Supplementary Material

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Section A. State-level characteristics of treatment and weighted synthetic control comparison states in the pre-law period

Characteristics of state population in the two years prior to enactment of Delaware's prescribing cap law on April 1, 2017.

	Treatment state N=454 fatal crashes	Unweighted comparison states[1] N=17126 fatal crashes	Synthetic Control[2]
State characteristics, per year			
Mean age	40.2	37.8	38.8
Average vehicle miles traveled	10,121.1	34,773.4	36,748.9
% Female	51.6	50.4	50.8
% Black non-Hispanic	21.3	9.7	13.2
% Hispanic	9.1	10.7	9.8
% With household income below poverty line	12.2	14.9	16.4
% Employed in population aged 20-64	72.4	72.6	70.2
% With no post-high school education	31.3	28.8	28.6

[1] AL, IA, KS, MS, MT, ND, NM, OR, TN, WY; [2] This column shows characteristics in the synthetic control, or weighted combination of comparison states used in the augmented synthetic control analyses.

Characteristics of state population in the two years prior to enactment of Kentucky's prescribing cap law on July 1, 2017.

	Treatment state N=2856 fatal crashes	Unweighted comparison states[1] N=13445 fatal crashes	Synthetic Control[2]
State characteristics, per year			
Mean age	38.8	37.7	38.6
Average vehicle miles traveled	49,134.9	30,125.0	49,709.1
% Female	50.8	50.2	51.0
% Black non-Hispanic	8.0	9.0	15.8
% Hispanic	3.4	11.4	9.4
% With household income below poverty line	18.2	14.6	15.9
% Employed in population aged 20-64	67.7	73.0	70.5
% With no post-high school education	32.8	28.3	30.5

[1] AL, IA, KS, MS, MT, ND, NM, OR, WY; [2] This column shows characteristics in the synthetic control, or weighted combination of comparison states used in the augmented synthetic control analyses.

Characteristics of state population in the two years prior to enactment of New York's prescribing cap law on July 22, 2016.

	Treatment state N=3891 fatal crashes	Unweighted comparison states[1] N=11827 fatal crashes	Synthetic Control[2]

State characteristics, per year			
Mean age	38.3	37.6	39.2
Average vehicle miles traveled	122,360.9	29,962.0	60,605.4
% Female	51.5	50.3	51.4
% Black non-Hispanic	14.4	9.8	17.4
% Hispanic	18.8	6.7	8.3
% With household income below poverty line	15.3	14.5	17.3
% Employed in population aged 20-64	72.1	73.4	67.1
% With no post-high school education	26.4	28.8	27.7

[1] AL, IA, KS, MS, MT, ND, OR, WY; [2] This column shows characteristics in the synthetic control, or weighted combination of comparison states used in the augmented synthetic control analyses.

Characteristics of state population in the two years prior to enactment of Ohio's prescribing cap law on August 31, 2017.

	Treatment state N=4159 fatal crashes	Unweighted comparison states[1] N=13415 fatal crashes	Synthetic Control[2]
State characteristics, per year			
Mean age	39.3	37.8	39.1
Average vehicle miles traveled	118,115.2	30,189.2	68,176.2
% Female	51.0	50.2	51.5
% Black non-Hispanic	12.2	9.0	24.1
% Hispanic	3.6	11.4	3.6
% With household income below poverty line	14.4	14.5	16.6
% Employed in population aged 20-64	73.4	73.1	67.1
% With no post-high school education	33.4	28.2	30.2

[1] AL, IA, KS, MS, MT, ND, NM, OR, WY; [2] This column shows characteristics in the synthetic control, or weighted combination of comparison states used in the augmented synthetic control analyses.

Characteristics of state population in the 19-months prior to enactment of Colorado's PDMP enrollment law on January 1, 2015.

	Treatment state N=1805 fatal crashes	Unweighted comparison states[1] N=46326 fatal crashes	Synthetic Control[2]
State characteristics, per year			
Mean age	36.3	37.4	36.2
Average vehicle miles traveled	48,242.0	50,467.2	40,942.1
% Female	49.7	50.4	50.3
% Black non-Hispanic	3.8	10.4	2.6
% Hispanic	21.1	10.4	11.8
% With household income below poverty line	12.4	16.2	14.6
% Employed in population aged 20-64	74.8	70.7	74.6

% With no post-high school education	21.8	29.2	26.9

[1] AK, AZ, FL, IA, KS, KY, LA, MI, MO, MS, MT, NC, ND, NE, NM, OR, SC, SD, TN, UT, WA, WY; [2] This column shows characteristics in the synthetic control, or weighted combination of comparison states used in the augmented synthetic control analyses.

Characteristics of state population in the two years prior to enactment of Idaho's PDMP enrollment law on July 1, 2014.

	Treatment state N=770 fatal crashes	Unweighted comparison states[1] N=54252 fatal crashes	Synthetic Control[2]
State characteristics, per year			
Mean age	35.6	37.4	35.6
Average vehicle miles traveled	16,107.2	62,107.7	30,617.3
% Female	49.8	50.4	50.3
% Black non-Hispanic	0.5	9.4	3.4
% Hispanic	11.8	10.1	7.6
% With household income below poverty line	15.5	15.2	15.1
% Employed in population aged 20-64	71.2	71.4	70.0
% With no post-high school education	27.7	29.0	30.2

[1] AK, CA, AZ, DE, FL, IA, KS, KY, LA, MI, MN, MO, NC, ND, NE, OR, SC, SD, UT, WA, WV, WY; [2] This column shows characteristics in the synthetic control, or weighted combination of comparison states used in the augmented synthetic control analyses.

Characteristics of state population in the two years prior to enactment of New York's PDMP query law on August 27, 2013.

	Treatment state N=4278 fatal crashes	Unweighted comparison states[1] N=45470 fatal crashes	Synthetic Control[2]
State characteristics, per year			
Mean age	38.1	36.7	37.8
Average vehicle miles traveled	123,322.4	69,130.5	157,701.6
% Female	51.5	50.2	50.7
% Black non-Hispanic	14.4	8.0	12.3
% Hispanic	18.2	11.3	16.7
% With household income below poverty line	16.0	14.9	16.6
% Employed in population aged 20-64	70.3	72.1	69.1
% With no post-high school education	27.0	28.1	27.6

[1] AK, AZ, CA, IA, FL, LA, KS, MO, MI, MN, NC, ND, OR, SD, UT, WY; [2] This column shows characteristics in the synthetic control, or weighted combination of comparison states used in the augmented synthetic control analyses.

Characteristics of state population in the two years prior to enactment of Oklahoma's PDMP query law on November 1, 2015.

	Treatment state N=2390 fatal crashes	Unweighted comparison states[1] N=47478 fatal crashes	Synthetic Control[2]
State characteristics, per year			
Mean age	36.2	38.2	37.6
Average vehicle miles traveled	47,729.7	55,736.4	42,077.5
% Female	50.4	50.6	50.5
% Black non-Hispanic	7.2	11.2	6.5
% Hispanic	9.9	9.3	14.4
% With household income below poverty line	16.4	16.3	17.2
% Employed in population aged 20-64	69.7	71.2	70.0
% With no post-high school education	31.7	30.6	30.1

[1] FL, GA, IA, KS, KY, LA, MI, MO, MS, MT, ND, NE, NM, OR, SD, TN, WV, WY; [2] This column shows characteristics in the synthetic control, or weighted combination of comparison states used in the augmented synthetic control analyses.

Characteristics of state population in the two years prior to enactment of Pennsylvania's PDMP query law on June 30, 2015.

