25*
	(0.06)	(0.13)	(0.08)	(0.18)	(0.13)
	[− 0.04,0.20]	[0.01,0.52]	[− 0.09,0.23]	[− 0.30,0.42]	[− 0.02,0.51]
10 mths after	0.12*	0.27**	0.05	0.21	0.33**
	(0.07)	(0.13)	(0.09)	(0.18)	(0.15)
	[− 0.01,0.26]	[0.01,0.54]	[− 0.13,0.23]	[− 0.15,0.57]	[0.03,0.63]
12 + mths after	0.25***	0.45***	0.14*	0.42	0.22
	(0.07)	(0.17)	(0.08)	(0.28)	(0.15)
	[0.11,0.39]	[0.11,0.79]	[− 0.03,0.31]	[− 0.15,0.99]	[− 0.09,0.53]
Observations	3,315	3,315	3,315	3,315	3,315

Notes: Event Study estimates from Eq. (2) in the text are presented. Observations are at the county month-year level. Each column is a separate regression, with the natural log of treatment admissions being used for all outcomes. "OTP" = Opioid Treatment Program. All regressions include month-year and county fixed effects, county-specific demographic, economic, and COVID-19 policy controls, and are weighted by the county population. Standard errors clustered at the county level are reported in parentheses, and 95 % confidence intervals are in brackets. All odd numbered months are omitted from this table for brevity, but estimates for all months are presented in Fig. 1.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

study estimates for the impact of the DMC-ODS waiver on outpatient, intensive outpatient, and OTP treatment admissions, respectively. We find no statistically significant impact of the waiver on outpatient or intensive outpatient admissions at any point in time. For OTP admissions in Column 5 and Panel (e), for 9–11 months after waiver implementation, we find a significant increase in admissions of roughly 30%, though twelve months or more after implementation the effect falls back to zero.

5. Discussion and conclusion

In this paper, we are the first to estimate the impact of California's Drug Medi-Cal Organized Delivery System (DMC-ODS) 1115 demonstration waiver on SUD treatment admissions. Specifically, we estimate the effect of California's DMC-ODS waiver on SUD treatment admissions using the universe of admissions to publicly-funded SUD treatment facilities in California from January 1, 2016 - December 31, 2020 and a difference-in-difference and event study design.

While our initial analyses suggested the DMC-ODS waiver did not have a significant impact on admissions, a closer examination showed that eleven or more months after the introduction of the DMC-ODS waiver, the number of unique patient admissions did increase significantly, especially for residential treatment admissions. Specifically, residential treatment admissions significantly increased by roughly 25% in all months after the introduction of the DMC-ODS waiver, which is consistent with the addition of the new Medicaid benefit for residential treatment. A causal interpretation of our results can be supported by our event study analysis, which revealed no evidence of pre-treatment trends, and our falsification tests on outpatient, intensive outpatient, and opioid treatment program admissions.

Anecdotal evidence received from California SUD/behavioral health administrators of counties participating in the DMC-ODS waiver suggests the effect of the DMC-ODS waiver may have been delayed by real-world implementation barriers to increasing capacity and provider struggles in adopting new practices. Administrators indicated licensing and certification of treatment programs have been a particular challenge, along with payment rates, documentation requirements, and up-front costs.

This study is not without its limitations. Specifically, the CalOMS-Tx administrative data used in the analyses is reported by treatment providers, and could be affected by any number of reporting issues. Reporting issues would potentially bias the difference-in-difference

