

Online appendix for

Deaths of Despair or Drug Problems?

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Appendix A

Table A.1: Summary Statistics for Variables Used in Main Analysis

Variable	Mean	Std. Dev		
<u>Outcomes: Δ in Drug Death Rates per 100,000 (2015 vs. 1999)</u>				
All Drugs	10.37	9.06		
Opioid Analgesics	3.58	4.22		
Illicit Opioids	6.27	6.67		
Drug, Suicide, Alcohol (DSA)	15.39	12.38		
Nondrug DSA	5.02	7.35		
Nondrug Suicide	2.76	5.67		
Alcohol	2.26	4.21		
<u>Economic Proxies (Δ 2015 vs. 1999)</u>				
Poverty Rate (3-year average)	2.93	2.47		
Median Household Income (3-year average, 2015\$)	-2,817	5,586		
Median Home Price, 2015\$: % Δ (2011-2015 average vs. 2000)	17.85	22.31		
Unemployment Rate (3-year average)	1.77	1.04		
Instrumented Import Share of Employment (2011 vs. 1999)	1.57	2.03		
<u>Additional Covariates (1999 & 2015)</u>				
	<u>1999</u>		<u>Δ: 1999-2015</u>	
<u>Population Shares</u>	<u>Mean</u>	<u>SD</u>	<u>Mean</u>	<u>SD</u>
Females	0.509	0.012	0.001	0.006
Hispanics	0.123	0.148	0.049	0.034
Non-Hispanic Blacks	0.121	0.128	0.010	0.027
Other Race (Non-Hispanics)	0.045	0.054	0.021	0.020
15-24 Year Olds	0.139	0.029	0.002	0.013
24-34 Year Olds	0.145	0.023	0.008	0.015
34-44 Year Olds	0.162	0.014	0.036	0.013
44-54 Year Olds	0.131	0.012	0.004	0.011
54-64 Year Olds	0.085	0.013	0.043	0.011
64-74 Year Olds	0.065	0.019	0.020	0.011
\geq 75 Year Olds	0.058	0.019	0.005	0.009
Some College (\geq 25 years old)	0.275	0.048	0.019	0.033
College Graduate (\geq 25 years old)	0.242	0.095	0.063	0.028
Female-headed Household (2000, 2010)	0.179	0.059	0.019	0.012
Foreign born (2000, 2011-2015)	0.109	0.102	0.021	0.020
<u>Medical/Policy Variables (2015)</u>				
Active Nonfederal MD's per 1000	2.514	1.903	0.247	0.720
Hospital beds per 1000: 2015	3.603	2.713	-0.708	1.616
Marijuana Legal in State for Medical/Recreational Uses	0.160	0.367	0.305	0.460
State Prescription Drug Monitoring Program	0.195	0.396	0.724	0.447
<u>Urban-Rural Status Share (2013)</u>				
Metropolitan Area: Population 250,000 – 999,999	0.210	0.408		
Metropolitan Area: Population <250,000	0.092	0.289		
Urban Area: Population \geq 20,000, adjacent to metro	0.043	0.203		
Urban Area: Population \geq 20,000, not adjacent to metro	0.015	0.122		
Urban Area: Population 2,500-19,999, adjacent to metro	0.047	0.211		
Urban Area: Population 2,500-19,999, not adjacent to metro	0.026	0.158		
Rural Area: Population <2,500, adjacent to metro	0.007	0.082		
Rural Area: Population <2,500, not adjacent to metro	0.008	0.089		

Note: Variables are measured at the county level and weighted by 2015 county populations. Independent variables are standardized to have a mean of 0 and a standard deviation of 1 in the econometric analysis.

Death rates involving opioid analgesics, heroin and synthetic opioids are adjusted for incomplete reporting on death certificates using the methods discussed in the text. Entries in parentheses indicate if variable dates are different from 1999 or 2015. Prescription drug monitoring programs (PDMP) are those with requirement that dispensers must report data to PDMP. For poverty, unemployment rates and household incomes, the variables are three-year averages ending in the year specified.

Table A.2: Correlations Between Economic Proxies

	Poverty	Income	Home Prices	Unemployment	Imports
Poverty	1.000				
Income	-0.702	1.000			
Home Prices	-0.530	0.641	1.000		
Unemployment	0.487	-0.436	-0.284	1.000	
Imports	0.154	-0.074	-0.098	0.101	1.000

Note: Table shows correlations between economic proxies with observations weighted by 2015 county populations. Proxy names are abbreviated (e.g. "Unemployment" refers to the change in the unemployment rate).

Table A.3: Estimated Effect of Economic Conditions on 1999-2015 Changes in Drug Death Rates, Various Sets of Controls

Model	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
$X_{1999}, \Delta X$	2.949*** (0.641)	2.114*** (0.432)	1.285*** (0.459)	2.982*** (0.567)	0.894** (0.440)	2.697*** (0.585)	2.795*** (0.620)	2.761*** (0.580)	0.419* (0.228)	0.096* (0.051)	0.431** (0.218)
$X_{1999}, \Delta X^I$	2.949*** (0.641)	1.808*** (0.315)	1.216*** (0.409)	2.444*** (0.495)	1.331*** (0.469)	2.697*** (0.585)	2.765*** (0.666)	2.795*** (0.612)	1.073** (0.454)	0.850*** (0.245)	0.792*** (0.205)
Additional Controls	None	A	B	C	D	E	F	G	B,D	A,B,D	All

Note: See note on Table 2. Table shows multiple proxy estimates for effect of economic conditions on 1999-2015 change in total drug mortality rate. Each cell shows results of a different regression. All models control for the five economic proxies. The top panel also controls for 1999 levels and changes between 1999 and 2015 in the specified additional controls. Middle panel uses instrumented, rather than actual, changes in controls. Additional controls abbreviations are detailed next. A: age shares; B: sex and race/ethnicity shares; C: education shares; D: shares female-headed households and foreign-born; E: urban-rural county category; F: medical infrastructure; G: state drug policies. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A.4: GMM (IV) Estimates of Effects of Economic Conditions on Changes in Various Death Rates, 1999-2015, with Instrumented Changes in Supplementary Covariates Controlled For

Economic Proxy	All Drugs	Opioid Analgesics	Illicit Opioids	All DSA	Suicide/Alcohol
<u>GMM Estimates</u>					
Δ in Poverty Rate	0.940*** (0.282)	0.330** (0.147)	-0.264 (0.275)	0.761* (0.389)	-0.005 (0.251)
Δ in Median Household Income	1.039*** (0.321)	0.388** (0.169)	0.050 (0.263)	0.414 (0.449)	-0.482* (0.283)
Δ in Median Home Price	1.387*** (0.492)	0.534*** (0.190)	-0.066 (0.314)	1.235** (0.582)	0.157 (0.310)
Δ in Unemployment Rate	1.789*** (0.485)	0.478** (0.229)	-0.012 (0.366)	1.391** (0.674)	-0.074 (0.401)
Δ in Import Exposure	3.123** (1.232)	1.249*** (0.467)	-0.100 (0.725)	2.180 (1.342)	-0.553 (0.838)
Multiple Proxy Estimate	0.792*** (0.205)	0.306*** (0.105)	-0.101** (0.042)	0.351*** (0.125)	-0.053*** (0.015)