	Treatment state N=4102 fatal crashes	Unweighted comparison states[1] N=44015 fatal crashes	Synthetic Control[2]
State characteristics, per year			
Mean age	40.7	38.2	39.8
Average vehicle miles traveled	100,006.3	55,469.1	108,729.8
% Female	51.1	50.6	50.9
% Black non-Hispanic	10.6	11.2	11.1
% Hispanic	6.6	9.2	6.6
% With household income below poverty line	13.5	16.4	15.8
% Employed in population aged 20-64	72.3	71.1	71.0
% With no post-high school education	36.2	30.6	33.7

[1] FL, GA, IA, KS, KY, LA, MI, MO, MS, MT, ND, NE, NM, OR, SD, TN, WV, WY; [2] This column shows characteristics in the synthetic control, or weighted combination of comparison states used in the augmented synthetic control analyses.

Characteristics in the two years prior to enactment of Virginia's PDMP query law on July 1, 2015.

	Treatment state N=2605 fatal crashes	Unweighted comparison states[1] N=41410 fatal crashes	Synthetic Control[2]
State characteristics, per year			
Mean age	37.7	38.3	37.8
Average vehicle miles traveled	81,422.1	55,899.0	79,701.6
% Female	50.8	50.6	50.7
% Black non-Hispanic	18.9	10.0	14.2
% Hispanic	8.8	9.5	10.1

% With household income below poverty line	11.6	16.2	15.4
% Employed in population aged 20-64	72.9	71.3	73.2
% With no post-high school education	24.6	30.4	28.9

[1] FL, GA, IA, KS, KY, MI, MO, MS, MT, ND, NE, NM, OR, SD, TN, WV, WY; [2] This column shows characteristics in the synthetic control, or weighted combination of comparison states used in the augmented synthetic control analyses.

Characteristics of state population in the two years prior to enactment of Mississippi's pill mill law on March 1, 2011.

	Treatment state N=2278 fatal crashes	Unweighted comparison states[1] N=49510 fatal crashes	Synthetic Control[2]
State characteristics, per year			
Mean age	36.0	37.2	35.8
Average vehicle miles traveled	40,002.7	58,617.9	44,913.5
% Female	51.5	50.7	50.9
% Black non-Hispanic	37.0	11.7	26.5
% Hispanic	2.6	10.3	5.3
% With household income below poverty line	22.2	14.7	18.1
% Employed in population aged 20-64	58.7	65.9	61.8
% With no post-high school education	30.6	29.8	32.6

[1] AL, AZ, CO, IA, ID, IL, IN, LA, MI, MO, NC, NV, NY, ND, OK, PA, RI, SC, VA, WY; [2] This column shows characteristics in the synthetic control, or weighted combination of comparison states used in the augmented synthetic control analyses.

Characteristics of state population in the two years prior to enactment of Ohio's pill mill law on July 1, 2011.

	Treatment state N=3812 fatal crashes	Unweighted comparison states[1] N=49458 fatal crashes	Synthetic Control[2]
State characteristics, per year			
Mean age	38.9	37.4	39.1
Average vehicle miles traveled	111,563.2	58,343.0	95,362.7
% Female	51.2	50.7	51.1
% Black non-Hispanic	12.0	11.4	12.1
% Hispanic	3.1	10.4	5.3
% With household income below poverty line	15.8	14.8	14.9
% Employed in population aged 20-64	67.1	67.7	65.7
% With no post-high school education	35.1	29.6	34.3

[1] AL, AZ, CO, IA, ID, IL, IN, LA, MA, MI, MO, NC, NV, NY, ND, OK, PA, RI, SC, VA, WY; [2] This column shows characteristics in the synthetic control, or weighted combination of comparison states used in the augmented synthetic control analyses.

Characteristics of state population in the two years prior to enactment of Texas' pill mill law on September 1, 2010.

	Treatment state N=11411 fatal crashes	Unweighted comparison states[1] N=55406 fatal crashes	Synthetic Control[2]
State characteristics, per year			
Mean age	33.5	37.5	35.2
Average vehicle miles traveled	232,227.7	59,557.3	169,150.3
% Female	50.4	50.8	50.9
% Black non-Hispanic	11.5	12.0	14.7
% Hispanic	37.3	10.3	27.9
% With household income below poverty line	17.2	14.4	16.0
% Employed in population aged 20-64	64.1	62.7	62.2
% With no post-high school education	25.5	30.2	24.4

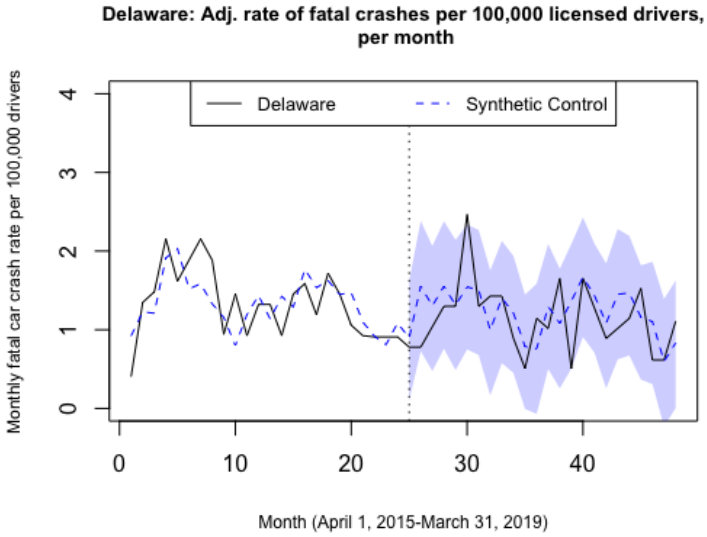
[1] AL, AZ, CO, CT, ID, IL, IN, LA, MA, MI, MO, NC, NV, NY, OK, PA, RI, SC, TN, VA, WV, WY; [2] This column shows characteristics in the synthetic control, or weighted combination of comparison states used in the augmented synthetic control analyses.

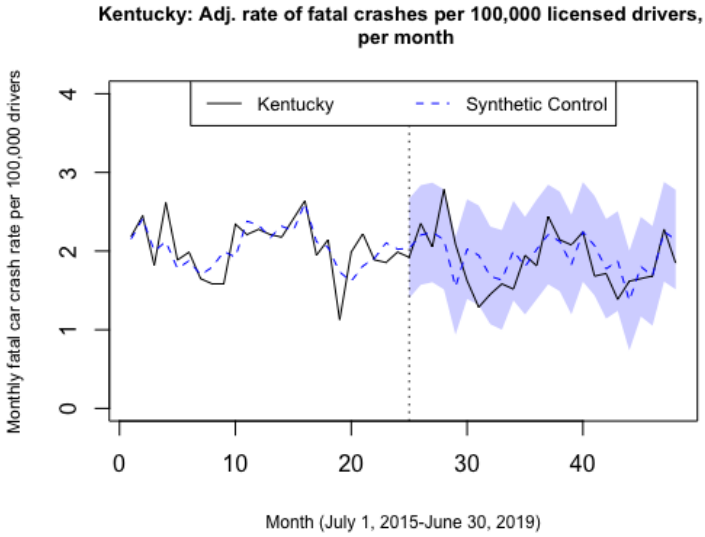
Section B. State-specific pre-period trends and predicted post-law outcomes for the rate of fatal crashes per 100,000 licensed drivers

