

APPENDIX

Appendix A Additional Data Sources

A.1 Additional county-level data

For heterogeneity analysis based on county characteristics, we collected data on average educational attainment, poverty rate, and metropolitan share of population. For educational attainment, we use the percentage of adults whose highest level of education is higher than high school degree. To account for the effect of urbanization, we classified counties into three categories based on their metropolitan status: metropolitan, micropolitan, or non-core. Metropolitan counties have a core urban area of 50,000 or more people. They are generally characterized by significant economic ties throughout the area, including social and economic integration, as indicated by commuting patterns. In contrast, micropolitan counties have an urban core of at least 10,000 (but less than 50,000) people. Non-core counties do not have an urban core of 10,000 or more people and thus represent the most rural counties. We use the share of metropolitan population for our subgroup analyses.

In conducting our robustness checks, we compiled housing market indicators at the county level. These include the Housing Market Index (HHI) from the Federal Housing Finance Agency, and the mortgage delinquency rate based on mortgages delinquent by 90 days or more from the Consumer Financial Protection Bureau. These data span the period 2008–2019.

The coverage indicator represents the effective coverage of reporting of IPV by agencies for a county in a given year, with higher values representing more complete coverage. Following [Fone et al. \(2023\)](#), the coverage indicator is calculated as:

$$CI_{c,t} = \left(1 - \sum_{a=1}^{n_{c,t}} \left(\frac{A_{a,c,t}}{T_{c,t}} \cdot \frac{12 - M_{a,t}}{12} \right)\right) \times 100 \quad (3)$$

where $CI_{c,t}$ is the coverage indicator for county c in year t ; $n_{c,t}$ is the number of agencies in county c at time t ; $A_{a,c,t}$ is the population of agency a in county c in year t ; $T_{c,t}$ is the total population in county c in year t ; and $M_{a,t}$ is the number of months agency a reported in year t .

A.2 Additional state-level data

Our baseline analysis controls for two state-level policies: indicators for whether the state has a Prescription Drug Monitoring Program (PDMP) of any form and for whether it has a medical marijuana law. Specifically, we accounted for whether a Prescription Drug Monitoring Program (PDMP) law was in effect in a given state during a particular year. These laws establish electronic databases that track controlled substance prescriptions within a state, providing valuable and timely information to health authorities about prescribing and patient behaviors that may lead to substance misuse. We accounted for the presence of a PDMP of any form, whether it involves voluntary database access or requires mandatory queries before prescribing or dispensing controlled substances. We also controlled for whether the state has a medical marijuana law in place considering marijuana as a therapeutic substitute to opioid consumption.

In our robustness analysis, we included several state policies to control for state-level differences in social welfare and health policies. Our analysis incorporated Good Samaritan Laws that protect individuals who provide emergency aid during a medical emergency or call for help during a drug-related overdose, and Naloxone Laws that give legal protection to healthcare providers who prescribe or dispense naloxone. We also added indicators for whether a state decriminalized the use of marijuana, and whether a state has passed recreational marijuana laws to reflect the legal status of marijuana in a state for a given year. We also accounted for the Physical Examination Laws, which vary among states but require a licensed practitioner to examine a patient before prescribing medication. Next, we included a binary variable that indicates whether a state expanded Medicaid coverage under the Affordable Care Act (ACA) provisions. Moreover, we incorporated the State Earned Income Tax Credit (EITC) policy as a percentage of the federal EITC. This policy reduces the tax owed by low to moderate-income working individuals and couples on a dollar-for-dollar basis. Lastly, we used the police per capita as a control variable, reflecting the number of law enforcement officers per 1,000 residents in a state for a given year.

Moreover, at the state level, we have integrated controls for the rate of mortgage delinquency, specifically focusing on mortgages overdue by 90 days or more, utilizing data derived from the Residential Mortgage Performance Statistics.

Additional Tables and Figures

TABLE A1: Normalized Differences Between Non-NIBRS, NIBRS, and Evans et al. (2022) Counties

	NIBRS (1)	Non-NIBRS (2)	Evans (3)	Norm. Diff. (1)-(2)	Norm. Diff. (1)-(3)
Percent female	50.29	50.00	50.81	0.10	-0.26
Percent Black	7.65	10.11	12.12	-0.12	-0.25
Percent White	89.70	85.95	81.85	0.17	0.41
Percent Hispanic	5.24	8.93	12.97	-0.23	-0.46
Percent age 0–19	26.58	26.68	27.37	-0.02	-0.18
Percent age 20–24	6.26	6.14	7.35	0.03	-0.29
Percent age 25–34	11.44	11.35	12.93	0.03	-0.52
Percent age 35–44	12.98	12.91	13.67	0.03	-0.32
Percent age 45–54	15.08	15.01	14.47	0.03	0.31
Percent age 55–64	12.43	12.42	11.24	0.00	0.46
Percent age 65 and up	15.23	15.49	12.96	-0.05	0.42
Cancer deaths per 100,000	231.15	234.60	196.67	-0.04	0.42
Unemployment rate	6.29	6.43	6.09	-0.03	0.05
Labor force participation rate	61.87	60.87	62.62	0.08	-0.07
Percent rural	53.69	59.74	20.42	-0.14	0.99
Illicit opioid market share	0.72	0.74	0.82	-0.02	-0.25
Opioid prescriptions per capita	0.88	0.85	0.88	0.05	0.01

Notes: Table reports means for the pre-intervention period, 2006–2009, at the county level. Observations: Non-NIBRS = 2,353 counties; NIBRS = 892 counties; Evans = 438 counties. Given the unequal sample sizes, we follow Imbens and Wooldridge (2009) in our comparison and focus on normalized differences:

$$\Delta_X = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{S_1^2 + S_2^2}},$$

rather than on the t-statistics here, since they are independent of the sample size. [Imbens and Wooldridge \(2009\)](#) suggest using 0.25 as the rule of thumb in these comparisons.