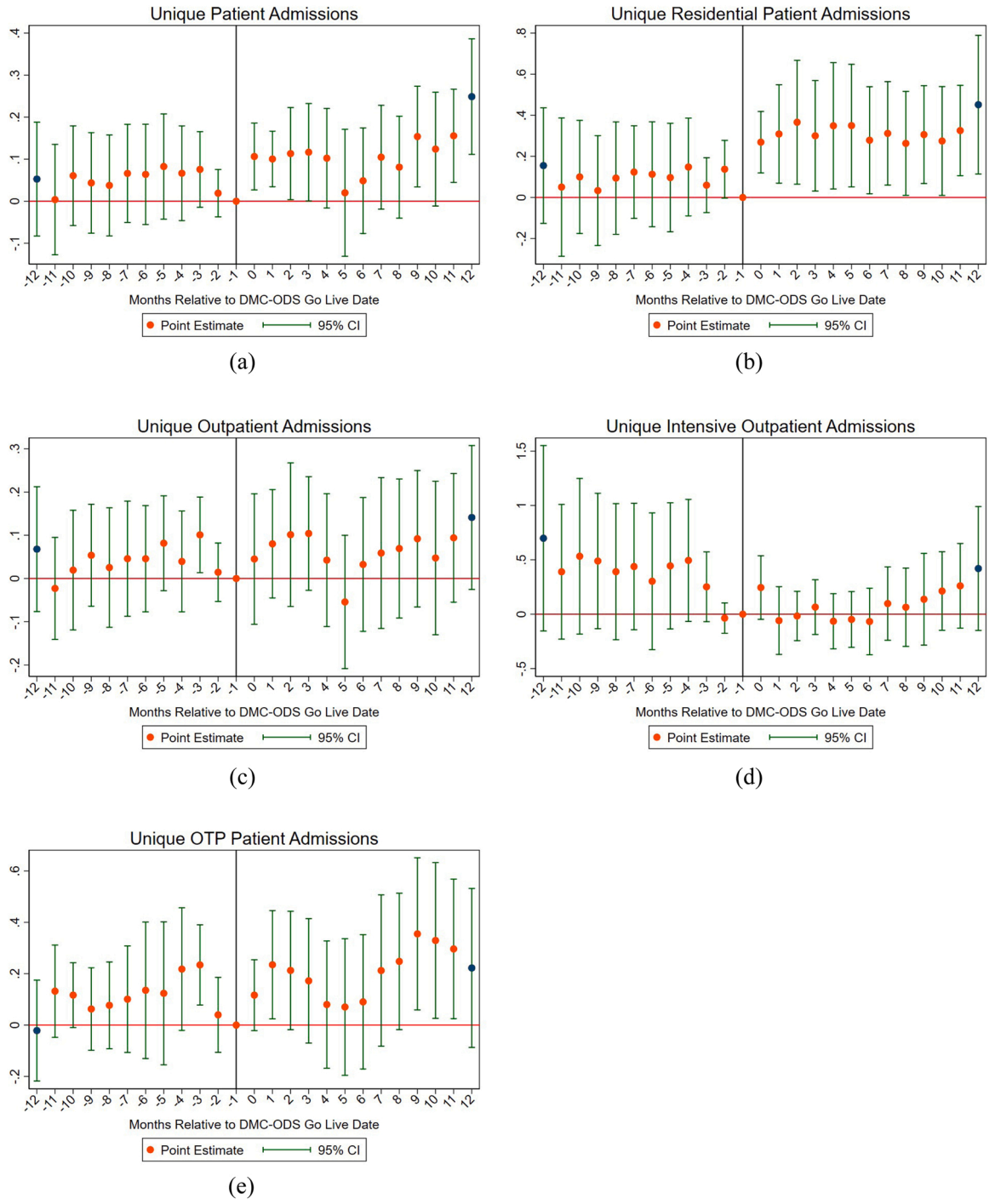

Fig. 1. Event study estimates: DMC-ODS waiver and SUD treatment admissions. Notes: Estimates of Eq. (2) described in the text. All estimates are relative to the month before DMC-ODS implementation. "OTP" = Opioid Treatment Program.

results if problems systematically occurred more often in waiver counties after beginning their participation in the DMC-ODS waiver. For example, if programs felt they were being more closely monitored under DMC-ODS, they may have been more careful to report data on every client as required. If so, our estimates on the impact of the waiver on treatment admissions would be biased upwards. Additionally, this study cannot empirically examine potential mechanisms behind the lagged increase in admissions, specifically residential admissions. Though the anedoctal evidence is useful, it would be beneficial to have data from providers on openings and closures, staffing, and licensing and certification, to rigorously examine the impact of these barriers on treatment admissions.

