

Key Findings

In 2017, in response to rising misuse and addiction to opioids and overdose related deaths, New Jersey enacted the most restrictive opioid prescribing law in the nation (New Jersey Public Law 2017, Chapter 28), which places a five-day limit on opioid prescriptions and increases access to treatment for substance use disorder. To assess one important possible impact of the law, this brief examines trends in volume and spending for outpatient opioid prescriptions reimbursed by New Jersey Medicaid. Key findings include:

- *The average number of opioid prescriptions and concordant Medicaid spending declined by nearly half in the second half of 2018 when compared to pre-policy averages (2015-2016).*
- *We estimate about 299,012 fewer opioid prescriptions and a more than \$8.6 million decrease in Medicaid spending by the end of 2018 Q4 after the law was enacted compared to what it would have been if pre-policy trends continued without the law.¹*
- *With regard to the commonly prescribed opioids, oxycodone consistently accounted for half of the total number of prescriptions. Following enactment of the New Jersey legislation, the decrease was most prominent for hydrocodone and hydromorphone prescriptions.*
- *Across all other metrics (drug schedules, durations of action, and drug sources), we estimate that the average numbers of prescriptions in the second half of 2018 were reduced by about 79,000 for Schedule II opioids, 100,000 for short-acting opioids, and 73,000 for semi-synthetic opioids when compared to the pre-policy averages.*

Opioids are potent prescription medications used to treat acute and chronic pain that also pose serious risks for addiction, overdose, and death. The misuse of, and addiction to, opioids has become a national emergency, with an estimated average of 130 deaths every day attributed to opioid overdose.^{2,3} Between 1999-2017, almost 400,000 people died from overdoses related to opioid pain medications in the United States. In 2017 alone, nearly 68% of drug overdose deaths involved an opioid. The rising number of suspected drug overdose deaths in New Jersey mirrors the national trend. Between 2013 and 2016, the number of overdose deaths in the state increased by more than 66% (with 1,336 deaths in 2013 and 2,221 in 2016), prompting lawmakers to take stronger actions to curb the rising trajectory.⁴

In addition to efforts aimed at education, prevention, and treatment of substance abuse, New Jersey passed the most restrictive law in the country to limit opioid prescriptions and improve access to recovery programs.⁵ That legislation,^{6,7} signed into law (NJ P.L. 2017, c.28) on February 15, 2017 by former New Jersey Governor Chris Christie, specifically aimed at: (1) increasing restrictions on opioid prescribing, including prohibiting the initial prescription of more than a five-day supply of opioids for the treatment of acute pain; requiring a documented medical history and Prescription Monitoring Program check prior to issuance of the prescription; counseling about risks and alternatives; and establishing a pain contract with minimum three-month reviews at the time of the third prescription, and (2) requiring state-regulated health plans to cover benefits for at least 180 days for both inpatient and outpatient treatment for persons diagnosed with a substance use disorder. However, the legislation exempts from the prescription limitations patients who are receiving treatment for cancer, receiving hospice care from a licensed hospice or palliative care

¹ Models adjusted for policy initiation, and Medicaid enrollment total obtained from the NJ Division of Medical Assistance and Health.

² <https://www.cdc.gov/drugoverdose/data/analysis.html>

³ <https://www.cdc.gov/drugoverdose/epidemic/index.html>

⁴ <https://www.njcares.gov/>

⁵ <http://www.ncsl.org/research/health/prescribing-policies-states-confront-opioid-overdose-epidemic.aspx>

⁶ <https://legiscan.com/NJ/text/S3/id/1558993>

⁷ <https://www.njspotlight.com/stories/17/02/15/governor-gets-his-addiction-law-just-5-weeks-after-outlined-in-state-of-state/>

provider, or residing in a long-term care facility. Also exempted are any medications prescribed to treat substance abuse or opioid dependence.

This brief examines trends following enactment of the legislation on: (1) the number of outpatient opioid prescriptions reimbursed by New Jersey Medicaid from 2015-2018, and (2) Medicaid spending on opioid prescriptions during that period. Findings are based on changes in the total number of Medicaid-covered prescriptions dispensed in outpatient settings, and variations shown are based on the drug schedule (Schedules II to V);^{8,9} duration of action (short- and long-acting); source of drug (natural, semi-synthetic, and synthetic); and the change in Medicaid spending on opioid prescriptions. Data in this brief come from the 2015-2018 New Jersey State Drug Utilization Data from the Centers for Medicare & Medicaid Services (CMS). The State Drug Utilization Data is a publicly available dataset routinely available from CMS with a three-to-five-month data lag. Data sources and methods are further described at the end of this brief.

Findings

Trends in Total Number of Opioid Prescriptions: Overall, an upward trend in the semiannual average number of Medicaid-covered opioid prescriptions continued through the first half of 2016. The second half of 2016 showed a very slight drop in the average number of prescriptions, followed by a sharp decline (-29.1%) by the end of 2017, coinciding with the enactment of the legislation. This downward trend continued through the end

of 2018 with the number of prescriptions further dropping 18.5% from the 2017 level (Figure 1 and Appendix Table 1).

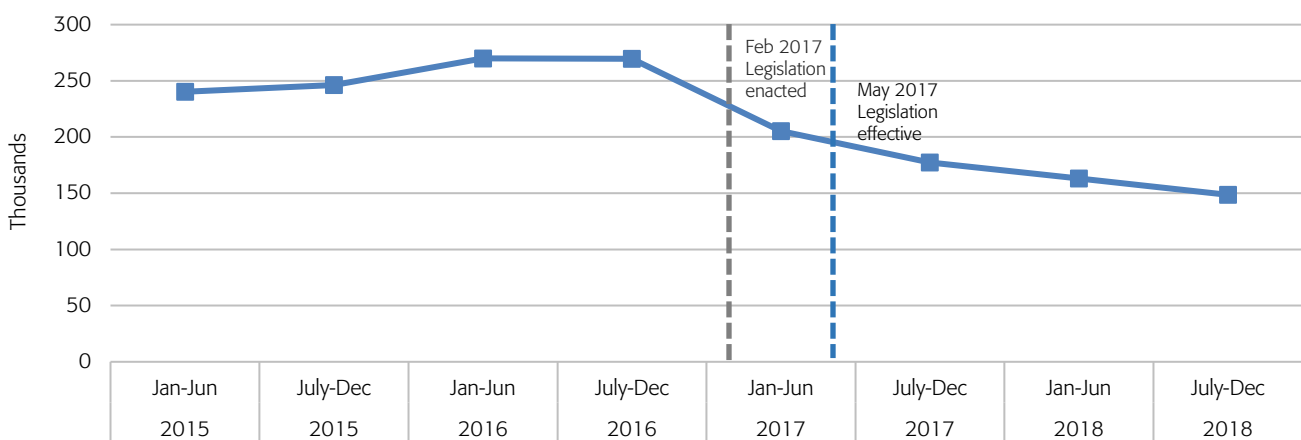
2015-2018 Trend Analysis

- Independent samples t-test: comparison of the mean number of prescriptions for each half year to the mean in the preceding half year were not statistically significant.
- Linear regression estimates: a statistically significant downward trend was observed for the total number of opioid prescriptions across the four years (Appendix Table 9).