Note: See notes on Table 5. All specifications also control for the 1999 set of supplementary characteristics and instrumented changes in them from 1999-2015. Robust standard errors with clustering at the commuter zone level are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.5: Multiple Proxy Estimates of Effect of Economic Conditions on Changes in Various Types of Drug Death Rates For Selected Time Periods

	Opioid Analgesics		Illicit Opioids	
	(1a)	(1b)	(2a)	(2b)
<u>1999-2015</u>				
Multiple Proxy Estimate	0.197 (0.136)	0.306*** (0.105)	0.305** (0.154)	-0.101** (0.042)
Dependent Var. Mean [SD]	3.58 [4.22]		6.27 [6.67]	
% of Δ Explained	4.7%	7.3%	4.6%	-1.5%
<u>1999-2011</u>				
Multiple Proxy Estimate	0.105* (0.056)	0.266*** (0.075)		
Dependent Var. Mean [SD]	3.81 [4.76]			
% of Δ Explained	2.2%	5.6%		
<u>2006-2015</u>				
Multiple Proxy Estimate			0.326** (0.133)	0.248*** (0.070)
Dependent Var. Mean [SD]			5.42 [6.15]	
% of Δ Explained			5.3%	4.0%
Additional Controls	ΔX	ΔX^I	ΔX	ΔX^I

Note: See notes on Tables 1 through 4. Table shows multiple proxy estimates for models with additional controls for the start year (1999 or 2006), All models include supplementary covariates in the starting year, as well as changes in either actual or instrumented values from the starting to ending years. When 2011 is the ending year, the ending period for measuring changes in home prices is 2007-2011 and 2011 covariates include the average share foreign born in 2006-2010. When 2006 is the first analysis year, initial year home prices are averaged from 2005=2009.

. *** p<0.01, ** p<0.05, * p<0.1

Table A.6: Dependent Variable Descriptive Statistics for Population Subgroups

Group	<u>All Drugs</u>		<u>Opioid Analgesics</u>		<u>Illicit Opioids</u>		<u>All DSA</u>		<u>Nondrug DSA</u>	
	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev
All	10.37	9.06	3.58	4.22	6.27	6.67	15.39	12.38	5.02	7.35
Males	12.79	12.70	3.57	5.51	9.08	10.17	19.56	18.61	6.77	12.61
Females	8.04	7.91	3.61	4.28	3.58	4.27	11.29	10.26	3.24	5.82
Whites	13.85	10.38	4.90	4.87	7.90	7.70	21.48	14.12	7.63	8.84
Nonwhite/Hispanics	4.81	12.49	1.45	7.03	3.53	7.42	6.55	22.30	1.74	18.05
20-59 Years Old	17.05	16.60	5.75	7.59	10.92	12.12	23.40	21.33	6.36	11.35
Whites: Aged 20-59	23.18	19.09	7.92	8.73	14.03	14.14	33.00	24.17	9.83	13.49
Whites: Aged 45-54	24.69	27.69	10.36	14.58	10.91	15.64	39.54	38.82	13.84	26.85
≤ High School	24.01	22.72	7.90	9.80	14.59	17.60	34.17	30.37	10.16	18.01
Some College	12.03	12.48	4.24	6.34	6.54	7.38	20.65	20.31	8.61	15.55
College Graduate	3.49	11.31	1.82	5.53	1.82	4.92	6.80	21.54	3.31	18.53

Note: Table shows average growth between 1999 and 2015 for specified type of drug mortality and population subgroup. Observations are weighted by 2015 county populations.