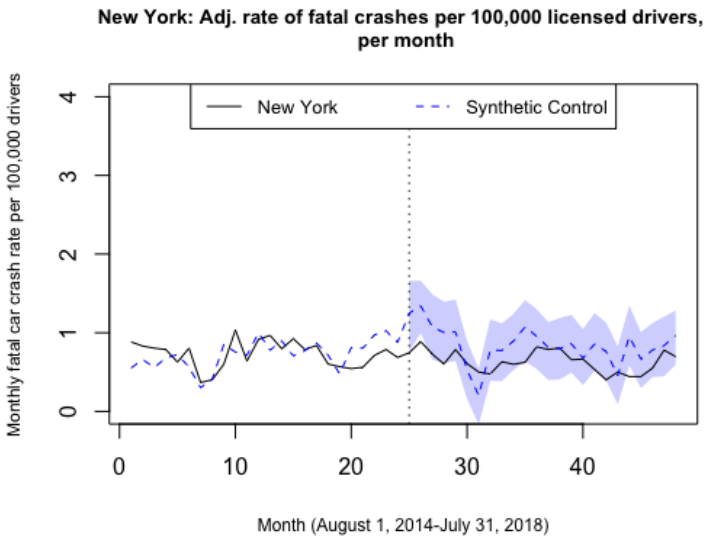
Graphs show the results of augmented synthetic control analyses adjusting for mean state resident age; the average vehicle miles traveled in the state; and the proportions of the state population that were female, were Black, were Hispanic, were living below the federal poverty line, were employed, and had a high school diploma as their highest level of educational attainment, per year.

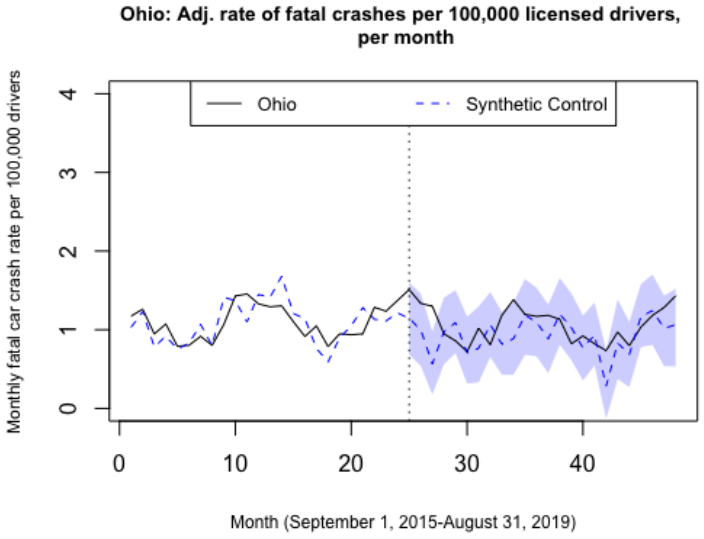
The graphs below depict outcome measures for the rate of fatally injured drivers per 100,000 licensed drivers in each month of the study period in the opioid prescribing law state (black solid line) and its synthetic control (blue dashed line) over the four-year study period, two years pre- and two years post-law. The vertical line in each graph indicates law implementation. The shading indicates the 95% confidence interval surrounding the post-law predicted outcomes in the synthetic control.

Prescribing Cap Laws

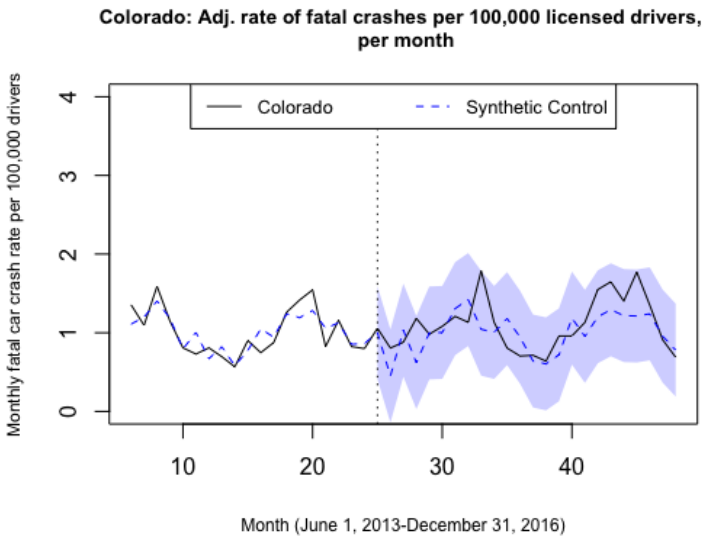


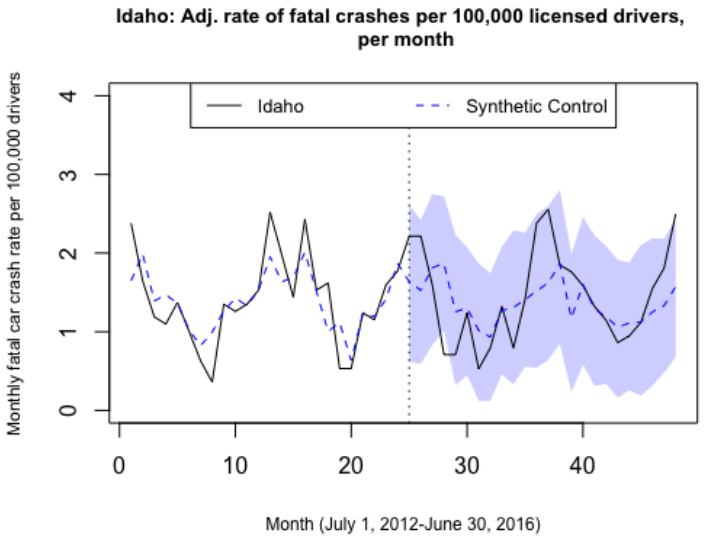



New York: Adj. rate of fatal crashes per 100,000 licensed drivers, per month
New York
Synthetic Control
Monthly fatal car crash rate per 100,000 drivers
0
1
2
3
4
0
10
20
30
40
Month (August 1, 2014-July 31, 2018)

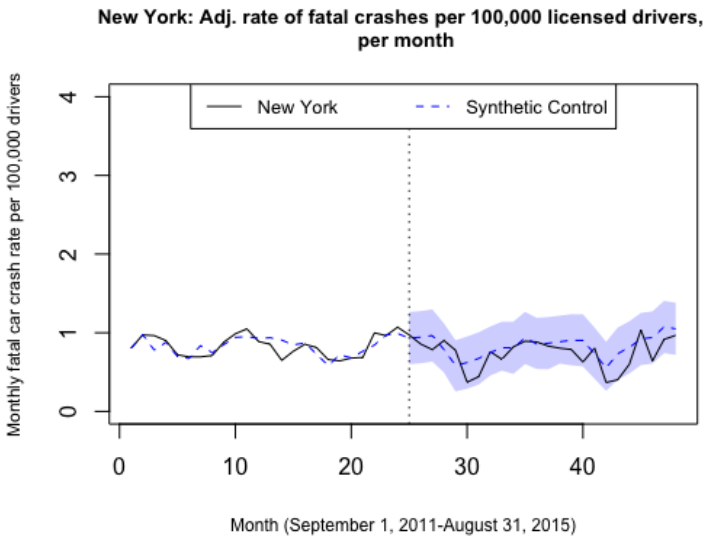

Ohio: Adj. rate of fatal crashes per 100,000 licensed drivers, per month
Ohio
Synthetic Control
Monthly fatal car crash rate per 100,000 drivers
0
1
2
3
4
0
10
20
30
40
Month (September 1, 2015-August 31, 2019)