TABLE A2: SUMMARY STATISTICS

	Pre-reformulation (2006–2009)	Post-reformulation (2010–2019)	Whole period (2006–2019)				
	Mean	Mean	Mean	SD	Min	Max	N
Intimate partner violence rate (per 1,000)	2.8345	2.5647	2.6546	1.9193	0.0000	15.0677	12,348
Heroin-involved IPV rate (per 1,000)	0.0001	0.0005	0.0004	0.0034	0.0000	0.1250	12,348
Injury rate (per 1,000)	1.3874	1.3143	1.3380	0.9659	0.0000	9.0921	12,348
Arrest rate (per 1,000)	1.5097	1.4262	1.4556	0.9844	0.0000	7.9778	12,348
Percent female	0.5029	0.5010	0.5017	0.0174	0.2631	0.5642	12,348
Percent Black	0.0765	0.0800	0.0788	0.1248	0.0011	0.7447	12,348
Percent White	0.8970	0.8884	0.8913	0.1324	0.1914	0.9961	12,348
Percent Hispanic	0.0524	0.0634	0.0598	0.0792	0.0032	0.6446	12,348
Percent under age 0 to 19	0.2658	0.2502	0.2554	0.0341	0.1234	0.3970	12,348
Percent age 20 to 24	0.0626	0.0641	0.0635	0.0256	0.0262	0.2833	12,348
Percent age 25 to 34	0.1144	0.1178	0.1167	0.0200	0.0531	0.2832	12,348
Percent age 35 to 44	0.1298	0.1167	0.1208	0.0156	0.0646	0.2031	12,348
Percent age 45 to 54	0.1508	0.1328	0.1391	0.0177	0.0586	0.2219	12,348
Percent age 55 to 64	0.1243	0.1403	0.1353	0.0213	0.0467	0.2139	12,348
Percent age over 64	0.1523	0.1781	0.1693	0.0426	0.0424	0.3788	12,348
Cancer deaths per 100,000 population	231.1478	238.0787	235.7004	66.7081	35.2602	697.6744	12,348
Unemployment rate	6.2866	5.6240	6.0677	2.9519	1.1000	25.6000	12,348
Labor force participation rate	0.6187	0.5908	0.5999	0.0842	0.2759	1.2668	12,348
Indicator for having medical marijuana law	0.1404	0.3455	0.2758	0.4469	0.0000	1.0000	12,348
Indicator for having a PDMP of any form	0.7161	0.9811	0.8954	0.3061	0.0000	1.0000	12,348
Initial percent without any college education (in 2006)	0.5129	0.5126	0.5127	0.1151	0.1501	0.7846	12,348
Initial percent of employment in mining (in 2006)	0.0072	0.0070	0.0071	0.0272	0.0000	0.2773	12,348

Notes: Data are from the 2006–2019 NIBRS. The table presents the means, standard deviations, minimum and maximum values, and the number of observations for variables used in the analysis at the county level (N=12,516 county-years).

TABLE A3: THE EFFECTS OF OXYCONTIN REFORMULATION ON IPV RATES SCALED BY FEMALE POPULATION

	(1)	(2)	(3)	(4)	(5)
Intimate partner violence rate	-0.3852*** (0.1121)	-0.4155*** (0.1140)	-0.4853*** (0.1304)	-0.4254*** (0.1271)	-0.4182*** (0.1274)
Observations	12,530	12,530	12,530	12,348	12,348
Mean in 2006-09	5.6036	5.6036	5.6036	5.6228	5.6228
Heroin-involved IPV rate	0.0004** (0.0002)	0.0003* (0.0002)	0.0004** (0.0002)	0.0004*** (0.0002)	0.0004** (0.0002)
Observations	12,530	12,530	12,530	12,348	12,348
Mean in 2006-09	0.0001	0.0001	0.0001	0.0001	0.0001
Injury rate	-0.1573*** (0.0569)	-0.1387** (0.0605)	-0.2029*** (0.0730)	-0.1913*** (0.0712)	-0.1983*** (0.0738)
Observations	12,530	12,530	12,530	12,348	12,348
Mean in 2006-09	2.7518	2.7518	2.7518	2.7558	2.7558
Arrest rate	-0.1318*** (0.0489)	-0.1430** (0.0559)	-0.1867*** (0.0587)	-0.1857*** (0.0593)	-0.1808*** (0.0585)
Observations	12,530	12,530	12,530	12,348	12,348
Mean in 2006-09	3.0027	3.0027	3.0027	3.0014	3.0014
County and year fixed effects	✓	✓	✓	✓	✓
Non-medical pain reliever misuse × year fixed effects	×	✓	✓	✓	✓
Initial county characteristics × year fixed effects	×	×	✓	✓	✓
Time-varying county socioeconomic controls	×	×	×	✓	✓
Any PDMP and medical marijuana law	×	×	×	×	✓

Notes: Data are from the 2006–2019 NIBRS. Estimates of average treatment effects of the OxyContin reformulation on the IPV rate, heroin-involved IPV rate, injury rate, and arrest rate per 1,000 female population reported by female victims at the county level (N=12,530 county-years). The population-weighted mean opioid prescriptions per capita during the pre-reformulation period (2006–2009) is standardized (mean=0, std=1). All specifications include county and year fixed effects. Column (2) adds general pain reliever misuse (2004–2009) at the state level interacted with year fixed effects; column (3) includes controls for initial county characteristics interacted with year fixed effects, including initial(2006) shares of the population without any college education and of employment share in mining, and 2010 share of rural population; column (4) adds county-level demographic, health, and economic controls (percent female, White, Black, Hispanic population; number of cancer deaths per 100,000 population; percent population under age 19, between 20 and 24, between 25 and 34, between 35 and 44, between 45 and 54, and between 55 and 64; unemployment and labor force participation rates), and column (5) controls for whether the state has a Prescription Drug Monitoring Program (PDMP) of any form, and for whether the state has a medical marijuana law. Outcome means for the pre-reformulation period (2006–2009) are listed in rows under standard errors. Standard errors in parentheses are clustered at the county level. ***, **, and * denote significance at the 1, 5, and 10 percent levels.

TABLE A4: THE EFFECTS OF OXYCONTIN REFORMULATION ON IPV RATES USING ALPERT ET AL. (2018)
OXYCONTIN MISUSE MEASURE

	(1)	(2)	(3)	(4)	(5)
Intimate partner violence rate	-0.3988 (0.5537)	-0.4328 (0.6495)	-0.3050 (0.6373)	-0.3307 (0.5598)	-0.3776 (0.5734)
Observations	13,468	13,468	13,468	13,080	13,080
Mean in 2006-09	2.7580	2.7580	2.7580	2.7801	2.7801
Heroin-involved IPV rate	0.0011*** (0.0003)	0.0011*** (0.0004)	0.0011*** (0.0004)	0.0011** (0.0004)	0.0010** (0.0004)
Observations	13,468	13,468	13,468	13,080	13,080
Mean in 2006-09	0.0001	0.0001	0.0001	0.0001	0.0001
Injury rate	-0.1722 (0.2672)	-0.1157 (0.2993)	-0.0754 (0.3133)	-0.0998 (0.2836)	-0.1549 (0.3033)
Observations	13,468	13,468	13,468	13,080	13,080
Mean in 2006-09	1.3606	1.3606	1.3606	1.3674	1.3674
Arrest rate	-0.0686 (0.2178)	-0.0667 (0.2561)	-0.0101 (0.2655)	0.0019 (0.2449)	0.0044 (0.2395)
Observations	13,468	13,468	13,468	13,080	13,080
Mean in 2006-09	1.4862	1.4862	1.4862	1.4880	1.4880
County and year fixed effects	✓	✓	✓	✓	✓
Non-medical pain reliever misuse × year fixed effects	×	✓	✓	✓	✓
Initial county characteristics × year fixed effects	×	×	✓	✓	✓
Time-varying county socioeconomic controls	×	×	×	✓	✓
Any PDMP and medical marijuana law	×	×	×	×	✓