Figure A.1: DSA Mortality Rates by Sex

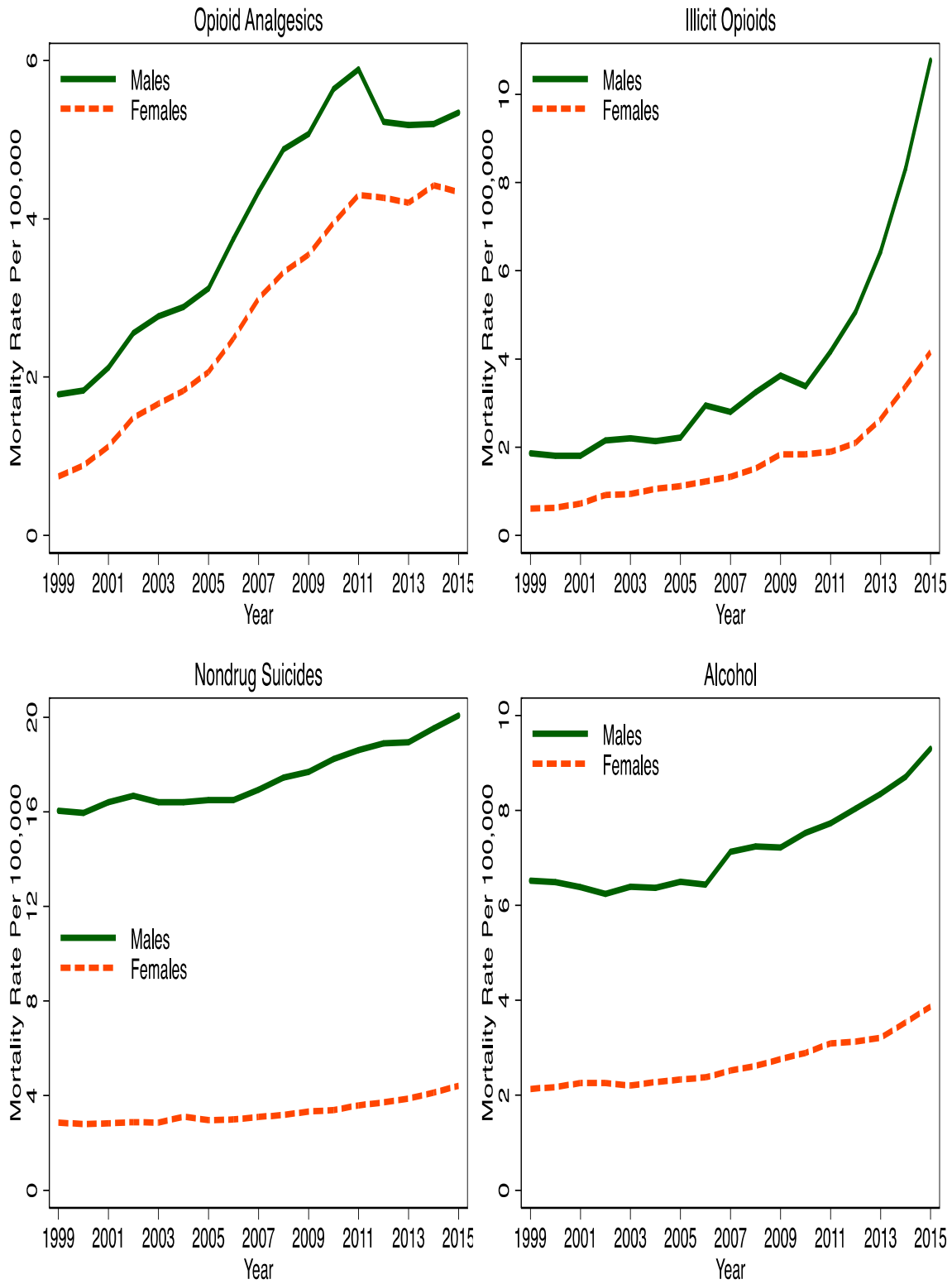


Figure A.2: DSA Mortality Rates by Race/Ethnicity

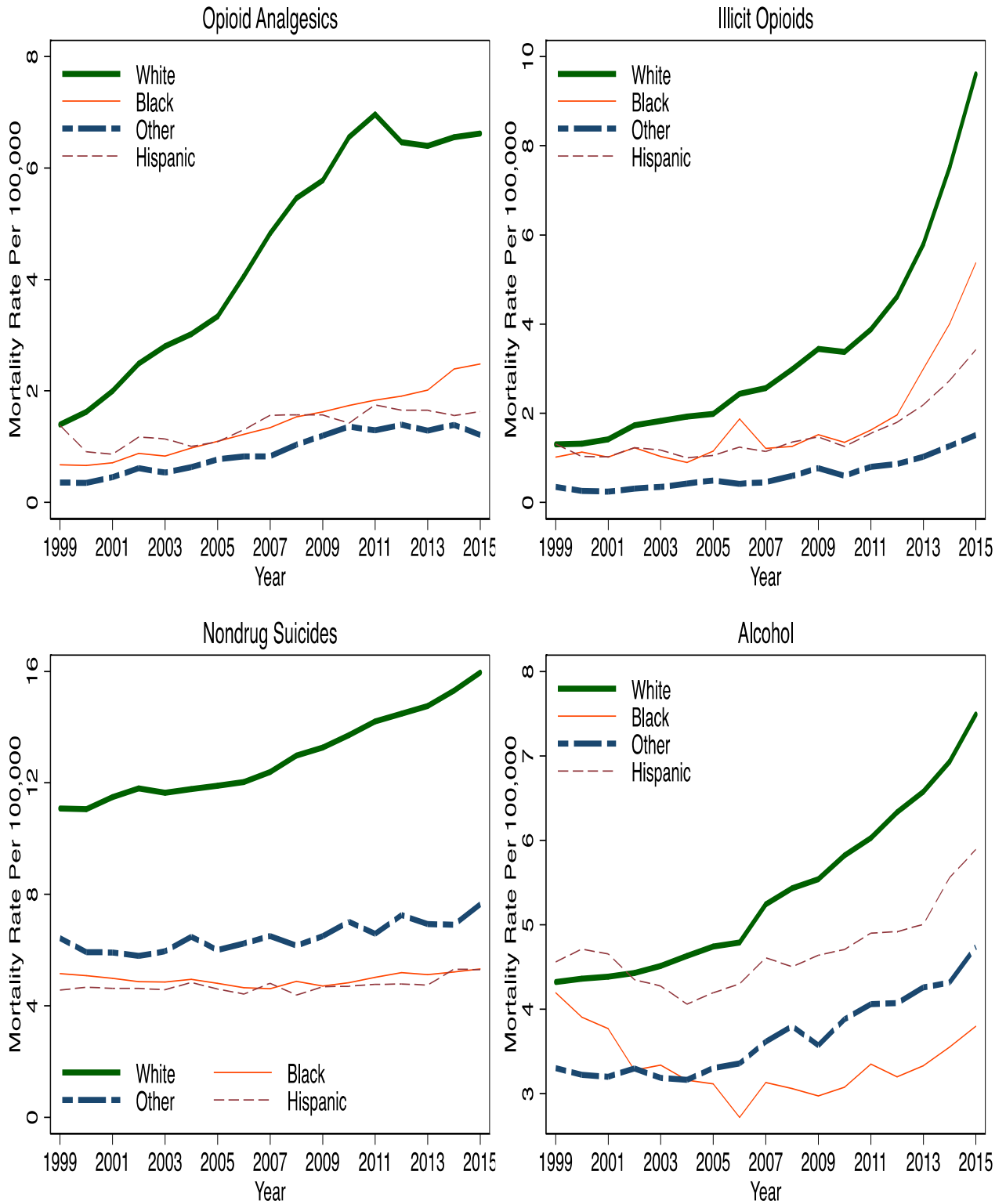


Figure A.3: DSA Mortality Rates by Age

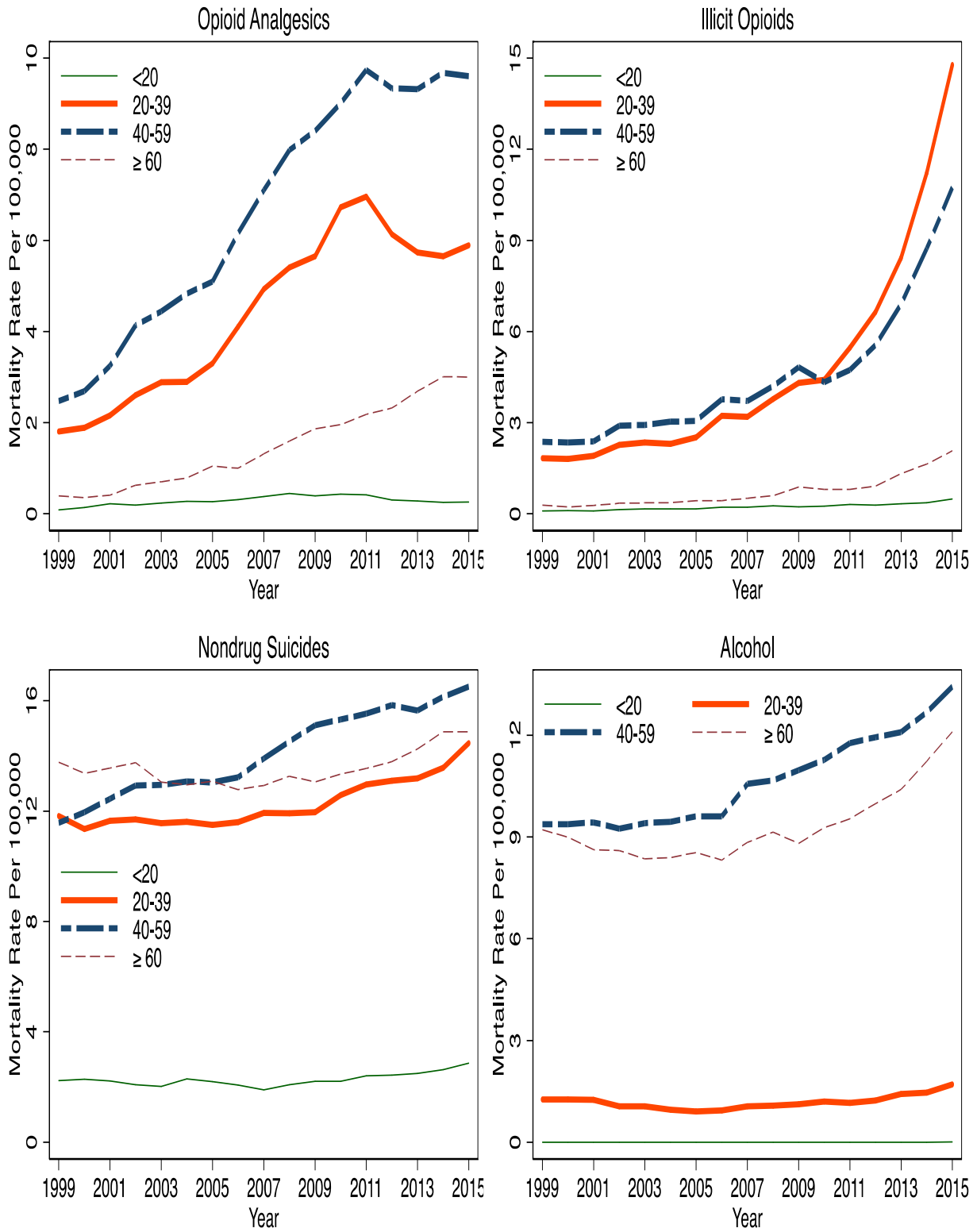
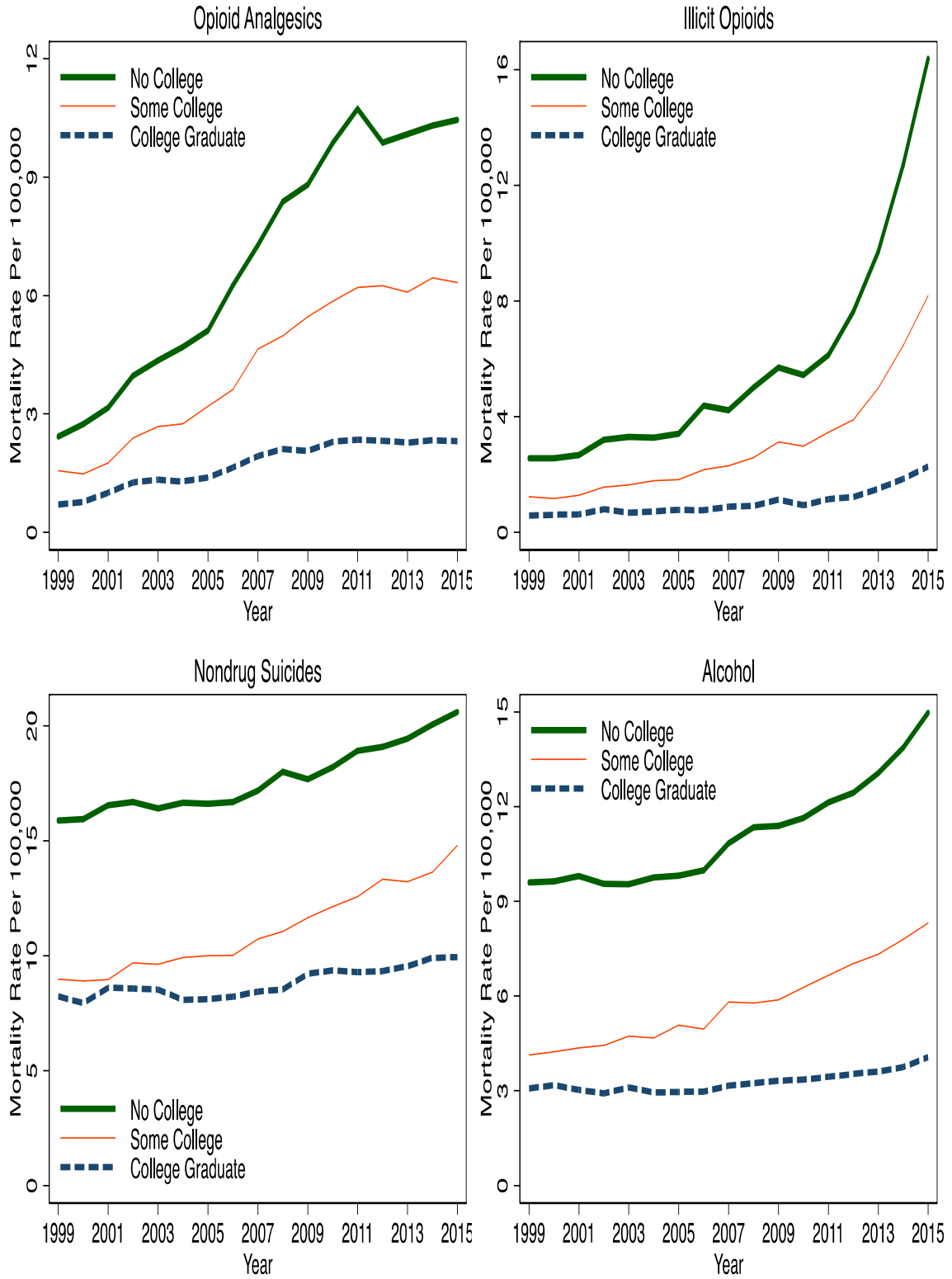


Figure A.4: DSA Mortality Rates by Education



Appendix B

Table B.1: Estimated Effect of Economic Conditions on Changes in Nondrug Suicide and Alcohol Death Rates, 1999-2015

Economic Proxy	Nondrug Suicide	Alcohol
<u>No Covariates: Measures Included Separately</u>		
Δ in Poverty Rate	0.012 (0.195)	0.103 (0.182)
Δ in Median Household Income	0.228 (0.191)	0.220 (0.200)
Δ in Median Home Price	0.387** (0.182)	0.165 (0.191)
Δ in Unemployment Rate	-0.289 (0.184)	0.063 (0.194)
Δ in Import Exposure	0.220* (0.133)	-0.222* (0.122)
<u>No Covariates: Measures Included Together</u>		