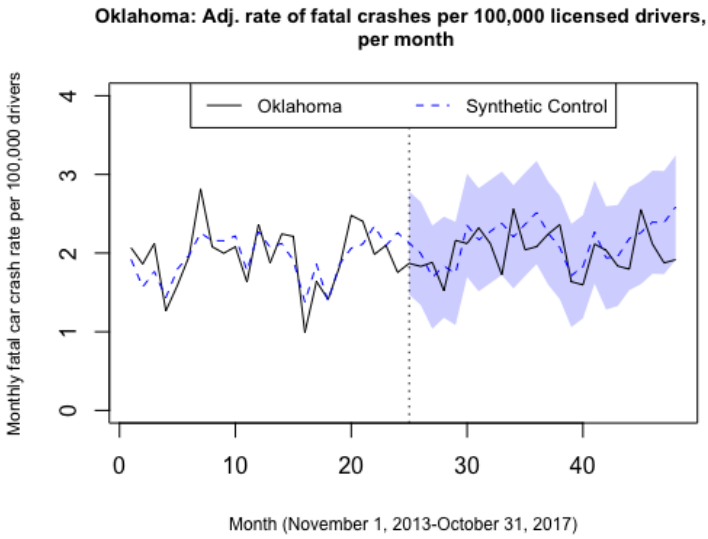
PDMP Enrollment Laws

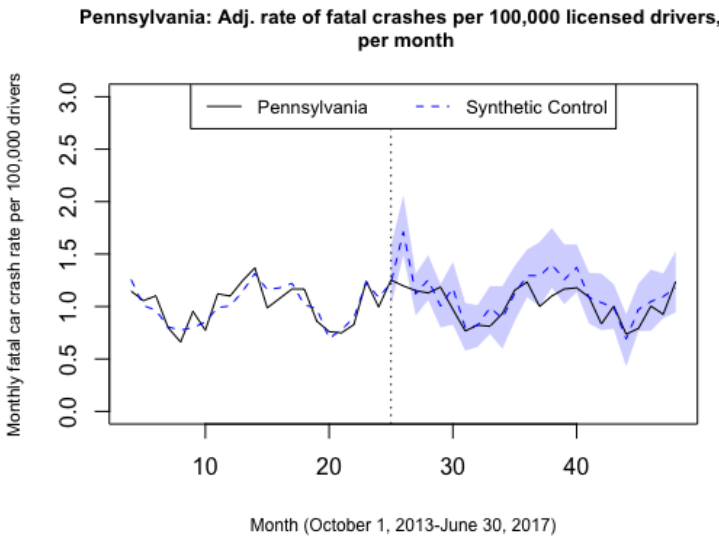


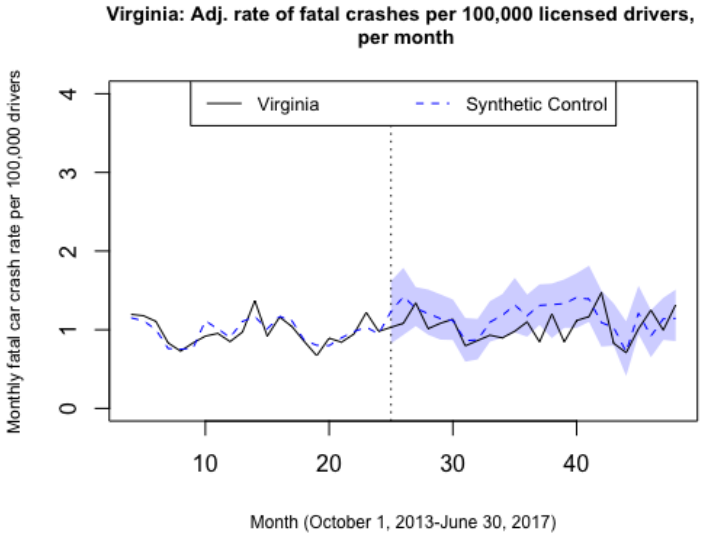


PDMP Query Laws

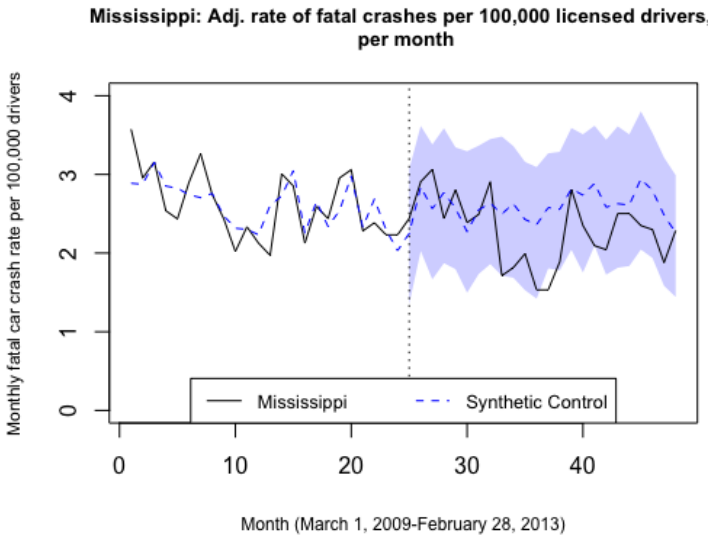


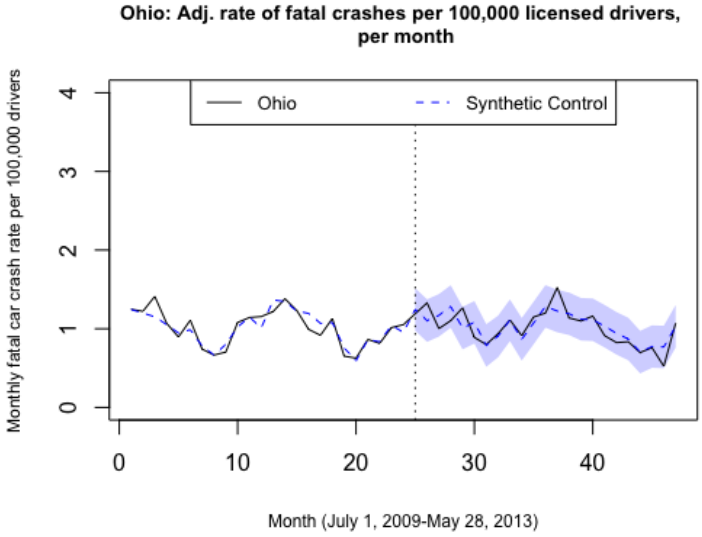


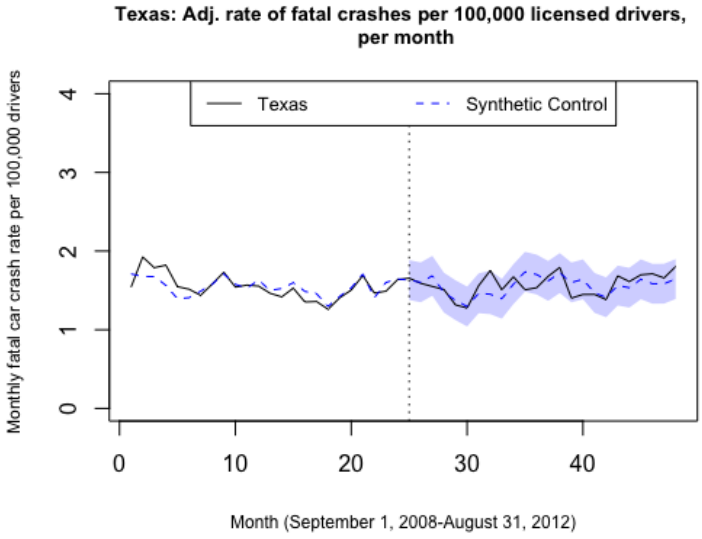

Pennsylvania: Adj. rate of fatal crashes per 100,000 licensed drivers, per month
Monthly fatal car crash rate per 100,000 drivers
Pennsylvania
Synthetic Control
0.0
0.5
1.0
1.5
2.0
2.5
3.0
10
20
30
40
Month (October 1, 2013-June 30, 2017)