Pre (2015-2016)/Post (2017-2018) Policy Comparison

- Independent samples t-test: a comparison of the average number of prescriptions in the pre-policy period (2015-2016) to the average of the last two quarters of 2018 showed a statistically significant decline (-42.1%) in the number of prescriptions (Appendix Table 10).
- Segmented regression analysis of interrupted time series: the observed decrease in the total number of prescriptions immediately subsequent to policy enactment was not statistically significant. However, by the end of the study period (2018 Q4), there was a statistically significant decrease (-60.3%) in the number of prescriptions after the law was enacted, compared to what it would have been if pre-policy trends continued without the law. The model specified the policy initiation in 2017 Q1 when the law was passed, and was adjusted for the number of people enrolled in Medicaid (Appendix Table 11).

Figure 1 | **Semiannual Trends in Average Number of Opioid Prescriptions from 2015–2018**



Source: New Jersey State Drug Utilization Data from CMS, 2015-2018; Analysis by Rutgers Center for State Health Policy.

⁸ Drugs are categorized into drug schedules (Schedule I to V) based on their potential to create severe psychological and/or physical dependence and abuse. Drugs included in the lower schedule have higher abuse potential as compared to drugs in higher schedules (Schedule V drugs have the lowest abuse potential).

⁹ <https://www.dea.gov/drug-scheduling>

Trends in Total Medicaid Spending: Overall, the rise in Medicaid spending for opioid prescriptions continued through the first half of 2016. The shift in trend was visible in the second half of 2016, and there was a marked decline in spending (-35.0%) by the end of 2017 (as compared to the 2016 level). By the end of 2018, spending further decreased by 28.8% from the 2017 level (Figure 2 and Appendix Table 1).

2015-2018 Trend Analysis

- Independent samples t-test: comparisons of the semi-annual averages of adjacent half years were not statistically significant.
- Linear regression estimates: there was a statistically significant downward trend in Medicaid spending across the four years (Appendix Table 9).

Pre (2015-2016)/Post (2017-2018) Policy Comparison

- Independent samples t-test: there was a statistically significant decline (-55.6%) in Medicaid spending when the pre-policy period (2015-2016) mean was compared to the mean of Q3 and Q4 of 2018 (Appendix Table 10).
- Segmented regression analysis of interrupted time series: there was a net decline in Medicaid spending by 66.5% by the end of 2018 Q4 after the law was passed compared to what it would have been if pre-policy trends continued without the law. However, these results were marginally statistically significant ($p < 0.1$) (Appendix Table 11).

Trends for Commonly Prescribed Opioids: Commonly prescribed opioids include codeine, fentanyl, hydrocodone, hydromorphone, morphine, oxycodone, and tramadol. From 2015 to 2018, oxycodone was recorded as the most commonly prescribed opioid and consistently contributed to half of the total number of prescriptions (2015=49.9%, 2016=51.2%, 2017=50.8%, 2018=50.1%) in New Jersey. Together, tramadol and codeine, the second

and third most frequently prescribed opioids respectively, made up about 30% of total prescriptions, revealing a substantial differential between prescriptions of oxycodone and all other opioid drugs. Other drugs in this class, such as buprenorphine (prescribed for pain), butorphanol, levorphanol, meperidine, oxymorphone, pentazocine, and tapentadol contributed to less than 0.5% of total prescriptions (Figure 3 and Appendix Table 2).

The semiannual trend in the average number of prescriptions of oxycodone, tramadol, morphine, and hydromorphone showed an uptick in the pre-policy period followed by a substantial decline starting in the first half of 2017 (Appendix Table 3).

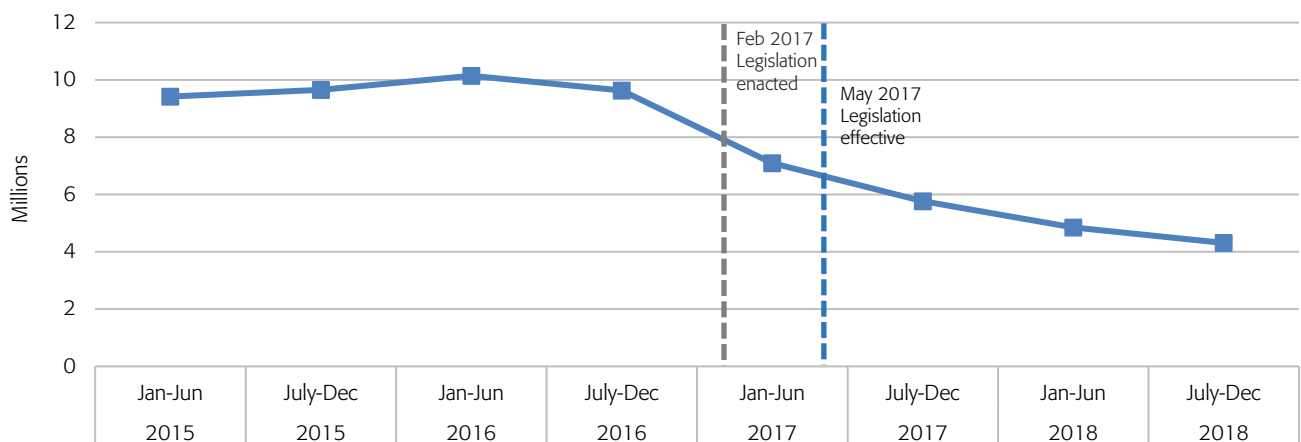
2015-2018 Trend Analysis

- Using the first half of 2015 as a baseline, the percent change in the average number of prescriptions from the baseline to the end of 2018 Q4 was highest for hydrocodone (-62.1%), followed by codeine (-43.6%), and hydromorphone (-40.5%). The number of oxycodone prescriptions, the most widely prescribed opioid, decreased by 36.3% by the end of 2018 Q4 (Figure 4 and Appendix Table 4).
- Linear regression estimates: the downward trends were statistically significant for five out of seven of the commonly prescribed opioids (codeine, hydrocodone, hydromorphone, oxycodone, and tramadol) across the four years. (Appendix Table 9).