Notes: Data are from the 2006–2019 NIBRS. Estimates of average treatment effects of the OxyContin reformulation on the IPV rate, heroin-involved IPV rate, injury rate, and arrest rate per 1,000 population reported by female victims at the county level (N=12,530 county-years). State-level OxyContin misuse prior to the intervention is obtained from (Alpert et al. 2018), and is standardized. All specifications include county and year fixed effects. Column (2) adds general pain reliever misuse (2004–2009) at the state level interacted with year fixed effects; column (3) includes controls for initial county characteristics interacted with year fixed effects, including initial(2006) shares of the population without any college education and of employment share in mining, and 2010 share of rural population; column (4) adds county-level demographic, health, and economic controls (percent female, White, Black, Hispanic population; number of cancer deaths per 100,000 population; percent population under age 19, between 20 and 24, between 25 and 34, between 35 and 44, between 45 and 54, and between 55 and 64; unemployment and labor force participation rates), and column (5) controls for whether the state has a Prescription Drug Monitoring Program (PDMP) of any form, and for whether the state has a medical marijuana law. Outcome means for the pre-reformulation period (2006–2009) are listed in rows under standard errors. Standard errors in parentheses are clustered at the state level. ***, **, and * denote significance at the 1, 5, and 10 percent levels.

TABLE A5: THE EFFECTS OF OXYCONTIN REFORMULATION ON IPV RATES BY REMOVING ECONOMIC CONTROLS

	(1)	(2)	(3)	(4)	(5)
Intimate partner violence rate	-0.1973*** (0.0574)	-0.2136*** (0.0581)	-0.2483*** (0.0666)	-0.2278*** (0.0663)	-0.2236*** (0.0662)
Observations	12,530	12,530	12,530	12,348	12,348
Mean in 2006-09	2.8235	2.8235	2.8235	2.8345	2.8345
Heroin-involved IPV rate	0.0002** (0.0001)	0.0001* (0.0001)	0.0002** (0.0001)	0.0002*** (0.0001)	0.0002*** (0.0001)
Observations	12,530	12,530	12,530	12,348	12,348
Mean in 2006-09	0.0001	0.0001	0.0001	0.0001	0.0001
Injury rate	-0.0803*** (0.0292)	-0.0715** (0.0309)	-0.1037*** (0.0373)	-0.1009*** (0.0377)	-0.1042*** (0.0389)
Observations	12,530	12,530	12,530	12,348	12,348
Mean in 2006-09	1.3847	1.3847	1.3847	1.3874	1.3874
Arrest rate	-0.0669*** (0.0250)	-0.0735*** (0.0284)	-0.0955*** (0.0298)	-0.1020*** (0.0304)	-0.0996*** (0.0298)
Observations	12,530	12,530	12,530	12,348	12,348
Mean in 2006-09	1.5092	1.5092	1.5092	1.5097	1.5097
County and year fixed effects	✓	✓	✓	✓	✓
Non-medical pain reliever misuse × year fixed effects	×	✓	✓	✓	✓
Initial county characteristics × year fixed effects	×	×	✓	✓	✓
Time-varying county characteristics	×	×	×	✓	✓
Any PDMP and medical marijuana law	×	×	×	×	✓

Notes: Data are from the 2006–2019 NIBRS. Estimates of average treatment effects of the OxyContin reformulation on the IPV rate, heroin-involved IPV rate, injury rate, and arrest rate per 1,000 population reported by female victims at the county level (N=12,530 county-years). The population-weighted mean opioid prescriptions per capita during the pre-reformulation period (2006–2009) is standardized (mean=0, std=1). All specifications include county and year fixed effects. Column (2) adds general pain reliever misuse (2004–2009) at the state level interacted with year fixed effects; column (3) includes controls for initial county characteristics interacted with year fixed effects, including initial(2006) shares of the population without any college education and of employment share in mining, and 2010 share of rural population; column (4) adds county-level demographic, health (percent female, White, Black, Hispanic population; number of cancer deaths per 100,000 population; and percent population under age 19, between 20 and 24, between 25 and 34, between 35 and 44, between 45 and 54, and between 55 and 64), and column (5) controls for whether the state has a Prescription Drug Monitoring Program (PDMP) of any form, and for whether the state has a medical marijuana law. Outcome means for the pre-reformulation period (2006–2009) are listed in rows under standard errors. Standard errors in parentheses are clustered at the county level. ***, **, and * denote significance at the 1, 5, and 10 percent levels.

TABLE A6: ROBUSTNESS CHECKS RELATED TO REPORTING BIAS

	Injury probability	Arrest probability	Number of agencies
Post $\times$ Exposure	-0.0022 (0.0068)	0.0054 (0.0068)	0.0002 (0.0005)
Observations	12,348	12,348	12,348
Mean in 2006-09	0.5153	0.5788	0.1095

Notes: Data are from the 2006–2019 NIBRS. The dependent variables are: (1) the probability that an IPV incident involves a reported injury, defined as fraction of incidents that resulted in an injury; (2) the probability that an IPV incident leads to an arrest, defined as the fraction of incidents that resulted in an arrest; and (3) the number of law enforcement agencies reporting to NIBRS per 1,000 residents. Specifications include county and year fixed effects, county-level covariates (percent female, White, Black, Hispanic population; number of cancer deaths per 100,000 population; percent population under age 19, between 20 and 24, between 25 and 34, between 35 and 44, between 45 and 54, and between 55 and 64; unemployment and labor force participation rates), pre-treatment shares of the population without any college education, employment share in mining, rural share of population, and non-medical pain reliever misuse, all interacted with year fixed effects, and state-level policies (indicators for a PDMP of any form and a medical marijuana law). Standard errors are clustered at the county level.