This study provides valuable information for policymakers about implementing 1115 waivers and their important public health implications. California's DMC-ODS waiver has demonstrated that 1115 waivers like it can likely significantly increase access to SUD treatment. The observed increase in access to SUD treatment as a result of the introduction of the DMC-ODS waiver may represent substantial internal costs to individuals, and external costs for society. Specifically, SUD treatment has shown to be effective in decreasing drug use, re-overdoses, and crime (Brewer et al., 1998; Griffith et al., 2000; Prendergast et al., 2002; Swensen, 2015; Wen et al., 2014; Khurana et al.,

2022). However, if states considering similar 1115 waivers wish to take full advantage of the new benefits and increase access to treatment in a timely and efficient manner, they would be well advised to streamline treatment program licensing and certification processes and provide clear training and technical assistance on the new requirements well ahead of their planned implementation date.

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Contributors

Brittany Bass served as the lead author and conceptualized the study and methodology, performed all statistical analyses, and wrote the first draft of the manuscript. Darren Urada and Vandana Joshi contributed to the conceptualization of the study, methodology design, data acquisition and curation, and manuscript editing. Dhruv Khurana and Anne Boustead contributed to the methodology design, data acquisition and curation, and manuscript editing. All authors edited and agreed upon the final manuscript.

Conflicts of interest

We have no competing interests to declare.

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Author disclosures

None.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.drugalcdep.2023.109847.

References

Baptiste-Roberts, K., Hossain, M., 2018. Socioeconomic disparities and self-reported substance abuse-related problems. Addict. Health 10 (2), 112.

Bass, B., Urada, D., Joshi, V., Padwa, H., Huang, D., Gilbert, M., Antonini, V.P., 2022. Access to Care: Drug Medi Cal organized delivery system 2021 evaluation report. University of California, Los Angeles Integrated Substance Abuse Programs. ⟨https://www.uclaisap.org/dmcods-eval/assets/documents/20220422-DMC-ODS-FY-2021-Evaluation-Report-with-Appendices.pdf⟩.

Bassuk, E.L., Buckner, J.C., Perloff, J.N., Bassuk, S.S., 1998. Prevalence of mental health and substance use disorders among homeless and low-income housed mothers. Am. J. Psychiatry 155 (11), 1561–1564.

Brewer, D.D., Catalano, R.F., Haggerty, K., Gainey, R.R., Fleming, C.B., 1998. A meta-analysis of predictors of continued drug use during and after treatment for opiate addiction. Addiction 93 (1), 73–92.

CMS, 2015. Centers for Medicare and Medicaid Services: Special Terms and Conditions, p. 91–92. Online. Retrieved from: ⟨https://www.dhcs.ca.gov/provgovpart/Documents/MC2020FINAL-STC-12-30-15.pdf⟩.

Crable, E.L., Benintendi, A., Jones, D.K., Walley, A.Y., Hicks, J.M., Drainoni, M.L., 2022. Translating Medicaid policy into practice: policy implementation strategies from three US states' experiences enhancing substance use disorder treatment. Implement. Sci. 17 (1), 1–14.

Cunningham, P., Woodcock, C., Clark, M., Middleton, A., Barnes, A., Idala, D., & Donohue, J. , 2020. Expanding Access to Addiction Treatment Services through Section 1115 Waivers for Substance Use Disorders: Experiences From Virginia and Maryland. Other Hilltop Institute (UMBC) Works. ⟨https://academyhealth.org/sites/default/files/expandingaccesstoaddictiontreatmentthrough1115waiversapril2020.pdf⟩.