Pre (mean of 2015-2016)/Post (mean of Q3 and Q4 of 2018) Policy Comparison

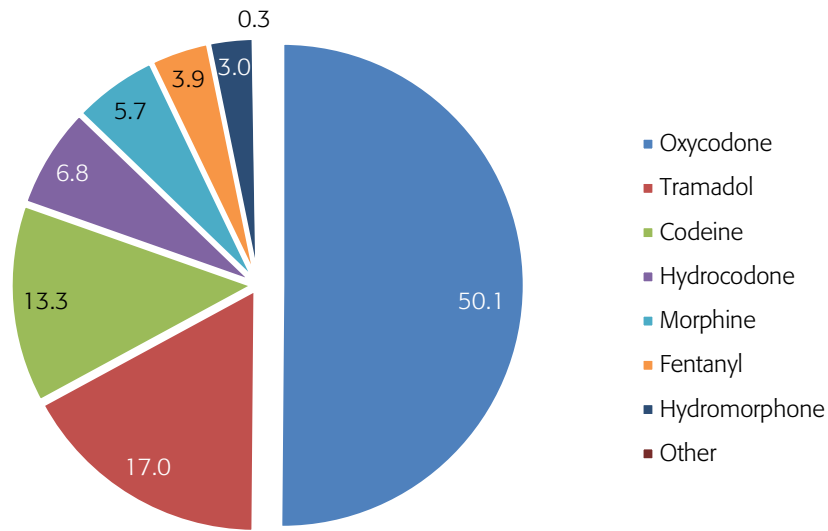
- Independent samples t-test: there was a statistically significant decline in prescriptions for hydrocodone (-59.7%) and hydromorphone (-46.3%). For other opioids (except morphine), decreases were evident, but only marginally statistically significant (Appendix Table 10).

Figure 2 | **Semiannual Trends in Average Medicaid Spending from 2015–2018**



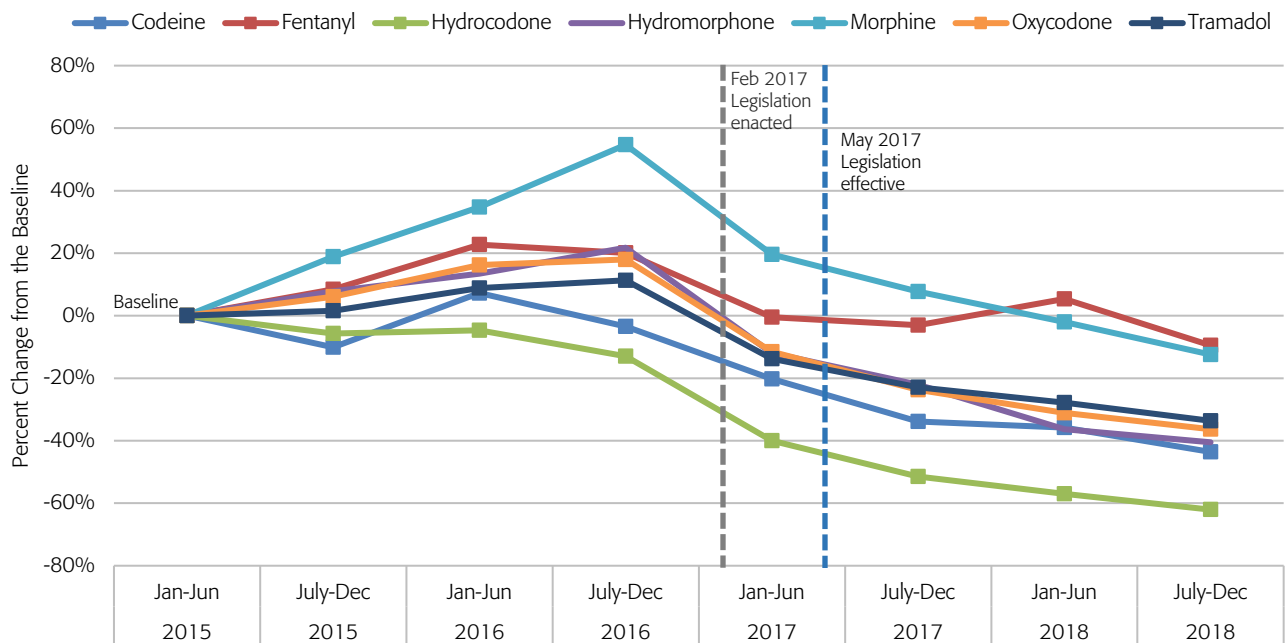
Source: New Jersey State Drug Utilization Data from CMS, 2015-2018; Analysis by Rutgers Center for State Health Policy.

Figure 3 | **Percentage Distribution of Commonly Prescribed Opioids in 2018**



Source: New Jersey State Drug Utilization Data from CMS, 2015-2018; Analysis by Rutgers Center for State Health Policy.

Figure 4 | **Semiannual Percent Change in the Average Number of Prescriptions from the Baseline (January–June 2015)**



Source: New Jersey State Drug Utilization Data from CMS, 2015-2018; Analysis by Rutgers Center for State Health Policy.

The majority of opioids are classified as Schedule II controlled drugs due to their relatively high potential for abuse and dependence.¹⁰ From 2015-2018, Schedule II drugs comprised nearly seven out of every ten Medicaid-covered opioid prescriptions (2015=70.7%, 2016=71.4%, 2017=70.5%, 2018=69.6%).

2015-2018 Trend Analysis

- When compared to the baseline, the percent decline in the average number of prescriptions by the end of 2018 Q4 was largest for Schedule V drugs (-56.7%), followed by Schedule II drugs (-38.2%) (Figure 5 and Appendix Table 6).
- Linear regression estimates: there was a statistically significant downward trend for the semiannual average number of prescriptions for all drug schedules (Appendix Table 9).

Pre (mean of 2015-2016)/Post (mean of Q3 and Q4 of 2018) Policy Comparison

- Independent samples t-test: the declines were statistically significant for Schedule II opioids (-43.1%), and marginally significant for opioids in other drug Schedules (Appendix Table 10).

We explored whether the prescribing pattern shifted post-policy-enactment from drugs leading to severe psychological and/or physical dependence (Schedule II drugs) to drugs with lower potential for abuse (Schedule IV or V drugs), but the relative frequency of prescriptions

remained the same for all of the drug schedules (Appendix Table 5).

Short-acting opioids were prescribed in more than nine out of ten prescriptions (2015=93.2%, 2016=92.7%, 2017=92.6%, 2018=93.1%) from 2015-2018. The semi-annual average number of prescriptions for the short-acting opioids showed an upward trend in the pre-policy period. This was followed by a marked decline starting from the first half of 2017. The prescription pattern for long-acting opioids showed similar variations (Appendix Table 7).