TABLE A7: ROBUSTNESS TO ADDITIONAL SPECIFICATIONS

	IPV rate per 1,000 population	Heroin-involved IPV rate per 1,000 population	Injury rate per 1,000 population	Arrest rate per 1,000 population
Housing price index	-0.2265*** (0.0668)	0.0002** (0.0001)	-0.1071*** (0.0387)	-0.0954*** (0.0312)
Observations	10,904	10,904	10,904	10,904
Mortgage delinquency rate	-0.2403*** (0.0689)	0.0002** (0.0001)	-0.1174*** (0.0405)	-0.1011*** (0.0322)
Observations	10,904	10,904	10,904	10,904
State level mortgage delinquency rate	-0.1853*** (0.0650)	0.0002** (0.0001)	-0.0926** (0.0390)	-0.0873*** (0.0313)
Observations	10,586	10,586	10,586	10,586
Number of agencies reporting	-0.2132*** (0.0636)	0.0002*** (0.0001)	-0.0991*** (0.0373)	-0.0907*** (0.0290)
Observations	12,348	12,348	12,348	12,348
Dropping counties below 65% coverage rate	-0.2239*** (0.0671)	0.0003** (0.0001)	-0.1082*** (0.0398)	-0.0971*** (0.0311)
Observations	9,151	9,151	9,151	9,151
Evans (2022) counties	-0.3061** (0.1542)	0.0004* (0.0002)	-0.1948** (0.0976)	-0.1859*** (0.0668)
Observations	1,386	1,386	1,386	1,386

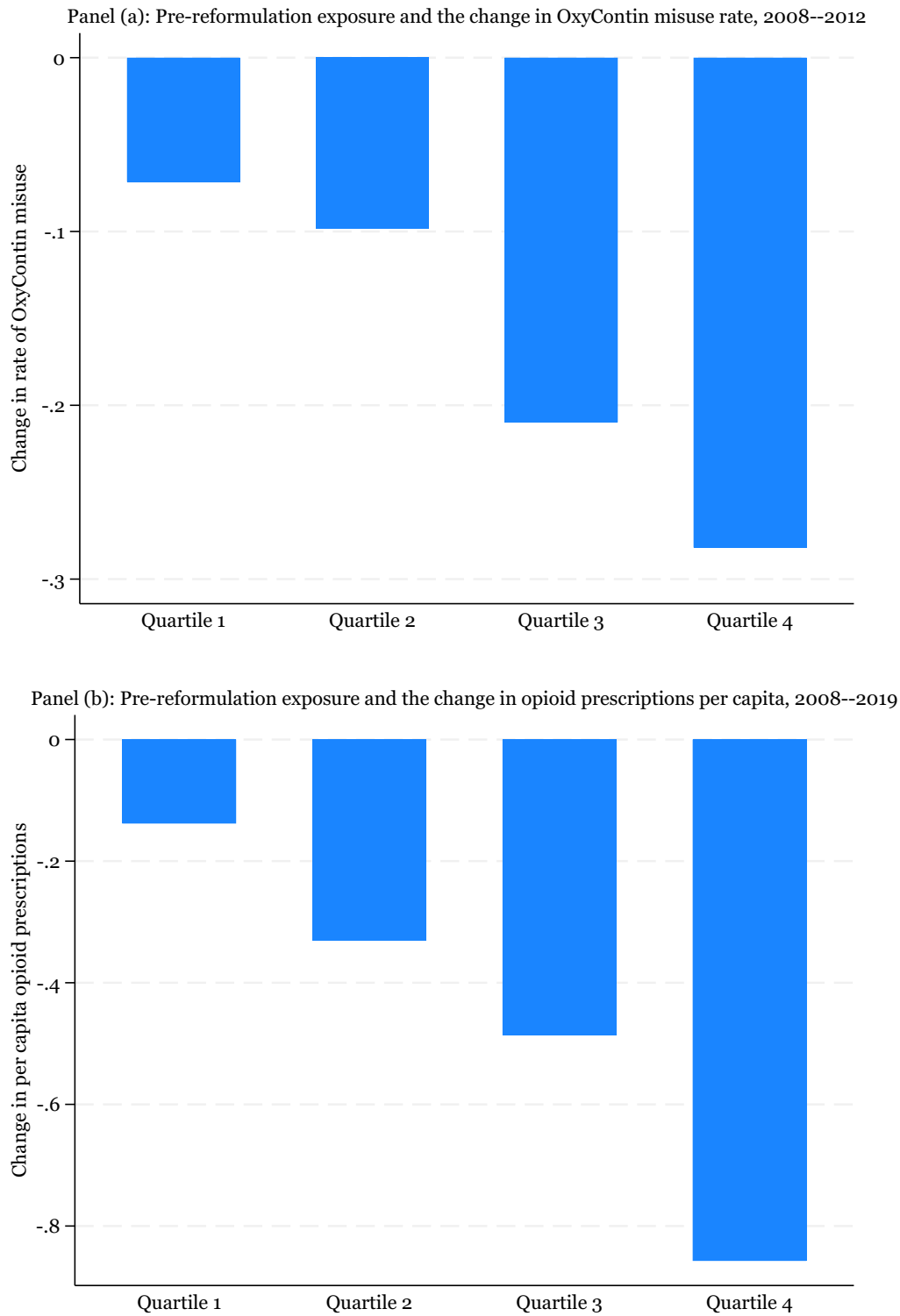
Notes: Data are from the 2006–2019 NIBRS. Analyses showing the IPV rate, heroin-involved IPV rate, injury rate, and arrest rate per 1,000 population reported by female victims at the county level. The population-weighted mean opioid prescriptions per capita during the pre-reformulation period (2006–2009) is standardized (mean=0, std=1). Specifications include county and year fixed effects, county-level covariates (percent female, White, Black, Hispanic population; number of cancer deaths per 100,000 population; percent population under age 19, between 20 and 24, between 25 and 34, between 35 and 44, between 45 and 54, and between 55 and 64; unemployment and labor force participation rates), pre-treatment shares of the population without any college education, employment share in mining, rural share of population, and non-medical pain reliever misuse, all interacted with year fixed effects, and state-level policies (indicators for a PDMP of any form and a medical marijuana law). Standard errors are clustered at the county level.