Virginia: Adj. rate of fatal crashes per 100,000 licensed drivers, per month
Monthly fatal car crash rate per 100,000 drivers
Virginia
Synthetic Control
0
1
2
3
4
10
20
30
40
Month (October 1, 2013-June 30, 2017)

Pill Mill Laws





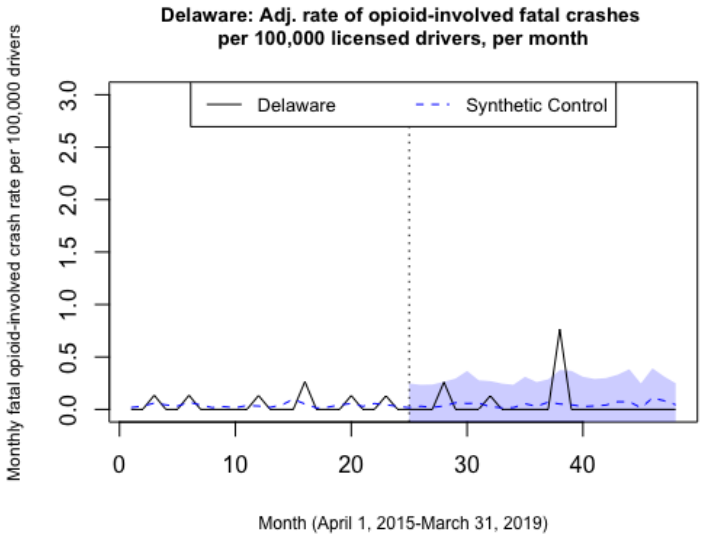


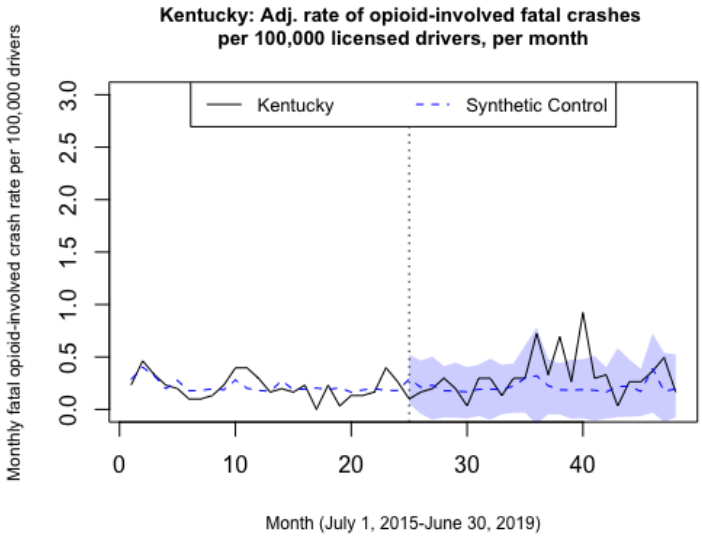
Section C. State-specific pre-period trends and predicted post-law outcomes for the rate of opioid-involved fatal crashes per 100,000 licensed drivers

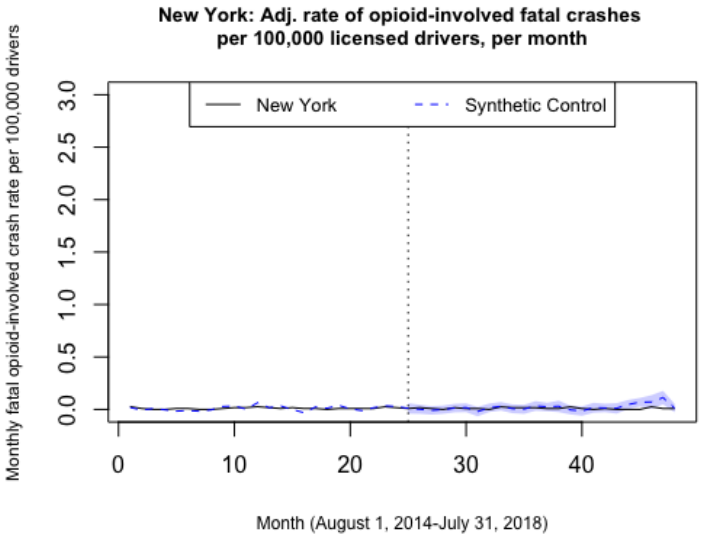
Graphs show the results of augmented synthetic control analyses adjusting for mean state resident age; the average vehicle miles traveled in the state; and the proportions of the state population that were female, were Black, were Hispanic, were living below the federal poverty line, were employed, and had a high school diploma as their highest level of educational attainment, per year.

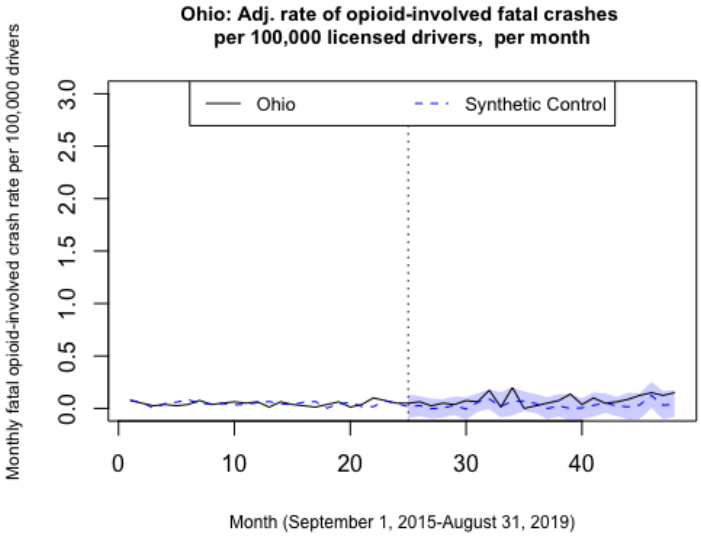
The graphs below depict outcome measures for the rate of opioid-involved fatal crashes per 100,000 licensed drivers in each month of the study period in the opioid prescribing law state (black solid line) and its synthetic control (blue dashed line) over the four-year study period, two years pre- and two years post-law. The vertical line in each graph indicates law implementation. The shading indicates the 95% confidence interval surrounding the post-law predicted outcomes in the synthetic control.