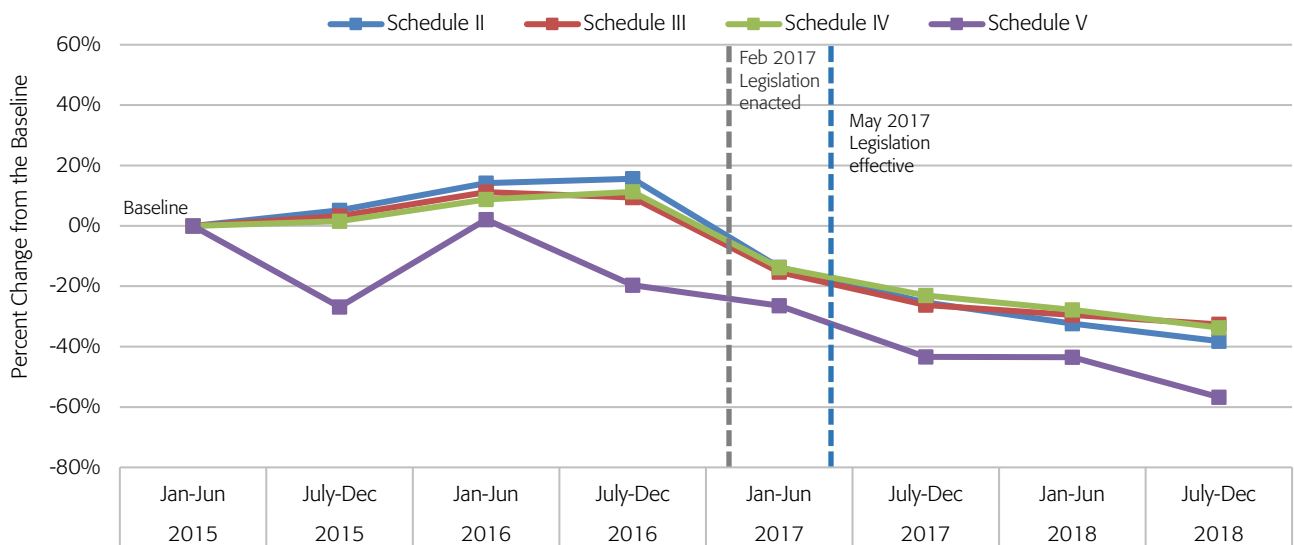
2015-2018 Trend Analysis

- When compared to the baseline, the average number of prescriptions for both short- and long-acting opioids decreased by more than one-third (short-acting=-38.3%, long-acting= -36.6%) by the end of 2018 Q4 (Figure 6 and Appendix Table 8).
- Linear regression estimates: the downward trend was statistically significant for both short- and long-acting opioids across the four years (Appendix Table 9).

Pre (mean of 2015-2016)/Post (mean of Q3 and Q4 of 2018) Policy Comparison

- Independent samples t-test: the decline was statistically significant for short-acting opioids (-41.9%), and marginally significant for long-acting opioids (Appendix Table 10).

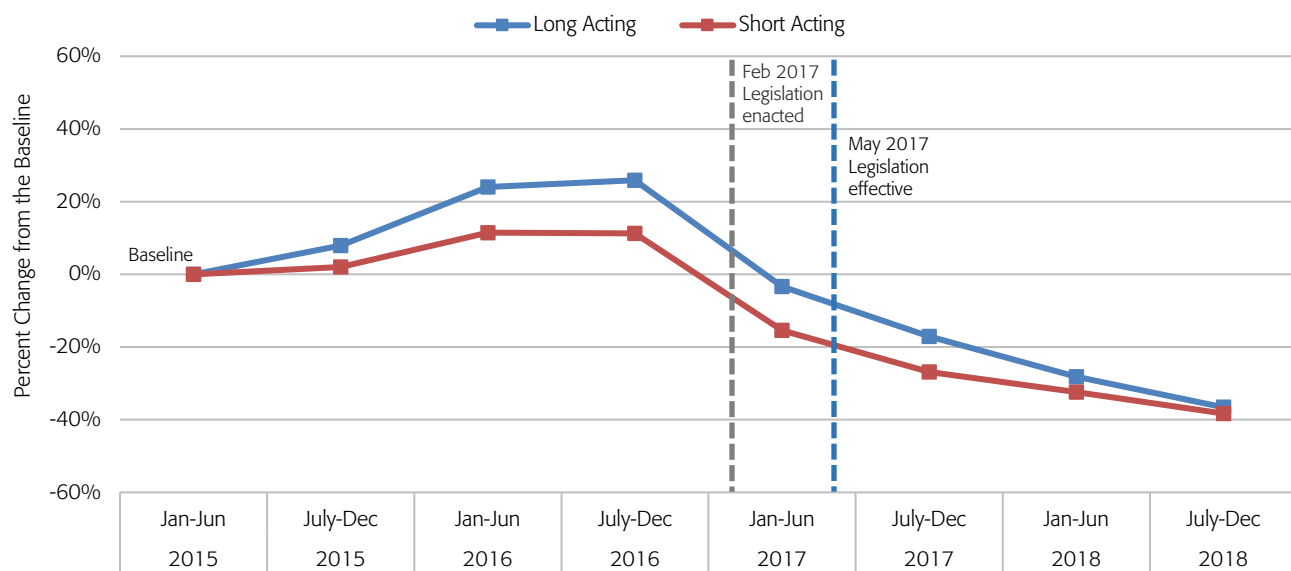
Figure 5 | Semiannual Percent Change in the Average Number of Schedule II–V Opioid Prescriptions from the Baseline (January–June 2015)



Source: New Jersey State Drug Utilization Data from CMS, 2015-2018; Analysis by Rutgers Center for State Health Policy.

¹⁰ Schedule II: hydromorphone, meperidine, fentanyl, morphine, oxycodone and hydrocodone
 Schedule III: products with less than 90 milligrams of codeine per dosage unit, buprenorphine products
 Schedule IV: tramadol
 Schedule V: some preparations of codeine

Figure 6 | **Semiannual Percent Change in the Average Number of Long-Acting and Short-Acting Opioid Prescriptions from the Baseline (January–June 2015)**



Source: New Jersey State Drug Utilization Data from CMS, 2015-2018; Analysis by Rutgers Center for State Health Policy.

Semi-synthetic opioids, such as oxycodone, hydrocodone, hydromorphone, and oxymorphone, comprised more than six out of ten prescriptions (2015=63.7%, 2016=63.4%, 2017=61.6%, 2018=60.0%). Natural opioids (such as morphine and codeine) and synthetic opioids (such as tramadol and fentanyl) were prescribed less often. The semiannual average number of prescriptions showed an uptick for both semi-synthetic and synthetic opioids in the pre-policy period, and the averages started to decline from the first half of 2017 (see Appendix Table 7).

2015-2018 Trend Analysis

- When compared to the baseline period, the decrease in the average number of prescriptions by the end of 2018 Q4 was highest for semi-synthetic opioids followed by natural opioids (semi-synthetic=-40.9%, natural=-36.8%, synthetic=-30.3%) (Figure 7 and Appendix Table 8).
- Linear regression estimates: the declines were statistically significant for all three sources of opioids across the four years (Appendix Table 9).