TABLE A8: ROBUSTNESS TO HOUSING MARKET INDICATORS

	IPV rate per 1,000 population	Heroin-involved IPV rate per 1,000 population	Injury rate per 1,000 population	Arrest rate per 1,000 population
Controlling for:				
Housing price index	-0.2252*** (0.0664)	0.0002** (0.0001)	-0.1050*** (0.0387)	-0.0931*** (0.0307)
Observations	10,904	10,904	10,904	10,904
Mortgage delinquency rate	-0.2373*** (0.0684)	0.0002** (0.0001)	-0.1140*** (0.0404)	-0.0982*** (0.0315)
Observations	10,904	10,904	10,904	10,904
State level mortgage delinquency rate	-0.1830*** (0.0645)	0.0002** (0.0001)	-0.0905** (0.0387)	-0.0856*** (0.0305)
Observations	10,586	10,586	10,586	10,586

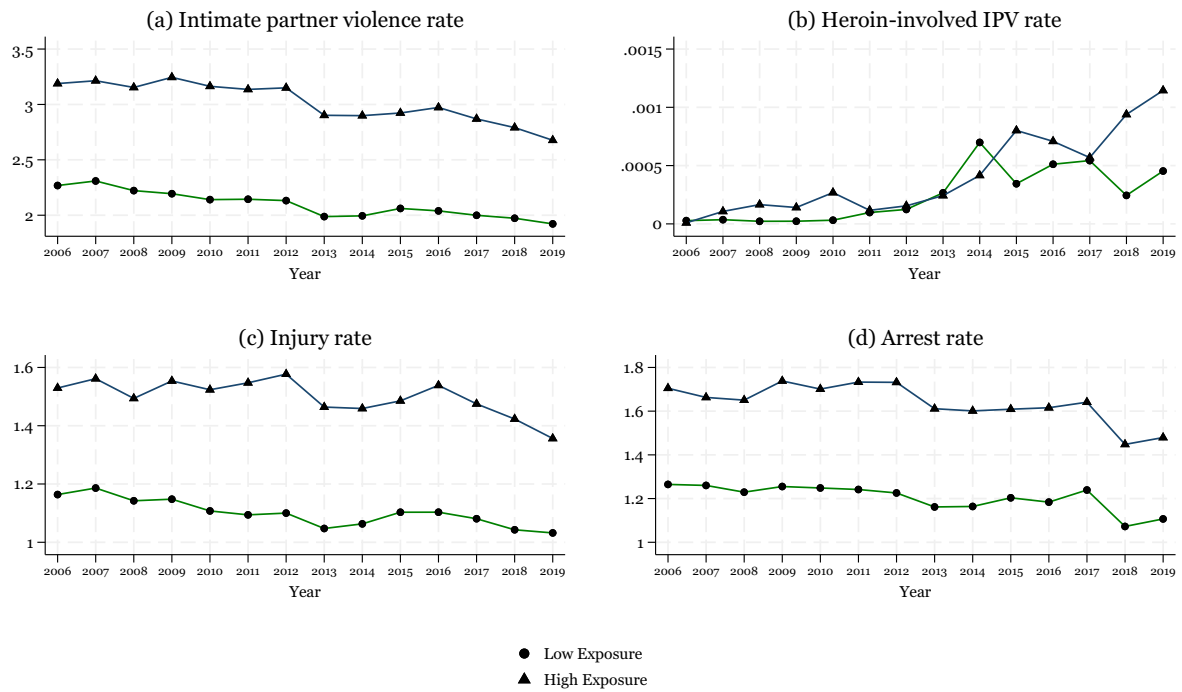
Notes: Data are from the 2006–2019 NIBRS. Analyses showing the IPV rate, heroin-involved IPV rate, injury rate, and arrest rate per 1,000 population reported by female victims at the county level. The population-weighted mean opioid prescriptions per capita during the pre-reformulation period (2006–2009) is standardized (mean=0, std=1). Specifications include county and year fixed effects, county-level covariates (percent female, White, Black, Hispanic population; number of cancer deaths per 100,000 population; percent population under age 19, between 20 and 24, between 25 and 34, between 35 and 44, between 45 and 54, and between 55 and 64; unemployment and labor force participation rates), pre-treatment shares of the population without any college education, employment share in mining, rural share of population, and non-medical pain reliever misuse, all interacted with year fixed effects, and state-level policies (indicators for a PDMP of any form and a medical marijuana law). Standard errors are clustered at the county level.

FIGURE A1: RELATIONSHIP BETWEEN PRE-REFORMULATION EXPOSURE AND THE CHANGE IN PRESCRIPTION OPIOID MISUSE



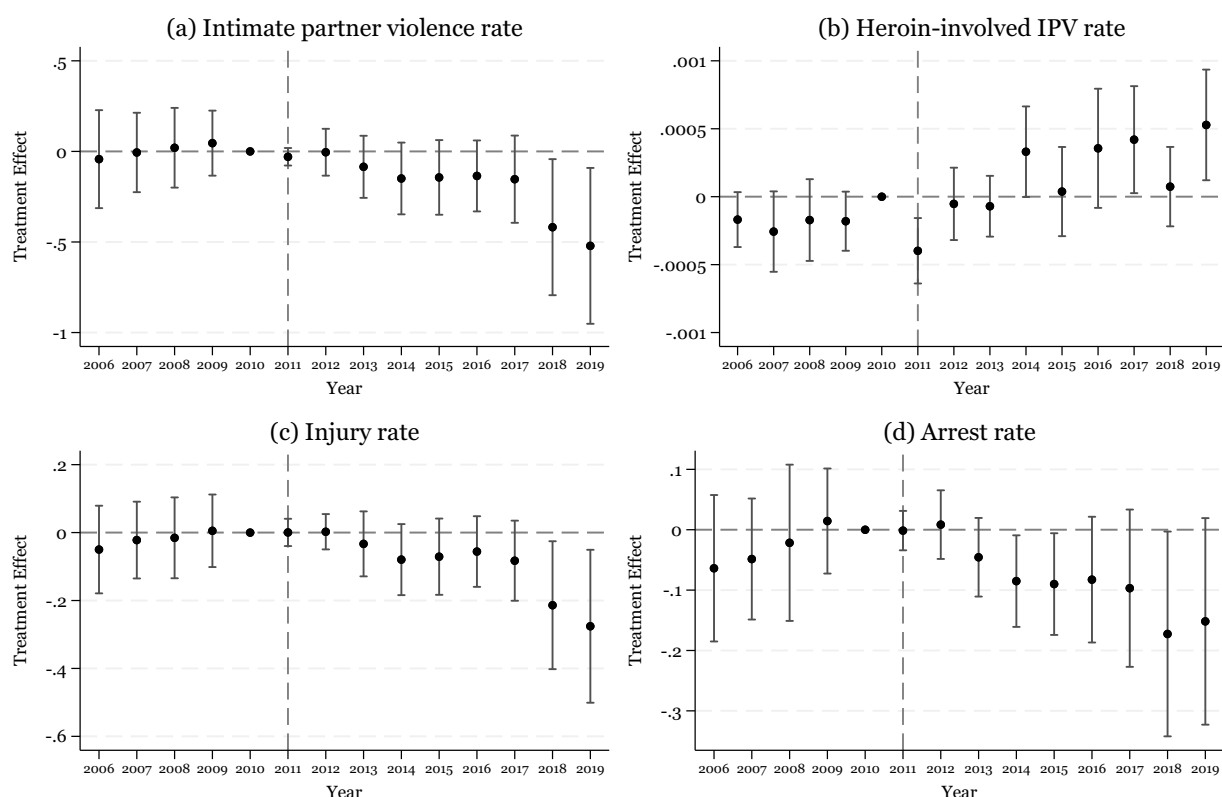
Note: We use the population-weighted mean per capita opioid prescriptions in the county from 2006 to 2009, pre-reformulation exposure period, to create quartiles of exposure (with the quartile 1 representing lowest average exposure and quartile 4 highest average exposure). Panel (a) plots the reductions in the state-level population-weighted average rate of OxyContin misuse from 2008 to 2012, while Panel B plots the reductions in the county-level population-weighted average per capita Schedule II opioid prescriptions based on the CDC data from 2008 to 2019.