Prescribing Cap Laws

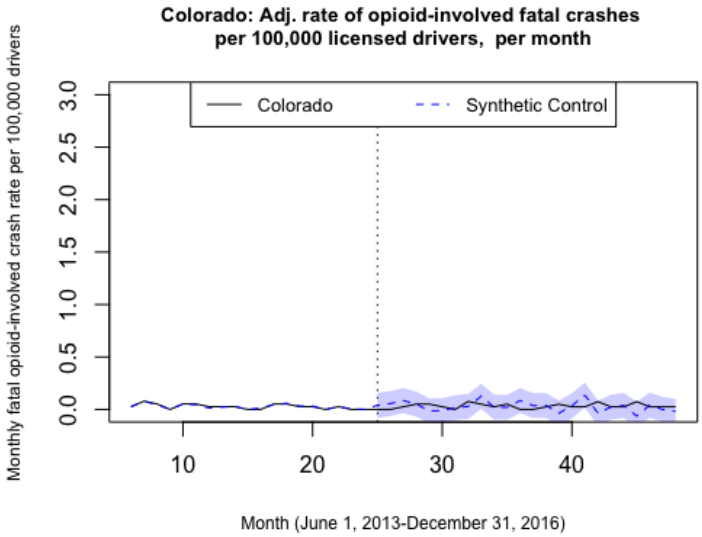


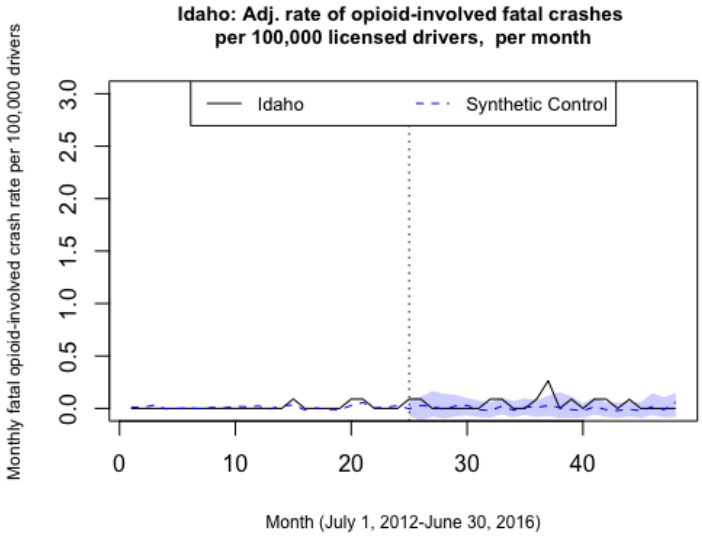



New York: Adj. rate of opioid-involved fatal crashes
per 100,000 licensed drivers, per month
New York
Synthetic Control
Monthly fatal opioid-involved crash rate per 100,000 drivers
0.0
0.5
1.0
1.5
2.0
2.5
3.0
0
10
20
30
40
Month (August 1, 2014-July 31, 2018)

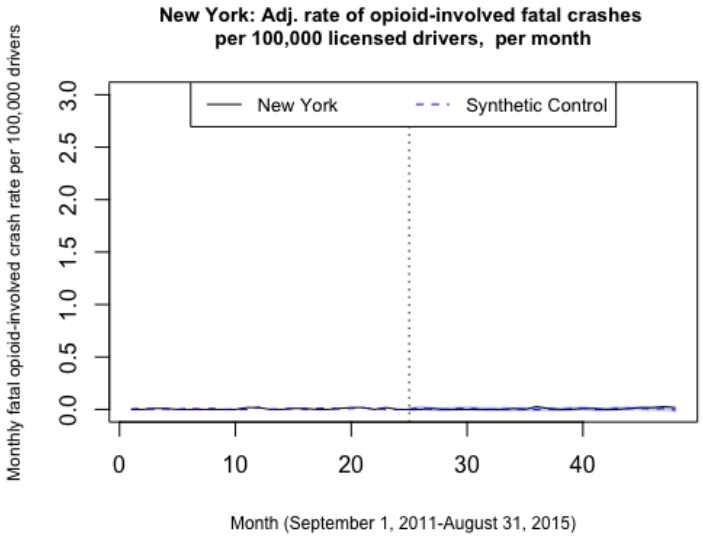

Ohio: Adj. rate of opioid-involved fatal crashes
per 100,000 licensed drivers, per month
Ohio
Synthetic Control
Monthly fatal opioid-involved crash rate per 100,000 drivers
0.0
0.5
1.0
1.5
2.0
2.5
3.0
0
10
20
30
40
Month (September 1, 2015-August 31, 2019)