Pre (mean of 2015-2016)/Post (mean of Q3 and Q4 of 2018) Policy Comparison

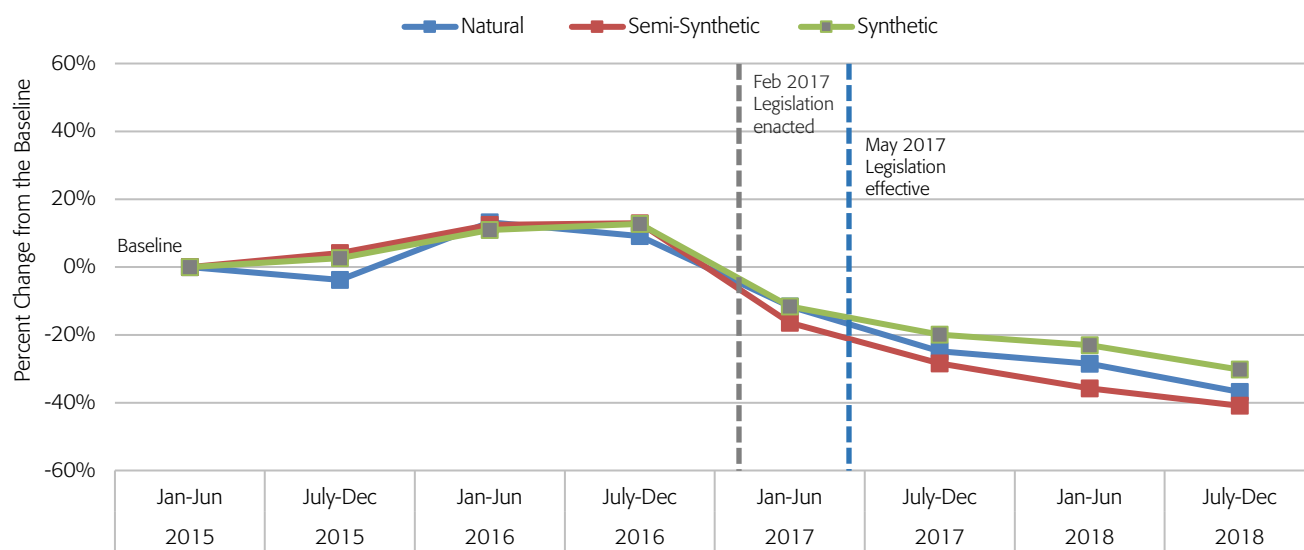
- Independent samples t-test: comparisons were statistically significant for the semi-synthetic group (-45.0%) and marginally significant for natural and synthetic opioids (Appendix Table 10).

Discussion

The analysis in this brief is intended to provide an early look at volume and spending trends in NJ Medicaid outpatient opioid prescriptions following enactment of the 2017 legislation. The data show that both the number of prescriptions and spending peaked in the first half of 2016. The peak was followed by a sharp drop starting from the first half of 2017, coinciding with the passage of the legislation. The decline continued further in 2018 and, by the end of the year, the overall volume of prescriptions declined by nearly 455,000 and spending by about \$21 million in 2018 compared to the 2016 levels. We estimate that had pre-enactment trends continued, for the last quarter of 2018, Medicaid would have paid for nearly 379,783 (+60.3%) opioid prescriptions at a cost to the program of nearly \$13 million (+66.5%).

For the commonly prescribed opioids, the trend mirrored the overall trend for oxycodone, tramadol, morphine, and hydromorphone. Oxycodone, the most widely prescribed opioid, was prescribed about 40.0% less in 2018 as compared to the 2016 level. However, the magnitude of change was larger for the number of hydrocodone and hydromorphone prescriptions. With regard to other metrics (such as opioid drug schedules, durations of action, and drug sources), the declines from the peak to the end of 2018 was prominent (>40%) for opioids included in Schedules II and V, both short and long-acting opioids, and semi-synthetic opioids. When compared with the pre-policy averages, we estimate that the

Figure 7 | **Semiannual Percent Change in the Average Number of Opioid Prescriptions from the Baseline (January–June 2015) by Drug Source**



Source: New Jersey State Drug Utilization Data from CMS, 2015-2018; Analysis by Rutgers Center for State Health Policy.

average numbers of prescriptions in the second half of 2018 were reduced by more than one-third for Schedule II, short-acting, and semi-synthetic opioids.

The post-policy trend estimates provide evidence that the enactment of the legislation led to a sharp decrease in the number of opioid-related prescriptions and Medicaid spending starting from the first quarter of 2017 and continuing for the remaining quarters in 2017 and in 2018. However, there may be other factors that influenced this trend, including heightened awareness about opioids, impact of federal prescribing guidelines, change in indications (e.g., chronic vs. acute pain), etc., which were not controlled for in our analysis. It may be that more time is needed both in terms of policy adoption and available data before this declining trend becomes distinctly evident. Further research on the legislation’s impacts on prescribing practices is needed to identify other contributing factors in order to provide a more comprehensive assessment of the way in which the law has changed prescribing behaviors.

Data Source and Methods

We used 2015-2018 New Jersey State Drug Utilization Data from CMS to perform our analysis. The State Drug Utilization Data is a publicly available dataset compiled through state reports and includes drug utilization data

for covered outpatient drugs that are paid for by state Medicaid agencies. It provides quarterly data on the number of prescriptions and the dollars reimbursed by NJ Medicaid for each drug. CMS suppresses all data with counts fewer than 11. Drugs were identified by National Drug Code (NDC) numbers. We used multiple lists to identify all drugs containing opioids from the database. We: (1) compiled a list of all prescription drugs containing opioids from the National Drug Code Directory,¹¹ which is managed by the US Food and Drug Administration; (2) used Centers for Disease Control and Prevention data files of controlled substances including opioids, 2016, 2017, & 2018 versions;¹² and (3) referenced the Healthcare Effectiveness Data and Information Set (HEDIS) 2018 Medications List Directory.¹³

We verified NDC drug codes on the DailyMed website,¹⁴ an official provider of FDA label information and managed by the National Library of Medicine, for “indications of use” and excluded prescription drugs (such as buprenorphine, and methadone) that are usually prescribed for medication-assisted treatment. Overall, seven drugs contributed to more than 99.5% of the prescriptions (codeine, fentanyl, hydrocodone, hydromorphone, morphine, oxycodone, and tramadol). We used the consumer price index for US prescription drugs developed by the Bureau of Labor Statistics¹⁵ to adjust all dollar amounts to 2018 dollars. Data were analyzed using SPSS 26 and STATA MP 16 software. We included the 2015

¹¹ <https://www.fda.gov/Drugs/InformationOnDrugs/ucm142438.htm>

¹² <https://www.cdc.gov/drugoverdose/resources/data.html>

¹³ <https://www.ncqa.org/hedis/measures/hedis-2018-ndc-license/hedis-2018-final-ndc-lists/>

¹⁴ <https://dailymed.nlm.nih.gov/dailymed/index.cfm>

¹⁵ <https://beta.bls.gov/dataQuery/find?removeAll=1>

and 2016 data in the pre-policy period, and the 2017 and 2018 data in the post-policy period.