FIGURE A2: HIGH EXPOSURE VS LOW EXPOSURE



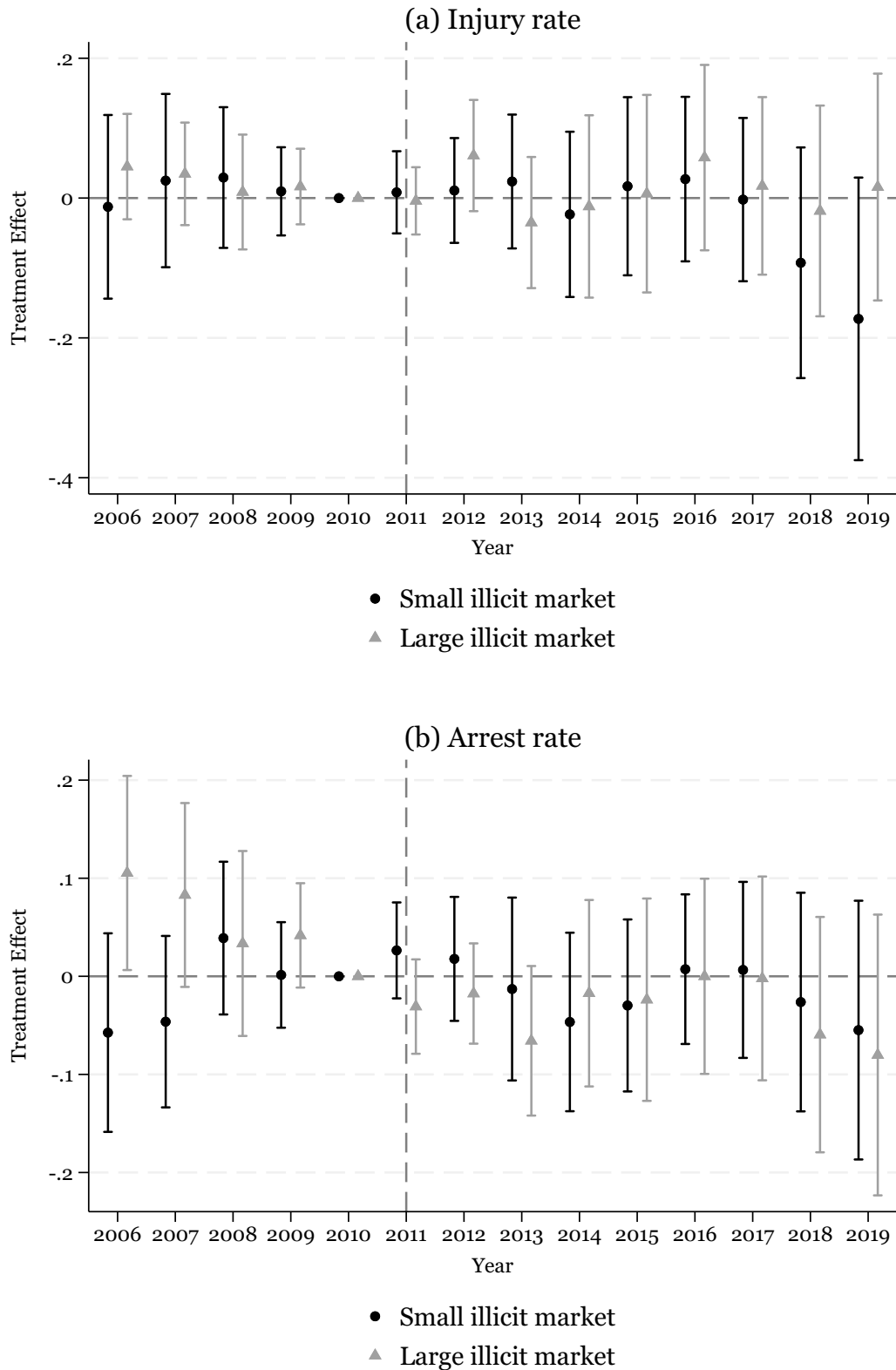
Note: Data are from the 2006–2019 NIBRS. The figure presents the trends in outcome variables by splitting counties into low and high exposure groups by the median of our measure of exposure to OxyContin reformulation in 2006–2009.