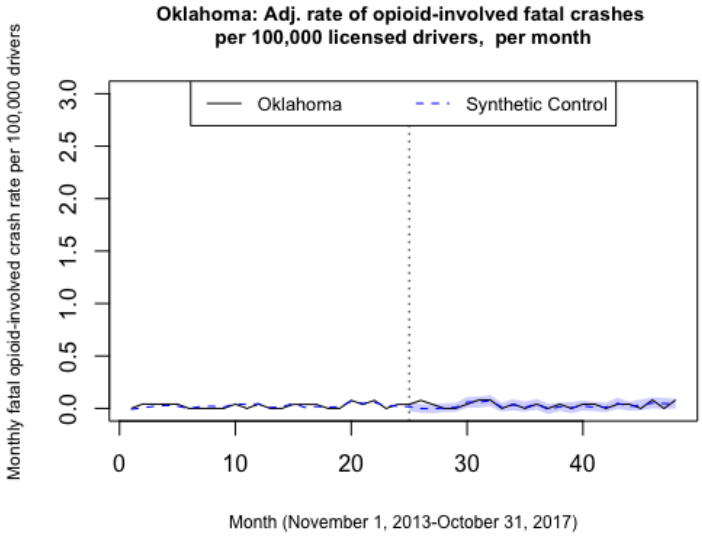
PDMP Enrollment Laws

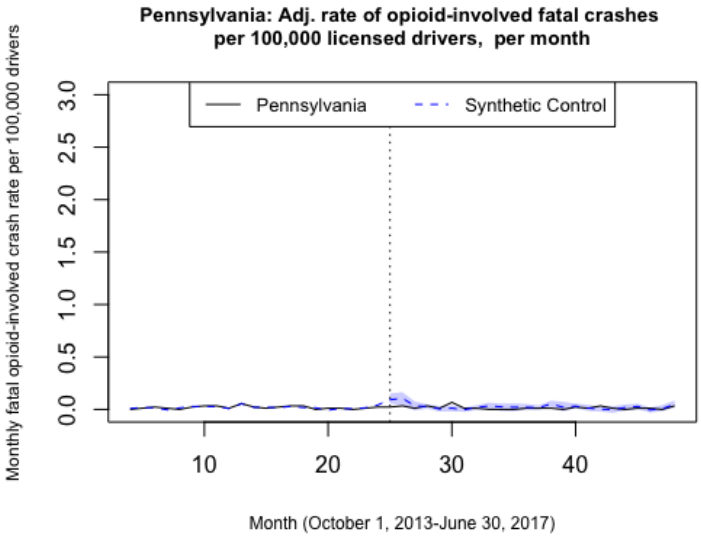


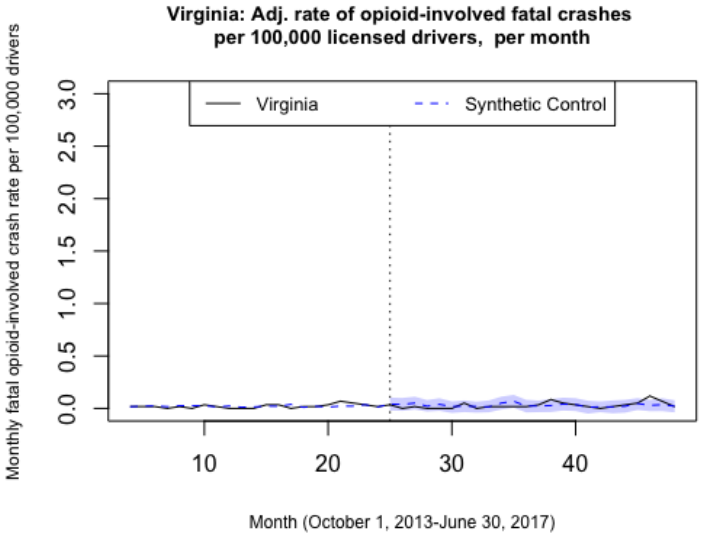


PDMP Query Laws

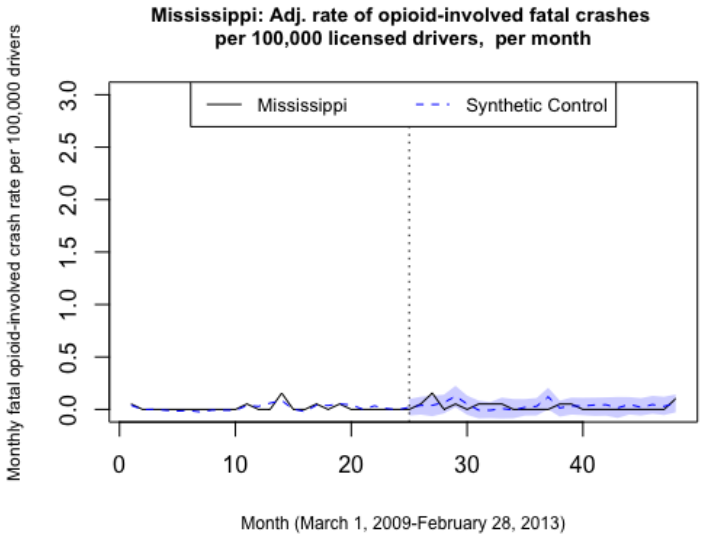


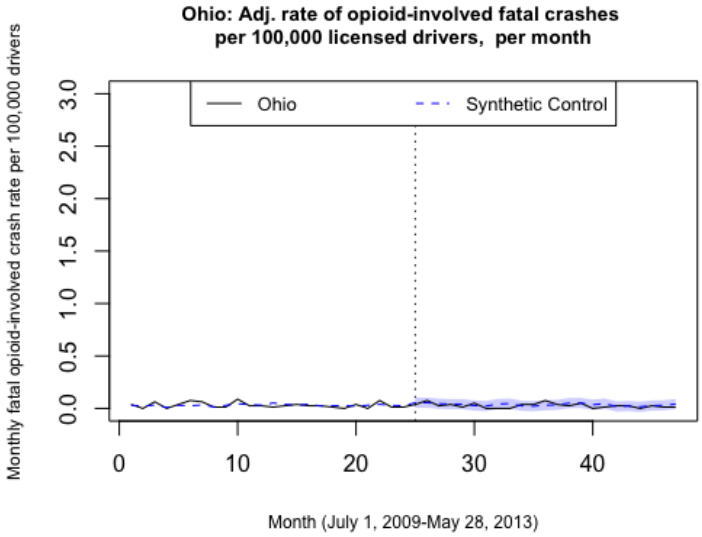


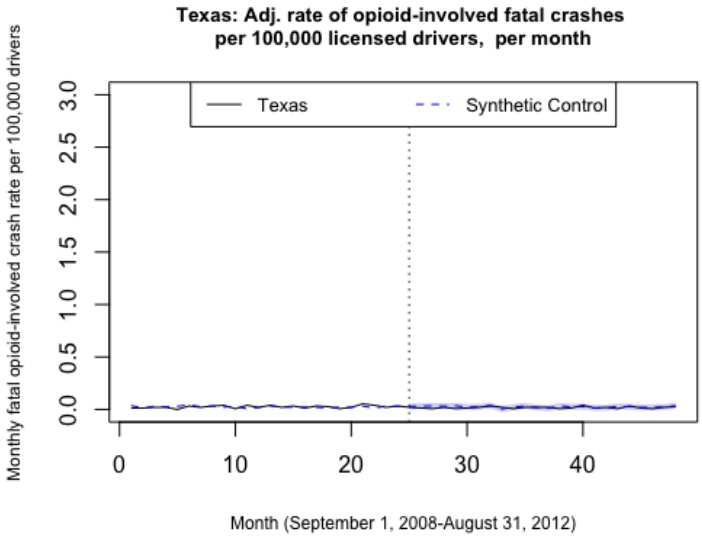

Pennsylvania: Adj. rate of opioid-involved fatal crashes
per 100,000 licensed drivers, per month
Pennsylvania
Synthetic Control
Monthly fatal opioid-involved crash rate per 100,000 drivers
0.0
0.5
1.0
1.5
2.0
2.5
3.0
10
20
30
40
Month (October 1, 2013-June 30, 2017)


Virginia: Adj. rate of opioid-involved fatal crashes
per 100,000 licensed drivers, per month
Virginia
Synthetic Control
Monthly fatal opioid-involved crash rate per 100,000 drivers
0.0
0.5
1.0
1.5
2.0
2.5
3.0
10
20
30
40
Month (October 1, 2013-June 30, 2017)

Pill Mill Laws







Section D. Estimated effect of opioid prescribing laws on the rate of fatal crashes per 100,000 licensed drivers in a given month during the first two years of law implementation

State Law*	Group	Mean in a Given Month in the 2 Years Pre law	Mean in a Given Month in the 2 Years Post law	Difference	Effect of Law
Opioid Prescribing Cap Law					
Delaware	Treatment state	1.331	1.141	-0.190	-0.083 (-0.910, 0.744)
	Synthetic Control	1.331	1.223	-0.107	
Kentucky	Treatment state	2.049	1.882	-0.167	-0.061 (-0.728, 0.605)
	Synthetic Control	2.049	1.944	-0.105	
New York	Treatment state	0.728	0.636	-0.092	-0.210 (-0.605, 0.186)
	Synthetic Control	0.728	0.846	0.118	
Ohio	Treatment state	1.093	1.073	-0.020	0.139 (-0.322, 0.601)
	Synthetic Control	1.093	0.933	-0.159	
Mandatory PDMP Enrollment Law					
Colorado	Treatment state	1.008	1.103	0.095	0.103 (-0.434, 0.639)
	Synthetic Control	1.008	1.001	0.007	
Idaho	Treatment state	1.396	1.455	0.059	0.078 (-0.879, 1.035)
	Synthetic Control	1.396	1.377	-0.019	
Mandatory PDMP Query Law					
New York	Treatment state	0.829	0.746	-0.083	-0.089 (-0.433, 0.255)
	Synthetic Control	0.829	0.835	0.006	
Oklahoma	Treatment state	1.948	2.013	0.065	-0.133 (-0.824, 0.558)
	Synthetic Control	1.948	2.147	0.198	
Pennsylvania	Treatment state	1.007	1.028	0.021	-0.090 (-0.359, 0.180)
	Synthetic Control	1.007	1.118	0.111	
Virginia	Treatment state	0.974	1.042	0.068	-0.121 (-0.451, 0.209)
	Synthetic Control	0.974	1.163	0.189	
Pill Mill Law					
Mississippi	Treatment state	2.609	2.293	-0.316	-0.300 (-1.174, 0.573)
	Synthetic Control	2.609	2.593	-0.016	
Ohio	Treatment state	1.014	1.019	0.005	-0.011 (-0.297, 0.274)
	Synthetic Control	1.014	1.030	0.016	
Texas	Treatment state	1.547	1.573	0.026	0.015 (-0.254, 0.283)
	Synthetic Control	1.547	1.559	0.012	

Section E. Estimated effects of opioid prescribing laws on the rate of opioid-involved fatal crashes per 100,000 licensed drivers in a given month during the first two years of law implementation