Δ in Poverty Rate	-0.248 (0.185)	-0.061 (0.161)
Δ in Median Household Income	0.306 (0.234)	0.238 (0.210)
Δ in Median Home Price	0.425** (0.209)	0.069 (0.198)
Δ in Unemployment Rate	-0.446** (0.184)	-0.007 (0.177)
Δ in Import Exposure	0.239* (0.133)	-0.237* (0.123)
R ²	0.013	0.006
P-Value	<0.001	0.257
Multiple Proxy Estimate	1.067*** (0.231)	0.500** (0.247)
% of Total Δ Explained	18.8%	11.9%
Dependent Var. Mean [SD]	2.76 [5.67]	2.26 [4.21]
<u>Models with Controls for X₁₉₉₉ & ΔX</u>		
Multiple Proxy Estimate	-0.038*** (0.013)	0.041*** (0.010)
% of Total Δ Explained	-0.7%	1.0%
<u>Models with Controls for X₁₉₉₉ & ΔX^I</u>		
Multiple Proxy Estimate	0.214*** (0.054)	0.365*** (0.096)
% of Total Δ Explained	3.8%	8.7%
<u>GMM (IV) Estimates, Models with Controls for X₁₉₉₉ & ΔX^I</u>		
Δ in Poverty Rate	-0.398** (0.184)	0.285* (0.172)