FIGURE A3: EVENT STUDY RESULTS USING ALPERT ET AL. (2018) OXYCONTIN MISUSE MEASURE



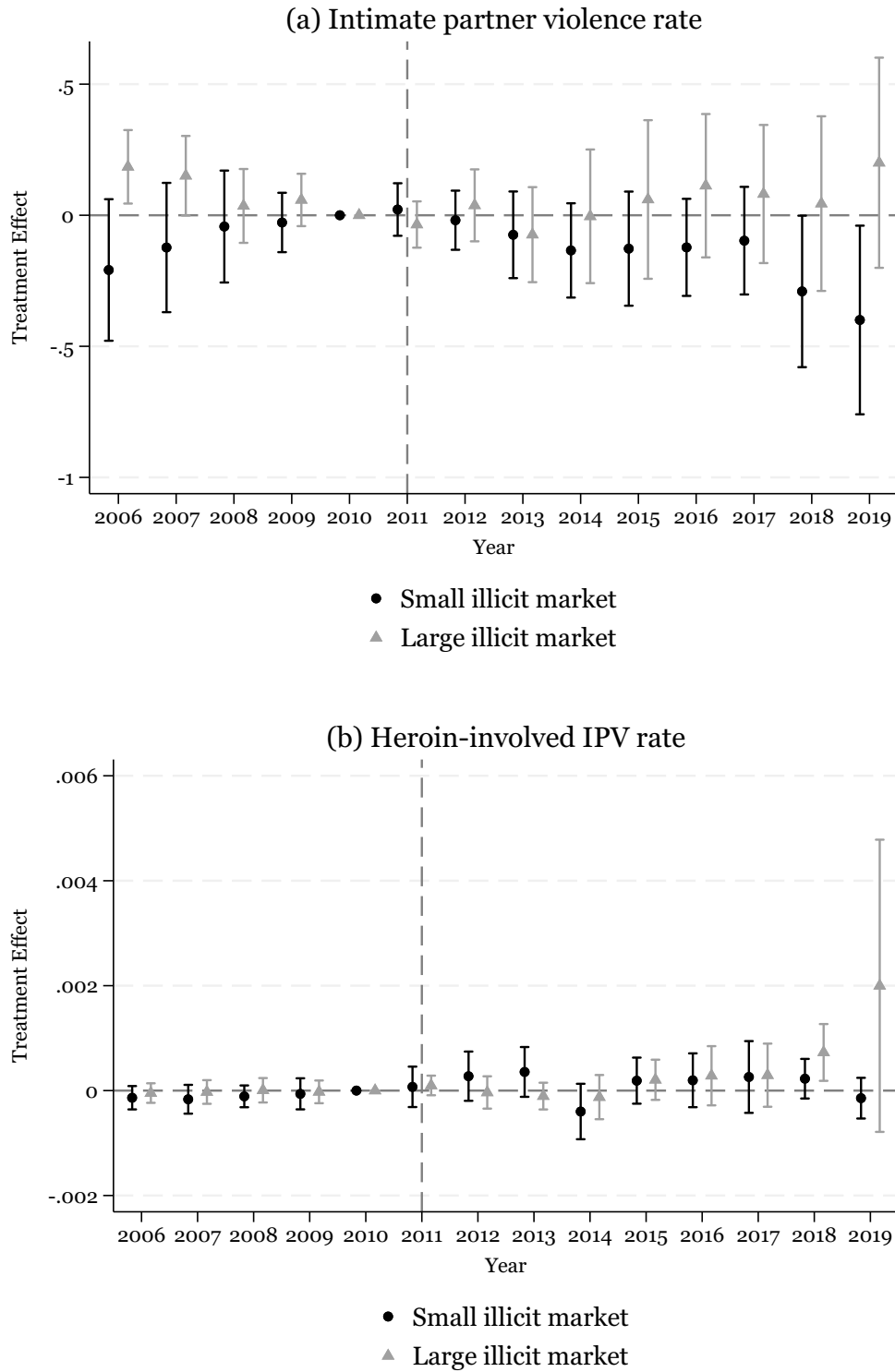
Note: Data are from the 2006–2019 NIBRS. Event-study plots showing the response of IPV rate, heroin-involved IPV rate, injury rate, and arrest rate per 1,000 population reported by female victims at the county level ($N=12,530$ county-years) to OxyContin reformulation in 2010. State-level OxyContin misuse prior to the intervention is obtained from [Alpert et al. \(2018\)](#), and is standardized. Each figure reports treatment effect estimates and 95 percent confidence intervals with 2010, the reformulation year, normalized to zero. Specifications include county and year fixed effects, county-level covariates (percent female, White, Black, Hispanic population; number of cancer deaths per 100,000 population; percent population under age 19, between 20 and 24, between 25 and 34, between 35 and 44, between 45 and 54, and between 55 and 64; unemployment and labor force participation rates), pre-treatment shares of the population without any college education, employment share in mining, rural share of population, and non-medical pain reliever misuse, all interacted with year fixed effects, and state-level policies (indicators for a PDMP of any form and a medical marijuana law). Standard errors are clustered at the state level.

FIGURE A4: HETEROGENEITY ANALYSES BY SIZE OF ILLICIT OPIOID MARKET ACTIVITY



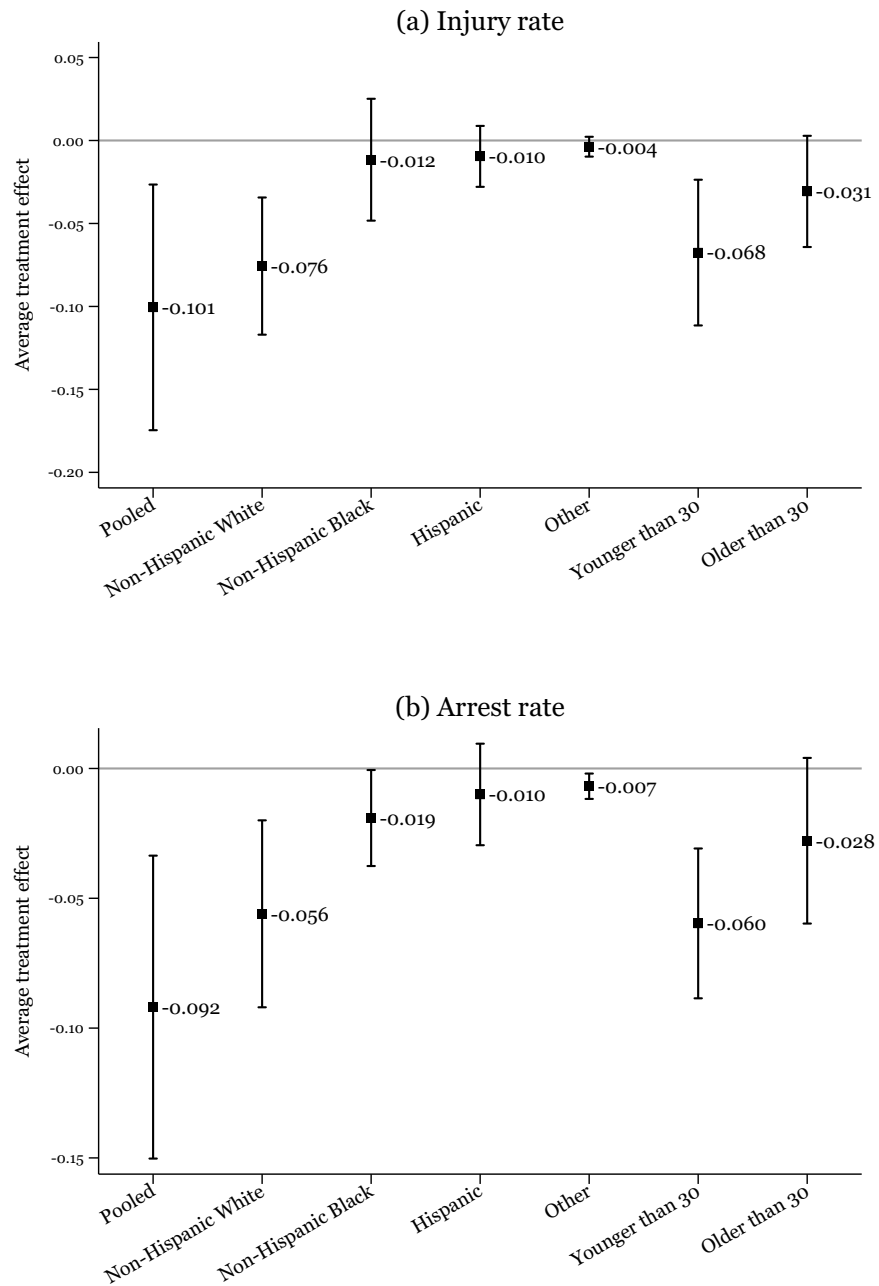
Note: Data are from the 2006–2019 NIBRS. The figure presents subgroup analyses by the size of the illicit opioid market activity in a state, which is proxied by the share of deaths due to illicit or synthetic opioids in total deaths due to opioids over the period 2006 to 2009, prior to OxyContin reformulation in 2010. Specifications include baseline controls as listed in Figure 2. The coefficient estimates show treatment effects on injury rate and arrest rate per 1,000 population, as reported by female victims at the county level. Vertical bars represent the respective 95% confidence intervals for these estimates. Standard errors are clustered at the county level.