State Law*	Group	Mean in a Given Month in the 2 Years Pre law	Mean in a Given Month in the 2 Years Post law	Difference	Effect of Law
Opioid Prescribing Cap Law					
Delaware	Treatment state	0.039	0.048	0.009	0.003 (-0.265, 0.270)
	Synthetic Control	0.039	0.045	0.006	
Kentucky	Treatment state	0.218	0.311	0.093	0.095 (-0.209, 0.399)
	Synthetic Control	0.218	0.216	-0.002	
New York	Treatment state	0.011	0.010	-0.001	-0.011 (-0.059, 0.038)
	Synthetic Control	0.011	0.020	0.010	
Ohio	Treatment state	0.047	0.080	0.033	0.047 (-0.068, 0.162)
	Synthetic Control	0.047	0.033	-0.013	
Mandatory PDMP Enrollment Law					
Colorado	Treatment state	0.027	0.031	0.004	0.002 (-0.094, 0.098)
	Synthetic Control	0.027	0.029	-0.002	
Idaho	Treatment state	0.011	0.044	0.033	0.040 (-0.059, 0.139)
	Synthetic Control	0.011	0.004	-0.007	
Mandatory PDMP Query Law					
New York	Treatment state	0.006	0.007	0.001	0.002 (-0.021, 0.025)
	Synthetic Control	0.006	0.004	-0.001	
Oklahoma	Treatment state	0.025	0.033	0.009	0.007 (-0.043, 0.058)
	Synthetic Control	0.025	0.026	0.001	
Pennsylvania	Treatment state	0.018	0.015	-0.003	-0.010 (-0.046, 0.025)
	Synthetic Control	0.018	0.026	0.007	
Virginia	Treatment state	0.021	0.029	0.008	-0.001 (-0.063, 0.061)
	Synthetic Control	0.021	0.030	0.010	
Pill Mill Law					
Mississippi	Treatment state	0.015	0.026	0.011	-0.011 (-0.104, 0.082)
	Synthetic Control	0.015	0.037	0.022	
Ohio	Treatment state	0.030	0.027	-0.003	-0.009 (-0.061, 0.043)
	Synthetic Control	0.030	0.036	0.006	
Texas	Treatment state	0.025	0.017	-0.007	-0.008 (-0.037, 0.022)
	Synthetic Control	0.025	0.025	-0.000	

Section F. Change in the monthly rate of fatal single vehicle crashes and drug-involved fatal crashes per 100,00 licensed drivers, and fatally injured drivers over 65 per 100,000 drivers over 65, attributable to the law during its first 2 years of implementation

The table below shows the results of the sensitivity analysis which limit the analytic sample into three distinct subgroups: fatal single vehicle crashes and drug-involved fatal crashes per 100,000 licensed drivers, and fatally injured drivers over 65 per 100,000 drivers over 65. The augment synthetic control analyses adjusted for mean state resident age; the average vehicle miles traveled in the state; and the proportions of the state population that were female, were Black, were Hispanic, were living below the federal poverty line, were employed, and had a high school diploma as their highest level of educational attainment, per year.

State Law	Change in rate of fatally injured drivers in single vehicle crashes per 100,000 licensed drivers attributable to the law (95% CI)	Change in rate of fatally injured drugged drivers per 100,000 licensed drivers attributable to the law (95% CI)	Change in rate of fatally injured drivers over 65 per 100,000 licensed drivers over 65 attributable to the law (95% CI)
Opioid Prescribing Cap Law			
Delaware	-0.085 (-0.717, 0.547)	0.018 (-0.607, 0.643)	0.288 (-2.318, 2.893)
Kentucky	-0.019 (-0.388, 0.350)	0.376 (-0.381, 1.113)	0.557 (-1.409, 2.524)
New York	-0.130 (-0.430, 0.169)	-0.212 (-0.334, -0.090)	-0.227 (-1.062, 0.609)
Ohio	0.136 (-0.301, 0.574)	0.236 (-0.148, 0.620)	-0.066 (-1.472, 1.340)
Mandatory PDMP Enrollment Law			
Colorado	0.041 (-0.254, 0.337)	0.044 (-0.108, 0.196)	0.186 (-1.030, 1.401)
Idaho	0.045 (-0.711, 0.801)	0.016 (-0.289, 0.322)	-0.057 (-1.528, 1.414)
Mandatory PDMP Query Law			
New York	-0.052 (-0.283, 0.179)	-0.002 (-0.058, 0.054)	-0.190 (-0.996, 0.617)
Oklahoma	0.002 (-0.436, 0.432)	0.024 (-0.171, 0.218)	-0.433 (-1.887, 1.021)
Pennsylvania	-0.027 (-0.256, 0.203)	-0.030 (-0.141, 0.082)	-0.294 (-1.226, 0.639)
Virginia	-0.070 (-0.263, 0.123)	-0.042 (-0.183, 0.098)	-0.250 (-1.131, 0.630)
Pill Mill Law			
Mississippi	-0.198 (-0.740, 0.343)	-0.033 (-0.203, 0.138)	-0.146 (-1.834, 1.542)
Ohio	-0.024 (-0.243, 0.195)	-0.034 (-0.136, 0.067)	0.090 (-0.592, 0.773)
Texas	-0.024 (-0.284, 0.236)	-0.018 (-0.110, 0.074)	-0.007 (-0.637, 0.650)

Section G. Analysis code

Below, we present annotated example R code used for analysis. We include code for a single state (Delaware) and a single outcome (rate of fatal crashes per 100,000 licensed drivers); analyses for remaining states and outcomes are analogous. In the augsynth() function, we use the "ridge" option to the progfunc argument, which specifies that we augment the synthetic controls method with ridge regression. Ben-Michael et al. (2021) describe several nice theoretical properties of this approach which enhance interpretability, and we implement it following their recommendation. FARS data that was used for analysis is publicly available here: https://www.nhtsa.gov/file-downloads?p=nhtsa/downloads/FARS/.

```
## Install "remotes" package to download augsynth from GitHub
if (!("remotes" %in% installed.packages()))
install.packages('remotes')

## Install augsynth from Github (available at https://github.com/ebenmichael/augsynth).
## A list of package dependencies is available at
## https://raw.githubusercontent.com/ebenmichael/augsynth/master/DESCRIPTION.
## The below code will install the package as it existed when analyses were performed.
if (!("augsynth" %in% installed.packages()))
      remotes::install_github("ebenmichael/augsynth", dependencies = TRUE,
                              ref = "ab71fc726a32fe084b200be7b21469be84f43500")
## Load augsynth
library(augsynth)

## Load ggplot2 for plotting
library(ggplot2)

## Load data
load("CapLaw_Delaware.Rdata")

## Source helper functions to extend augsynth; download from ##
https://github.com/nickseewald/opioid-prescribing-augsynth
source("xaugsynth.R")

## Run augmented synthetic control method using ridge regression to augment, as
## recommended by Ben-Michael, et al. (2021).
Cap_De_Adj <-
      augsynth(
            fatal_rate ~ policy |
                  VMT + Total_MedianAge + Female_pop + fpl_totalpop + employ_age20_64 +
                  edu_hs_grad + Raceeth_BlackNoHS + Raceeth_Hispanic,
            unit = STATE,
            time = STATE_MONTH,
            data = CapLaw_Delaware,
            progfunc = "ridge",     #use ridge regression to impute control outcomes
            scm = TRUE,             #use SCM weighting function
            fixedeff = TRUE         #include unit fixed effects
)

## Compute average outcomes in pre- and post-law periods, using code from
## xaugsynth.R (see GitHub)
print(averageOutcomes(Cap_De_Adj), digits = 4)
```

```
## Plot for Online Section B, using code from xaugsynth.R (see GitHub)
potentialplot(Cap_De_Adj,
            xlab = "Month (April 1, 2015-March 31, 2019)",
            ylab = "Monthly fatal car crash rate per 100,000 drivers", cex.lab=0.75,
            main = "Delaware: Adj. rate of fatal crashes per 100,000 licensed drivers,
             per month", cex.main=0.85,
            ylim = c(0, 4.0),
            legendParams = list(legend = c("Delaware", "Synthetic Control"),
                  horiz = T, cex = 1))
```