Δ in Median Household Income	-0.511*** (0.198)	-0.022 (0.180)
Δ in Median Home Price	-0.407 (0.263)	0.353 (0.231)
Δ in Unemployment Rate	-0.581** (0.287)	0.493* (0.269)
Δ in Import Exposure	-1.355** (0.665)	0.674 (0.489)

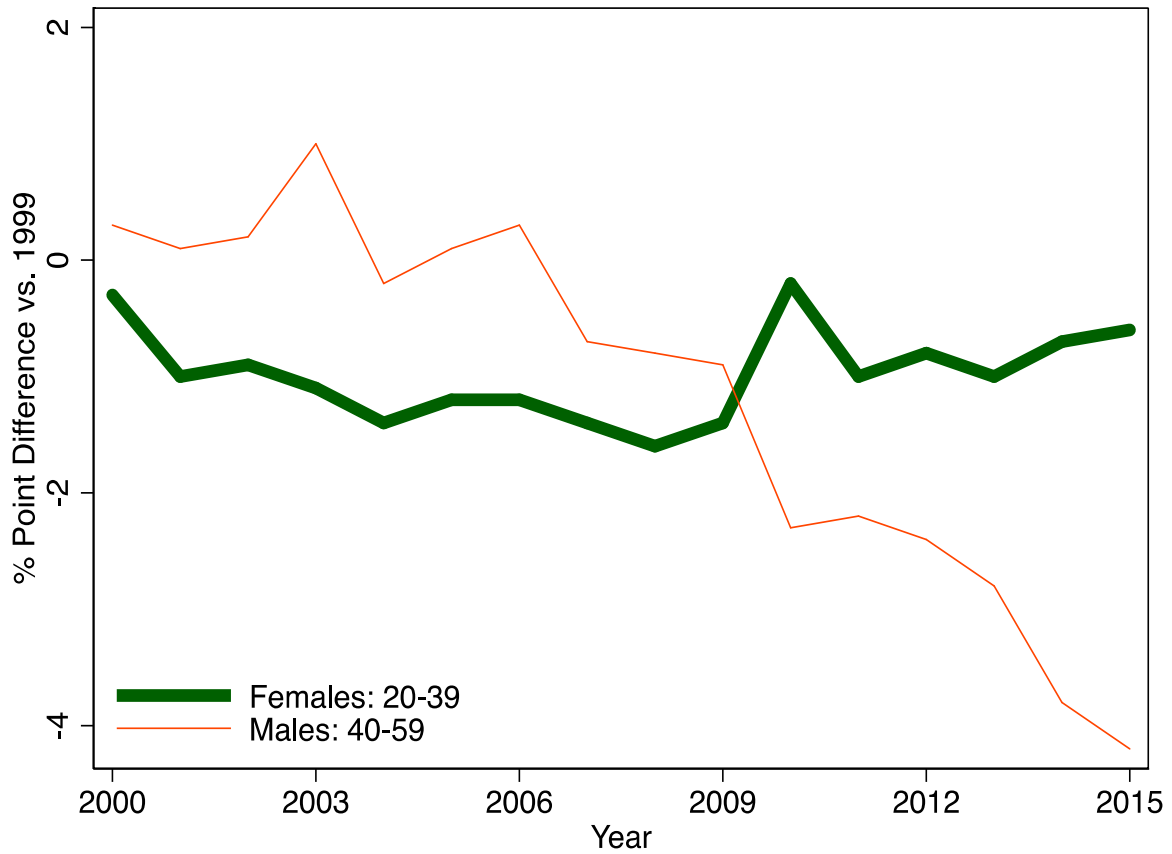
Note: See note on Tables 1-3 and 5. Models estimated are the same as in those tables, but with different sources of death.

Table B.2: Estimated Effect of Economic Conditions on 1999-2015 Change in Total Drug Death Rate, with Additional Sets of Controls

Economic Proxy/% Explained	(a)	(b)	(c)	(d)	(e)
<u>Proxies for ΔE</u>					
Multiple Proxy Estimate	2.949*** (0.641)	0.431** (0.218)	0.792*** (0.205)	0.798*** (0.171)	0.891*** (0.251)
% of Total Δ Explained	32.5%	4.8%	8.7%	8.8%	9.8%
<u>Proxies for E_0</u>					
Multiple Proxy Estimate				-0.289*** (0.046)	-0.778*** (0.184)
% of Total Δ Explained				-3.2%	-8.6%
Additional Controls	None	$X_{1999}, \Delta X$	$X_{1999}, \Delta X^I$	$X_{1999}, \Delta X$	$X_{1999}, \Delta X^I$

Note: See note on Tables 1 and 2. Estimates in columns (a) through (c) repeat those in Table 2. Estimates in columns (d) and (e) add controls for 1999 *levels* of the economic proxies.

Figure B.1: Regression-Adjusted Changes Since 1999 in Share of Drug Poisoning Deaths For Additional Groups, 2000-2015



Note: Figure shows coefficients on year dummy variables from county-level regressions that also control for county fixed-effects, the group population share, as well as the county unemployment and poverty rates, and median household incomes. Data are weighted by 2015 county populations.

Appendix C: Estimates of Drug Environment Effects Using Additional Drug Mortality Rates

I conducted additional analyses treatment vs. reference group time-patterns of drug mortality rates by analyzing several additional categories of narcotics fatalities. Specifically, illicit opioids were decomposed into heroin and synthetic opioids (ICD-10 T-codes 40.1 and 40.4), with analysis also provided for deaths involving methadone (T-code 40.3) and cocaine (T-code 40.5). Each of these drug categories exhibited sharp breaks or reversals in mortality trends during the analysis period.

Figure C.1 shows national patterns of mortality rates for these types of narcotics (as well as for opioid analgesics which were included in the main analysis). Opioid analgesic deaths grew rapidly from 1999-2011 but were flat thereafter. By contrast, heroin deaths changed little from 1999-2006, rose modestly from 2006-2010 and then quickly (by 276 percent) from 2010-2015. Synthetic opioids increased throughout the period but started from a low level, 0.4 per 100,000 in 1999 and grew slowly, to 1.3 per 100,000 in 2013, before exploding to 3.5 per 100,000 by 2015. Cocaine deaths rates grew quickly, from 1.7 to 3.2 per 100,000, from 1999-2006, declined to 1999 levels by 2009 and increased again after 2012. Methadone fatality rates rose dramatically, from 0.4 to 2.5 per 100,000, between 1999 and 2007, and then fell steadily.³⁴

To check the consistency of these patterns for the county-level analysis that follows, I examined the year coefficients from models where county-level mortality rates were regressed

³⁴ Sources of the drop in cocaine deaths after 2006 are not fully understood but reflect combinations of price increases and quantity reductions, “aging out” of the US cocaine user population and greater demand outside the United States (Kilmer and Midgette 2017). The decline in methadone deaths after 2007 probably reflected successful guidance and efforts by the Federal Drug Administration to decrease its use as treatment for pain (Jones, Baldwin, et al. 2016). I also examined deaths involving psychotropic medications, sedatives and non-specified narcotics but did not use them because each exhibited fairly steady trends over the analysis period (without sharp breaks or reversals).

on county fixed-effects, general time effects and the supplementary time-varying regressors. The patterns, shown in Figure C.2, are virtually identical to those in Figure C.1.