FIGURE A5: HETEROGENEITY ANALYSES BY SIZE OF ILLICIT OPIOID MARKET ACTIVITY USING AN ALTERNATIVE MEASURE



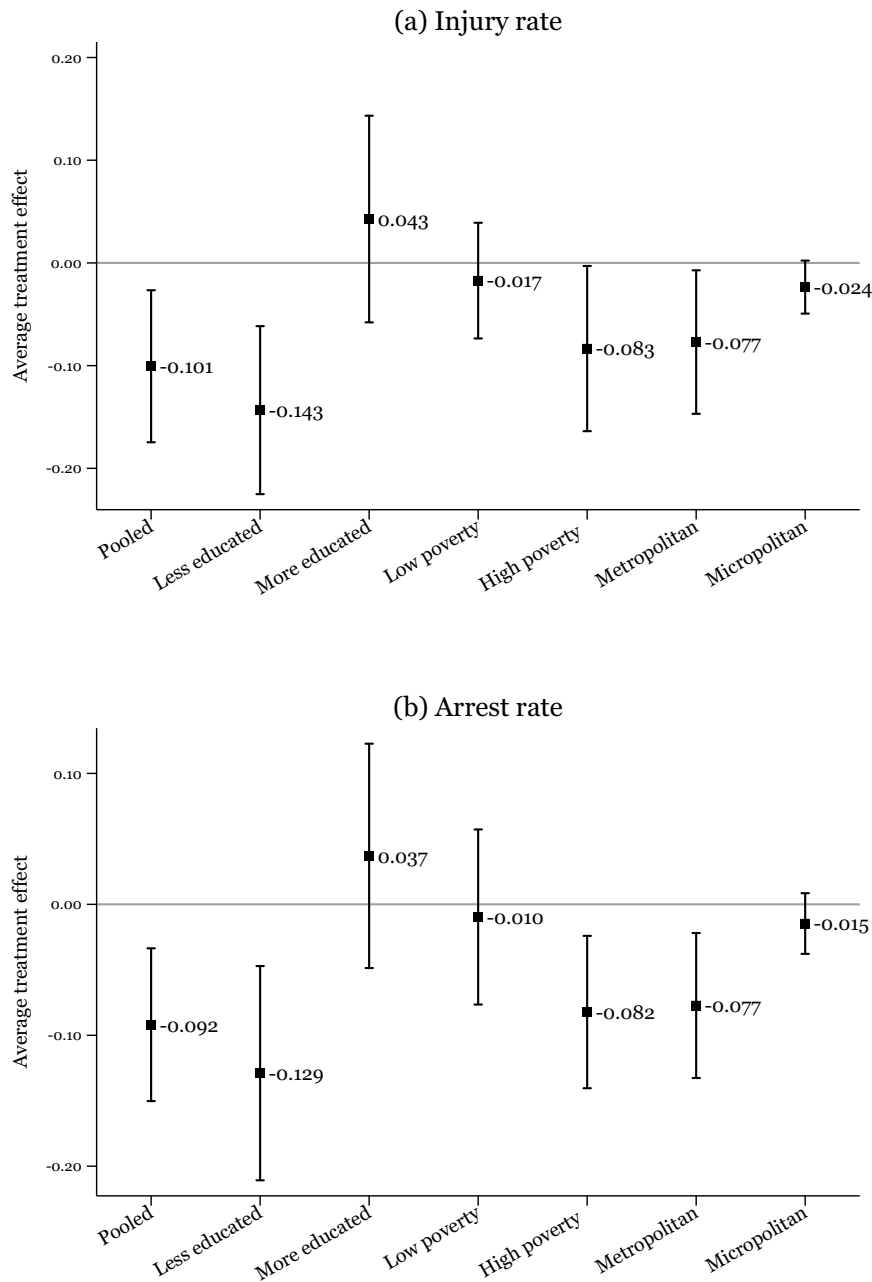
Note: Data are from the 2006–2019 NIBRS. The figure presents subgroup analyses by the size of the illicit opioid market activity in a state, which is proxied by the share of deaths due to illicit or synthetic opioids in total opioid deaths due to opioids over the period 2006 to 2009, prior to OxyContin reformulation in 2010. Specifications include baseline controls as listed in Figure 2. The coefficient estimates show treatment effects on IPV rate and heroin-involved IPV rate per 1,000 population, as reported by female victims at the county level. Vertical bars represent the respective 95% confidence intervals for these estimates. Standard errors are clustered at the county level.

FIGURE A6: HETEROGENEITY ANALYSES BY VICTIM CHARACTERISTICS



Note: Data are from the 2006–2019 NIBRS. The figure presents victim-level subgroup analyses, displaying estimated treatment effects on injury rate and IPV arrest rate per 1,000 population, as reported by female victims at the county level. Specifications include baseline controls as listed in Figure 2. Vertical bars represent the respective 95% confidence intervals for these estimates. Standard errors are clustered at the county level.

FIGURE A7: HETEROGENEITY ANALYSES BY COUNTY CHARACTERISTICS



Note: Data are from the 2006–2019 NIBRS. The figure presents county-level subgroup analyses, displaying estimated treatment effects on injury rate and IPV arrest rate per 1,000 population, as reported by female victims at the county level. Specifications include baseline controls as listed in Figure 2. Vertical bars represent the respective 95% confidence intervals for these estimates. Standard errors are clustered at the county level.