DHCS, 2023a. Department of Health Care Services: Drug Medi-Cal Treatment Program – Monitoring. Online. Retrieved from: ⟨https://www.dhcs.ca.gov/services/adp/Pages/dmcdrugmedicalmonitoring.aspx⟩.

DHCS, 2023b. Department of Health Care Services: County Plans & Contracts. Online. Retrieved from: ⟨https://www.dhcs.ca.gov/provgovpart/Pages/county-implementationplans.aspx⟩.

DHCS, 2019. Department of Health Care Services: Overview of California's Public Mental Health and Substance Use Disorder Services. Online. Retrieved from: ⟨https://www.dhcs.ca.gov/services/Documents/CA-Public-MH-SUD-Services-Overview.pdf⟩.

DHCS, 2021. Department of Health Care Services: Drug Medi-Cal organized delivery system. Online. Retrieved from: ⟨https://www.dhcs.ca.gov/provgovpart/Pages/Drug-MediCal-Organized-Delivery-System.aspx⟩.

Griffith, J.D., Rowan-Szal, G.A., Roark, R.R., Simpson, D.D., 2000. Contingency management in outpatient methadone treatment: a meta-analysis. Drug Alcohol Depend. 58 (1–2), 55–66.

Henery, J. , 2019. Medicaid waiver tracker: approved and pending Section 1115 Waivers by state. Kaiser Family Foundation (KFF), San Francisco. ⟨https://www.kff.org/medicaid/issuebrief/medicaid-waiver-tracker-approved-and-pending-section-1115-waivers-by-state/⟩.

Khurana, D., Urada, D., Bass, B., Joshi, V., 2022. Chapter 6: Partnership HealthPlan Cost Study, Drug Medi-Cal organized delivery system 2021 evaluation report. UCLA Integrated Substance Abuse Programs. ⟨https://www.uclaisap.org/dmc-ods-eval/assets/documents/20220422-DMC-ODS-FY-2021-Evaluation-Report-with-Appendices.pdf⟩.

Maclean, J.C., Wen, H., Simon, K.I., Saloner, B., 2021. Institutions for mental diseases Medicaid waivers: impact on payments for substance use treatment facilities: study examines Medicaid coverage of substance use disorder treatment at residential and outpatient facilities. Health Aff. 40 (2), 326–333.

Miles, J., 2019. Changes in residential substance use treatment service access resulting from recent Medicaid Section 1115 waivers. Psychiatr. Serv. 70 (5), 428–431.

Najavits, L.M., Hyman, S.M., Ruglass, L.M., Hien, D.A., Read, J.P., 2017. Substance use disorder and trauma. In: Gold, S.N. (Ed.), APA Handbook of Trauma Psychology: Foundations in Knowledge. American Psychological Association, pp. 195–213. https://doi.org/10.1037/0000019-012.

Prendergast, M.L., Podus, D., Chang, E., Urada, D., 2002. The effectiveness of drug abuse treatment: a meta-analysis of comparison group studies. Drug Alcohol Depend. 67 (1), 53–72.

Swensen, I.D., 2015. Substance-abuse treatment and mortality. J. Public Econ. 122, 13–30.

Tormohlen, K.N., Krawczyk, N., Feder, K.A., Riehm, K.E., Crum, R.M., Mojtabai, R., 2020. Evaluating the role of Section 1115 waivers on Medicaid coverage and utilization of opioid agonist therapy among substance use treatment admissions. Health Serv. Res. 55 (2), 232.

Wachino, Vikki, 2015. "SMD 15–003 Re: New Service Delivery Opportunities for Individuals with a Substance Use Disorder." Centers for Medicare and Medicaid Services, July 27. ⟨https://www.medicaid.gov/federal-policy-guidance/downloads/smd15003.pdf⟩.

Wen, H., Hockenberry, J.M., & Cummings, J.R., 2014. The effect of substance use disorder treatment use on crime: Evidence from public insurance expansions and health insurance parity mandates (No. w20537). National Bureau of Economic Research.