I next obtained regression-adjusted differences in the mortality rate changes across population groups stratified by sex and age by estimating equation (16) for models with males and 20-39 year olds (females and 40-59 year olds) as the treatment (reference) groups. The results are summarized in Figure C.3 and C.4, with solid lines indicating coefficients on the year dummy variables (relative to the reference group in the same year), dotted lines showing 95 percent confidence intervals and vertical lines showing years with breaks or reversals in mortality trends (e.g. 2006 and 2010 for heroin deaths). Of interest is whether the treatment versus control group differentials change substantially at the time of trend breaks/reversals in overall mortality rates.

The sex-differentials align closely with the drug environment hypothesis. Male heroin death rate differentials (relative to those for women) were virtually constant from 1999-2006, began to increase in 2007 and with accelerated growth after 2010. Synthetic opioid differentials were virtually nonexistent through 2013 but with much more rapid growth in male death rates from this source starting in 2014. Gender differences in death rates also closely tracked overall mortality risk for cocaine and methadone – rising in relative terms for males when overall rates were growing (from 1999-2006 for cocaine and 1999-2007 for methadone) and then falling, with a subsequent increase in male cocaine deaths following the post-2012 rise in total cocaine fatalities.

One potential concern is that these patterns might simply reflect overall higher mortality rates for males. However, this cannot be a complete explanation since synthetic opioid mortality rates were essentially the same for males and females throughout most of the 1999-2012 period

and gender differences in initial rates (in 1999) were small relative to the subsequent increases for heroin and methadone.

Figure C.4 shows corresponding patterns with 20-39 year olds as the treatment group, compared to 40-59 year olds. The results indicate differential risks that are related to the drug environment. There were no age differences in heroin-involved mortality rates from 1999-2006, but relative rates for 20-39 year olds increased slowly from 2007-2010 and more quickly thereafter. Synthetic opioid differentials were flat prior to 2013 (with lower rates for 20-39 than 40-59 year olds) but with dramatic relative growth for younger adults after 2013. Cocaine deaths became increasingly concentrated among 40-59 year olds during the 1999-2006 period of rising overall rates and then were mostly flat thereafter. Age differentials in methadone fatality rates were noisier but generally trending upwards prior to 2007, when overall death rates were growing, and then down thereafter.

To more formally evaluate whether breaks or reversals in mortality rates differentially affected sex and age groups, Table C.1 summarizes the results obtained from estimating equation (17). The coefficients on *POST* are of key interest, since they show treatment group changes in the relative trend differentials following a break or reversal in the overall mortality trend. These results confirm that changes in the overall drug environment differentially affect the treatment groups in the ways hypothesized.

Heroin deaths rose by fairly at fairly similar rates for men and young adults versus their counterparts through 2010 (when overall growth rates were relatively flat) but much faster thereafter. Similarly, there was fairly common trend growth in synthetic opioid fatality rates prior to 2013 but much greater subsequent increases males and young adults than for females and older persons (and with particularly slow relative growth for 40-59 year old women). Cocaine

death rates rose more for males and 40-59 year olds than for their counterparts from 1999-2006 but more slowly thereafter, following the decline in total cocaine death rates. For methadone, the increased trend growth was concentrated among males and older adults through 2007 but with the pattern reversed thereafter.

Additional supporting evidence is provided in Table C.2, which allows for separate trend changes for heroin and after 2006 and then following 2010 and for cocaine where decreasing overall death rates after 2006 were reversed beginning in 2011. Growth in heroin death rates was fairly homogenous prior to 2006, began to rise faster for men and younger adults in 2007, and with a further increase after 2010. Cocaine mortality rates rose for males and 40-59 year olds from 1999-2006 fell for these groups starting in 2007 and then again began to increase for males (but not 40-59 year olds) after 2012. These patterns sex-differentials or age-differentials are consistent with differential responsiveness to changes in risks related to the drug environment.

Table C.1: Sex and Age-Specific Differences in Various Narcotic Mortality Rate Trends

Regressor	Heroin	Synthetic Opioids	Cocaine	Methadone
<u>Sex-Specific (Reference Group: Females)</u>				
Male	1.01*** (0.10)	0.06*** (0.02)	1.66*** (0.11)	0.13*** (0.03)
Trend	0.05*** (0.01)	0.00 (0.00)	0.13*** (0.01)	0.17*** (0.01)
Post	0.65*** (0.04)	1.19*** (0.10)	-0.24*** (0.02)	-0.31*** (0.02)
<u>Age-Specific (Reference Group: 40-59 Year Olds)</u>				
Young	-0.43*** (0.11)	-0.35*** (0.03)	-0.19* (0.11)	-0.38*** (0.04)
Trend	0.10*** (0.01)	-0.03*** (0.00)	-0.19*** (0.02)	0.04** (0.01)
Post	0.54*** (0.05)	1.26*** (0.11)	0.20*** (0.03)	-0.07*** (0.03)

Note: See note on Table 10. Table shows differences in intercepts and time trends for males compared to females and 20-39 versus 40-49 year olds. The “Trend” coefficient shows the general difference in time trends between the treatment and reference groups. “Post” show deviations from the general trend for periods after a change in the overall trend effect. Specifically, “Post” refers to periods starting after 2010, 2013, 2006 and 2007 for heroin, synthetic opioids, cocaine and methadone. Regressions also control for group main effects, county fixed-effects and year dummy variables. Sample contains 106,426 group-year observations from 3,132 counties. Observations are weighted by 2015 county populations. Robust standard errors, clustered at the county level, are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table C.2: Additional Sex and Age-Specific Differences in Heroin and Cocaine Mortality Trends

Regressor	<u>Sex-Specific</u>		<u>Age-Specific</u>	
	Heroin	Cocaine	Heroin	Cocaine
Trend	0.01 (0.01)	0.17*** (0.01)	0.03*** (0.01)	-0.17*** (0.02)
Post	0.10*** (0.02)	-0.42*** (0.02)	0.19*** (0.03)	0.13*** (0.04)
Post2	0.56*** (0.05)	0.53*** (0.03)	0.36*** (0.06)	0.21*** (0.06)

Note: See notes on Tables 10 and C.1. Specification is the same as in table C.1, except for the inclusion of a second post-treatment period showing further changes in changes in trend slope effects. "Post" indicates differential trends after 2006 for heroin and cocaine, with "Post2" indicating additional trend breaks after 2010 and 2012. References groups are females and 40-59 year olds in the sex-specific and age-specific models. *** p<0.01, ** p<0.05, * p<0.1