To address large quarterly variations, we computed semi-annual averages of adjacent quarters for 2015-2018. We conducted an independent samples t-test to compare means of adjacent half years (e.g., mean of Q1 and Q2 vs. mean of Q3 and Q4). For identifying the change in trend for each of the metrics (such as number of prescriptions of commonly prescribed opioids, opioid drug schedules, durations of action, and drug sources), we used the first half of the 2015 data as the baseline and calculated percent change in the average number of prescriptions from the baseline for each metric.

Additionally, we conducted linear regressions on the average number of prescriptions for the eight half years to assess change over time from 2015 to 2018 for each of the metrics. We calculated time trends in the average semiannual value of metrics over 2015-2018 and designated 'yes' or 'no' to indicate whether the time trend reflected an improvement (downward trend in number of prescriptions) for each metric. The time trend estimate reflecting the average semi-annual change is reported along with a plot of the semi-annual mean values over the four years (see Table 9 in the Appendix).

Furthermore, we conducted an independent samples t-test to compare the pre-policy (2015 and 2016) means with the means of Q3 and Q4 of 2018 for each of the metric. The pre/post policy mean for each metric and the level of significance is reported in Appendix Table 10.

Finally, to isolate and estimate the impact of the legislation on the total number of prescriptions and spending, we used Segmented Regression Analysis of Interrupted Time Series.¹⁶ We adjusted for policy initiation and the number of people enrolled in Medicaid. We estimated any immediate changes in level and trend in the post-policy period, and also calculated the net change at the end of the post-policy period with the law in effect compared to a counterfactual scenario if pre-policy trends were allowed to continue without the law.

For our analysis examining the effect of the legislation on the number of prescriptions and spending, we utilized the model in equation (1):

$$Y_t = \beta_0 + \beta_1 * (time)_t + \beta_2 * (population)_t + \beta_3 * (policy post)_t + \beta_4 * (policy time)_t + e_i \quad (1)$$

Here, Y_t is the mean number of prescriptions (or spending) per quarter; time is a continuous variable indicating calendar quarters from the start of the study period. The variable *policy post* is an indicator (0/1) variable for the period subsequent to the policy change, and *policy time* is

a continuous variable equaling the number of quarters after the corresponding policy change. Coefficient β_0 estimates the baseline level of the outcome at the first time period, and β_1 indicates the baseline trend, i.e., the change in the outcome that occurs prior to the policy change, and β_2 captures the changes in the outcome due to the number of people enrolled in Medicaid. Coefficient β_3 estimates the level changes after policy enactment in 2017 Q1. Similarly β_4 estimates the change in trend in the outcome after policy enactment. Finally, e_i is the random error term utilized in the regression representing the statistical distribution of the outcome variable.

To calculate the net effect, we utilized equation (2):¹⁴

$$(Y_{q4\ 2018\ (with\ policy)} - Y_{q4\ 2018\ (without\ policy)}) = \beta_3 + \beta_4 * 8 \quad (2)$$

To calculate the relative change in outcome associated with the policy change, we utilized equation (3):

$$(Y_{q4\ 2018\ (with\ policy)} - Y_{q4\ 2018\ (without\ policy)}) / Y_{q4\ 2018\ (without\ policy)} \quad (3)$$

These model-based estimates of prescriptions and spending as of Q4 of 2018 are the policy effects we report in this brief. Given our small sample size it is important to take note of the confidence intervals for these estimates reported in Appendix Table 11. We tested for and did not find significant auto-correlation.

Acknowledgements

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¹⁶ Wagner AK, SB Soumerai, F Zhang, and D Ross-Degnan. 2002. "Segmented Regression Analysis of Interrupted Time Series Studies in Medication Use Research." *Journal of Clinical Pharmacy and Therapeutics* 27 (4): 299–309.

Appendix Tables

Year	Quarter	Number of Prescriptions	Medicaid Spending ^{^*}
2015	Q1	280,328	\$11,276,173
	Q2	200,482	\$7,563,539
	Mean Q1 & Q2	240,405	\$9,419,856
	Q3	267,573	\$10,536,426
	Q4	224,759	\$8,759,024
	Mean Q3 & Q4	246,166	\$9,647,725
2016	Q1	255,506	\$9,423,164
	Q2	284,441	\$10,861,886
	Mean Q1 & Q2	269,974	\$10,142,525
	Q3	169,609	\$6,027,165
	Q4	369,808	\$13,240,649
	Mean Q3 & Q4	269,709	\$9,633,907
2017	Q1	211,704	\$7,404,555
	Q2	198,640	\$6,784,581
	Mean Q1 & Q2	205,172	\$7,094,568
	Q3	182,699	\$6,123,631
	Q4	171,989	\$5,404,398
	Mean Q3 & Q4	177,344	\$5,764,014
2018	Q1	167,105	\$4,991,208
	Q2	159,219	\$4,706,408
	Mean Q1 & Q2	163,162	\$4,848,808
	Q3	150,745	\$4,380,292
	Q4	146,419	\$4,235,297
	Mean Q3 & Q4	148,582	\$4,307,795

Source: New Jersey State Drug Utilization Data from CMS, 2015-2018; Analysis by Rutgers Center for State Health Policy.
[^]Medicaid spending accounts for 98% of total spending.
^{*}Adjusted to 2018 dollars for prescription drugs in U.S. city average, all urban consumers, seasonally adjusted.

Opioids	2015 %	2016 %	2017 %	2018* %
Oxycodone	49.9	51.2	50.8	50.1
Tramadol	15.8	15.6	16.3	17.0
Codeine	13.4	13.0	13.1	13.3
Hydrocodone	10.4	8.8	7.4	6.8
Morphine	4.3	5.1	5.7	5.7
Hydromorphone	3.2	3.3	3.3	3.0
Fentanyl	2.6	2.8	3.2	3.9
Other*	0.2	0.3	0.3	0.3
Total	100.0	100.0	100.0	100.0

Source: New Jersey State Drug Utilization Data from CMS, 2015-2018; Analysis by Rutgers Center for State Health Policy.
*Drugs included are buprenorphine, butorphanol, levorphanol, meperidine, oxymorphone, pentazocine and tapentadol.