Figure C.1: Selected Drug Mortality Rates, 1999-2015

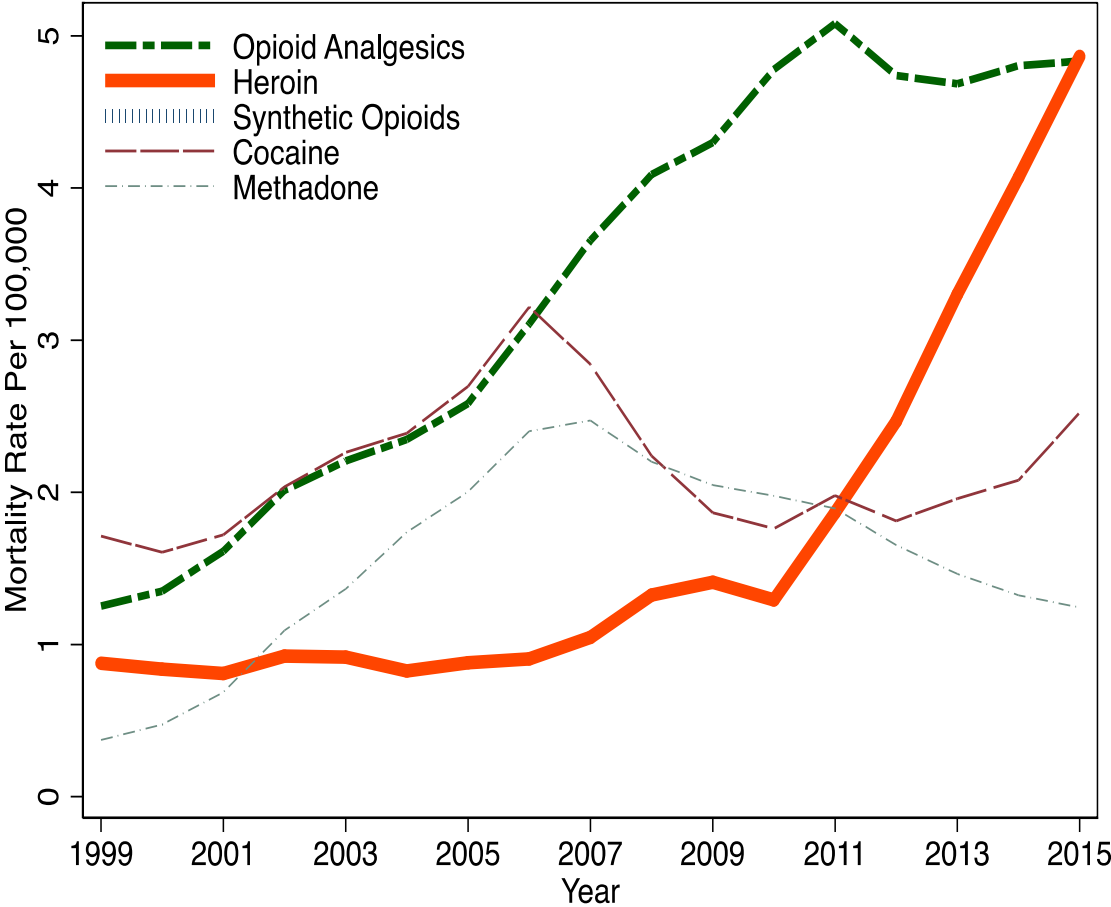
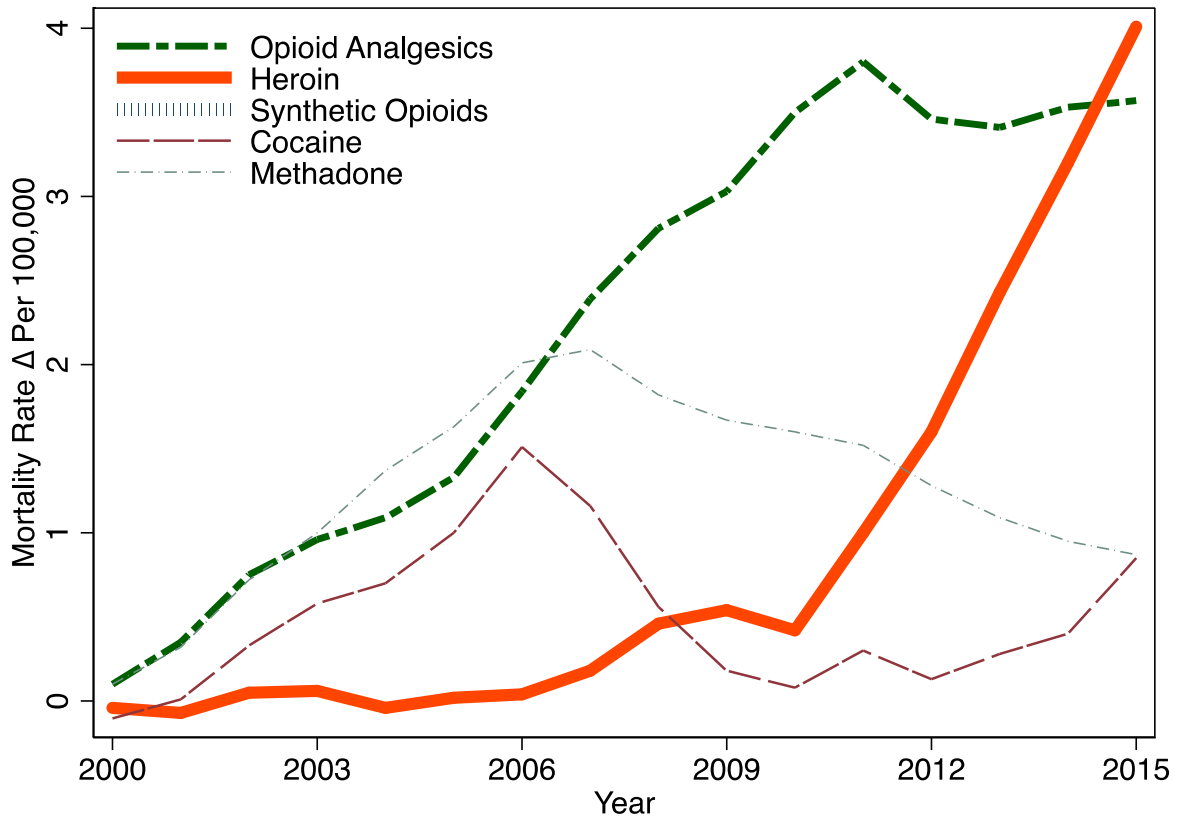
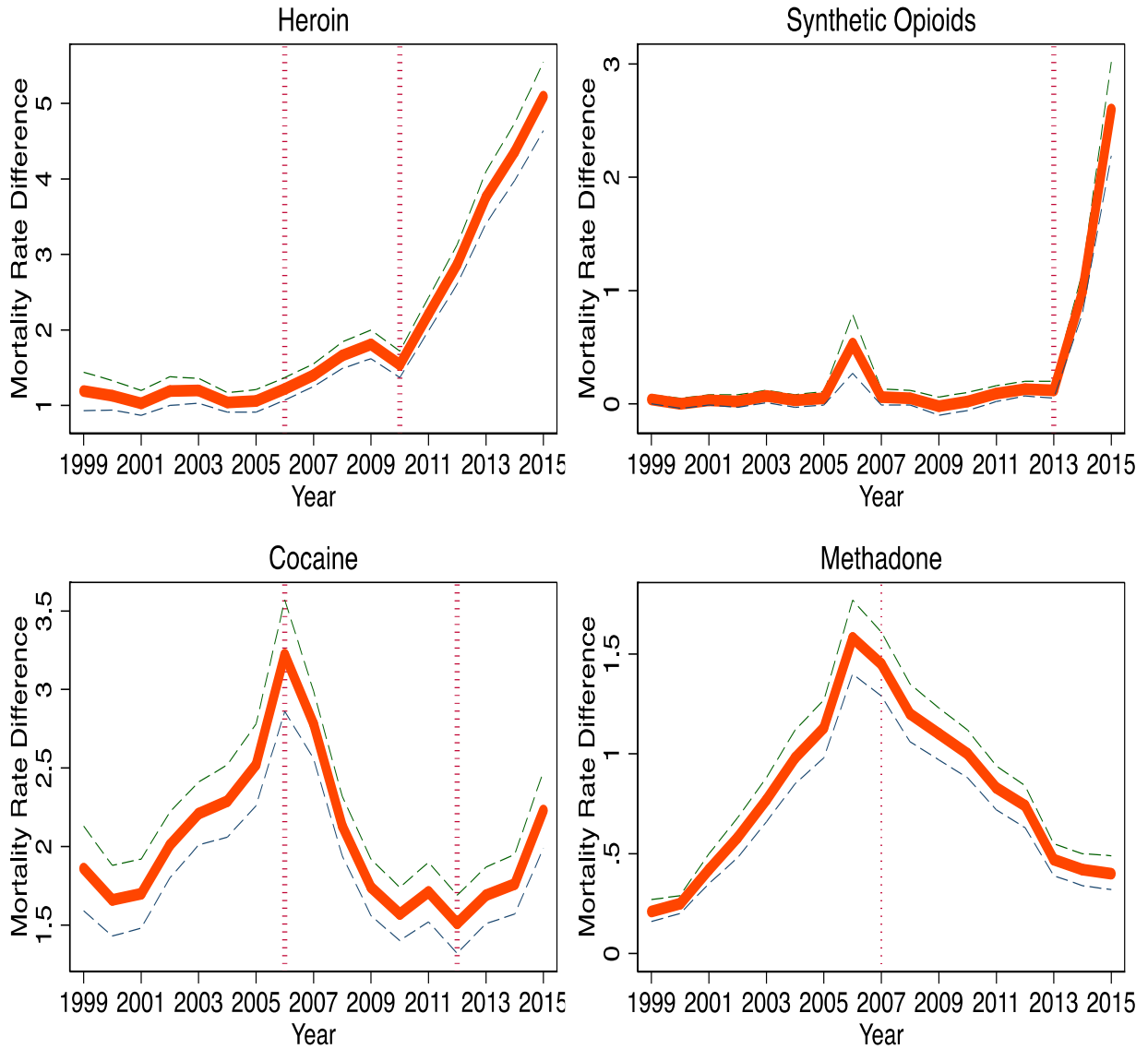