Year	Quarter	Codeine	Fentanyl	Hydrocodone	Hydromorphone	Morphine	Oxycodone	Tramadol
2015	Q1	41,452	6,235	30,898	7,482	10,471	138,171	44,995
	Q2	27,446	6,070	21,417	7,529	8,602	97,639	31,304
	Mean Q1 & Q2	34,449	6,153	26,158	7,506	9,537	117,905	38,150
	Q3	32,168	6,658	28,039	8,330	11,577	138,025	42,112
	Q4	29,779	6,682	21,279	7,849	11,100	112,095	35,359
	Mean Q3 & Q4	30,974	6,670	24,659	8,090	11,339	125,060	38,736
2016	Q1	34,123	7,474	23,953	9,121	12,147	129,756	38,384
	Q2	39,760	7,626	25,886	7,914	13,541	144,177	44,619
	Mean Q1 & Q2	36,942	7,550	24,920	8,518	12,844	136,967	41,502
	Q3	19,402	6,261	14,261	7,631	11,133	84,192	26,293
	Q4	47,127	8,521	31,260	10,644	18,367	194,042	58,638
	Mean Q3 & Q4	33,265	7,391	22,761	9,138	14,750	139,117	42,466
2017	Q1	30,090	5,257	16,720	6,326	11,285	108,037	33,259
	Q2	24,848	6,986	14,649	6,890	11,531	100,518	32,509
	Mean Q1 & Q2	27,469	6,122	15,685	6,608	11,408	104,278	32,884
	Q3	21,705	6,308	13,248	6,367	10,979	93,494	30,064
	Q4	23,830	5,621	12,139	5,327	9,565	86,270	28,731
	Mean Q3 & Q4	22,768	5,965	12,694	5,847	10,272	89,882	29,398
2018	Q1	24,133	6,146	11,513	5,062	9,508	82,683	27,679
	Q2	20,086	6,815	10,958	4,492	9,181	79,767	27,420
	Mean Q1 & Q2	22,110	6,481	11,236	4,777	9,345	81,225	27,550
	Q3	18,157	5,935	10,392	4,680	8,601	76,630	25,909
	Q4	20,710	5,201	9,458	4,250	8,100	73,521	24,728
	Mean Q3 & Q4	19,434	5,568	9,925	4,465	8,351	75,076	25,319

Source: New Jersey State Drug Utilization Data from CMS, 2015-2018; Analysis by Rutgers Center for State Health Policy.

Year	Quarter	Codeine	Fentanyl	Hydrocodone	Hydromorphone	Morphine	Oxycodone	Tramadol
2015	Jan-Jun	Baseline						
	July-Dec	-10.1	8.4	-5.7	7.8	18.9	6.1	1.5
2016	Jan-Jun	7.2	22.7	-4.7	13.5	34.7	16.2	8.8
	July-Dec	-3.4	20.1	-13.0	21.7	54.7	18.0	11.3
2017	Jan-Jun	-20.3	-0.5	-40.0	-12.0	19.6	-11.6	-13.8
	July-Dec	-33.9	-3.1	-51.5	-22.1	7.7	-23.8	-22.9
2018	Jan-Jun	-35.8	5.3	-57.0	-36.4	-2.0	-31.1	-27.8
	July-Dec	-43.6	-9.5	-62.1	-40.5	-12.4	-36.3	-33.6

Source: New Jersey State Drug Utilization Data from CMS, 2015-2018; Analysis by Rutgers Center for State Health Policy.

Year	Quarter	Schedule II	Schedule III	Schedule IV	Schedule V
2015	Q1	193,797	22,511	45,055	18,965
	Q2	141,650	16,048	31,355	11,429
	Mean Q1 & Q2	167,724	19,280	38,205	15,197
	Q3	193,129	21,580	42,206	10,658
	Q4	159,565	18,230	35,398	11,566
	Mean Q3 & Q4	176,347	19,905	38,802	11,112
2016	Q1	182,929	19,719	38,445	14,413
	Q2	199,984	23,147	44,691	16,619
	Mean Q1 & Q2	191,457	21,433	41,568	15,516
	Q3	123,930	12,991	26,293	6,395
	Q4	263,854	29,204	58,726	18,024
	Mean Q3 & Q4	193,892	21,098	42,510	12,210
2017	Q1	148,285	16,796	33,289	13,334
	Q2	141,217	15,853	32,542	9,028
	Mean Q1 & Q2	144,751	16,325	32,916	11,181
	Q3	130,833	14,684	30,092	7,090
	Q4	119,357	13,761	28,747	10,124
	Mean Q3 & Q4	125,095	14,223	29,420	8,607
2018	Q1	115,267	13,377	27,679	10,782
	Q2	111,594	13,788	27,438	6,399
	Mean Q1 & Q2	113,431	13,583	27,559	8,591
	Q3	106,520	13,140	25,926	5,159
	Q4	100,857	12,836	24,728	7,998
	Mean Q3 & Q4	103,689	12,988	25,327	6,579

Source: New Jersey State Drug Utilization Data from CMS, 2015-2018; Analysis by Rutgers Center for State Health Policy.
 *<https://www.dea.gov/drug-scheduling>

Year	Quarter	Schedule II	Schedule III	Schedule IV	Schedule V
2015	Jan-Jun	Baseline			
	July-Dec	5.1	3.2	1.6	-26.9
2016	Jan-Jun	14.2	11.2	8.8	2.1
	July-Dec	15.6	9.4	11.3	-19.7
2017	Jan-Jun	-13.7	-15.3	-13.8	-26.4
	July-Dec	-25.4	-26.2	-23.0	-43.4
2018	Jan-Jun	-32.4	-29.5	-27.9	-43.5
	July-Dec	-38.2	-32.6	-33.7	-56.7

Source: New Jersey State Drug Utilization Data from CMS, 2015-2018; Analysis by Rutgers Center for State Health Policy.

Year	Quarter	Long-Acting	Short-Acting	Natural*	Semi-Synthetic†	Synthetic‡
2015	Q1	18,455	26,1873	51,923	176,931	51,474
	Q2	13,206	187,276	36,048	126,848	37,586
	Mean Q1 & Q2	15,831	224,575	43,986	151,890	44,530
	Q3	18,331	249,242	43,745	174,739	49,089
	Q4	15,836	208,923	40,879	141,582	42,298
	Mean Q3 & Q4	17,084	229,083	42,312	158,161	45,694
2016	Q1	17,881	237,625	46,270	163,086	46,150
	Q2	21,396	263,045	53,301	178,526	52,614
	Mean Q1 & Q2	19,639	250,335	49,786	170,806	49,382
	Q3	12,493	157,116	30,535	106,344	32,730
	Q4	27,363	342,445	65,494	236,661	67,653
	Mean Q3 & Q4	19,928	249,781	48,015	171,503	50,1912
2017	Q1	15,652	196,052	41,375	131,510	38,819
	Q2	14,956	183,684	36,379	122,416	39,845
	Mean Q1 & Q2	15,304	189,868	38,877	126,963	39,332
	Q3	13,770	168,929	32,684	113,366	36,649
	Q4	12,488	159,501	33,395	103,973	34,621
	Mean Q3 & Q4	13,129	164,215	33,040	108,670	35,635
2018	Q1	11,708	155,397	33,641	99,455	34,009
	Q2	11,015	148,204	29,267	95,453	34,499
	Mean Q1 & Q2	11,362	151,801	31,454	97,454	34,254
	Q3	10,333	140,412	26,758	91,973	32,014
	Q4	9,743	136,676	28,810	87,513	30,096
	Mean Q3 & Q4	10,038	138,544	27,784	89,743	31,055

Source: New Jersey State Drug Utilization Data from CMS, 2015-2018; Analysis by Rutgers Center for State Health Policy.

*Natural: morphine and codeine
†Semi-Synthetic: oxycodone, hydrocodone, hydromorphone, and oxymorphone
‡Synthetic: tramadol and fentanyl

Table 8: Percent Change in the Average Number of Prescriptions of Long-Acting, Short-Acting, Natural, Semi-Synthetic, and Synthetic from the Baseline

Year	Quarter	Long-Acting	Short-Acting	Natural	Semi-Synthetic	Synthetic
2015	Jan-Jun	Baseline				
	July-Dec	7.9	2.0	-3.8	4.1	2.6
2016	Jan-Jun	24.1	11.5	13.2	12.5	10.9
	July-Dec	25.9	11.2	9.2	12.9	12.7
2017	Jan-Jun	-3.3	-15.5	-11.6	-16.4	-11.7
	July-Dec	-17.1	-26.9	-24.9	-28.5	-20.0
2018	Jan-Jun	-28.2	-32.4	-28.5	-35.8	-23.1
	July-Dec	-36.6	-38.3	-36.8	-40.9	-30.3

Source: New Jersey State Drug Utilization Data from CMS, 2015-2018; Analysis by Rutgers Center for State Health Policy.

Table 9: Linear Regression-Based Time Trend Estimates Reflecting the Average Semi-annual Change and a Plot of the Semi-annual Mean Sums for 2015–2018 for Each of the Metrics

	2015 Mean Q1&Q2	2015 Mean Q3&Q4	2016 Mean Q1&Q2	2016 Mean Q3&Q4	2017 Mean Q1&Q2	2017 Mean Q3&Q4	2018 Mean Q1&Q2	2018 Mean Q3&Q4	P-Value*	Trend	Improved	Graph	Trend Estimate
Number of prescriptions	240,405	246,166	269,974	269,709	205,172	177,344	163,162	148,582	0.008	↓	Yes		-16,669
Medicaid spending	\$9,419,856	\$9,647,725	\$10,142,525	\$9,633,907	\$7,094,568	\$5,764,014	\$4,848,808	\$4,307,795	0.001	↓	Yes		-\$898,260
Codeine	34,449	30,974	36,942	33,265	27,469	22,768	22,110	19,434	0.003	↓	Yes		-2,354
Fentanyl	6,153	6,670	7,550	7,391	6,122	5,965	6,481	5,568	0.244	↓	Yes		-132
Hydrocodone	26,158	24,659	24,920	22,761	15,685	12,694	11,236	9,925	0.000	↓	Yes		-2,673
Hydromorphone	7,506	8,090	8,518	9,138	6,608	5,847	4,777	4,465	0.014	↓	Yes		-576
Morphine	9,537	11,339	12,844	14,750	11,408	10,272	9,345	8,351	0.311	↓	Yes		-349
Oxycodone	117,905	125,060	136,967	139,117	104,278	89,882	81,225	75,076	0.014	↓	Yes		-8,275
Tramadol	38,150	38,736	41,502	42,466	32,884	29,398	27,550	25,319	0.008	↓	Yes		-2,281
Schedule II	167,724	176,347	191,457	193,892	144,751	125,095	113,431	103,689	0.010	↓	Yes		-12,036
Schedule III	19,280	19,905	21,433	21,098	16,325	14,223	13,583	12,988	0.007	↓	Yes		-1,215
Schedule IV	38,205	38,802	41,568	42,510	32,916	29,420	27,559	25,327	0.008	↓	Yes		-2,291
Schedule V	15,197	11,112	15,516	12,210	11,181	8,607	8,591	6,579	0.005	↓	Yes		-1,127
Long-Acting	15,831	17,084	19,639	19,928	15,304	13,129	11,362	10,038	0.031	↓	Yes		-1,111
Short-Acting	224,575	229,083	250,335	249,781	189,868	164,215	151,801	138,544	0.007	↓	Yes		-15,558
Natural	43,986	42,312	49,786	48,015	38,877	33,040	31,454	27,784	0.012	↓	Yes		-2,703
Semi-Synthetic	151,890	158,161	170,806	171,503	126,963	108,670	97,454	89,743	0.007	↓	Yes		-11,542
Synthetic	44,530	45,694	49,382	50,192	39,332	35,635	34,254	31,055	0.012	↓	Yes		-2,424

Source: New Jersey State Drug Utilization Data from CMS, 2015-2018; Analysis by Rutgers Center for State Health Policy.

*Bolder items are statistically significant (p<.05).

Table 10: Pre/Post Mean Comparison Using Independent Samples T-Test

Category	Pre-policy Period (2015-2016) Mean	2018 Mean Q3&Q4	p-Value*
Number of prescriptions	256,563	148,582	0.044
Medicaid spending	\$9,711,003	\$4,307,795	0.012
Codeine	33,907	19,434	0.057
Fentanyl	6,941	5,568	0.067
Hydrocodone	24,624	9,925	0.008
Hydromorphone	8,313	4,465	0.001
Morphine	12,117	8,351	0.116
Oxycodone	129,762	75,076	0.059
Tramadol	40,213	25,319	0.076
Schedule II	182,355	103,689	0.038
Schedule III	20,429	12,988	0.075
Schedule IV	40,271	25,327	0.076
Schedule V	13,509	6,579	0.063
Long-Acting	18,120	10,038	0.050
Short-Acting	238,443	138,544	0.043
Natural	46,024	27,784	0.054
Semi-Synthetic	163,090	89,743	0.037
Synthetic	47,449	31,055	0.071

Source: New Jersey State Drug Utilization Data from CMS, 2015-2018; Analysis by Rutgers Center for State Health Policy.

*Bolded p-values are statistically significant (p<.05).

Table 11: Regressions-Based Net Policy Estimate of S3 Law on the Number of Prescriptions and Spending as of 2018 Q4

Category	Coefficient of Net Change	p-Value*	Adjusted Estimates of the Outcome without Policy	Percent Change	95% Confidence Interval
Total number of prescriptions	-229,012	0.0480	379,783	-60.3%	(-119.9%, -0.7%)
Medicaid spending	-\$8,645,714	0.0500	\$13,000,000	-66.5%	(-133.1%, 0.0%)

Source: New Jersey State Drug Utilization Data from CMS, 2015-2018; Analysis by Rutgers Center for State Health Policy.

Note: Models adjusted for policy initiation, and Medicaid enrollment total obtained from the NJ Division of Medical Assistance and Health Services, NJ FamilyCare Monthly Enrollment Statistics.¹⁷

*Bolded p-values are statistically significant (p<.05).

¹⁷ <https://www.state.nj.us/humanservices/dmahs/news/reports/>



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