Figure C.2: Regression-Adjusted Drug Mortality Rate Changes Since 1999



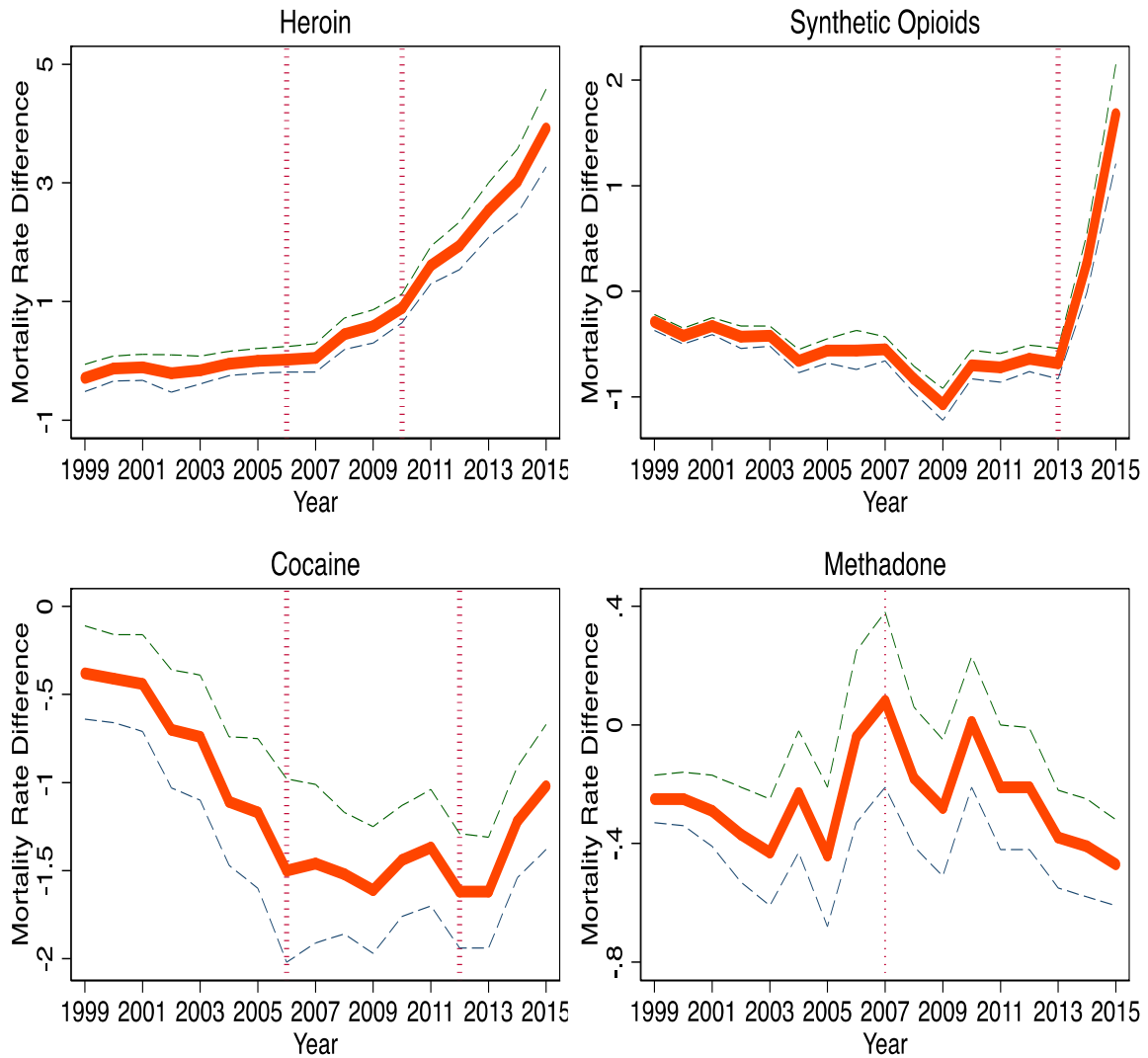
Note: Figure shows year coefficients from panel models where the dependent variables are county mortality rates per 100,000 and with 1999 as the excluded reference year. In addition to year dummy variables, the models also control for county fixed-effects. Observations are weighted by 2015 county populations.

Figure C.3: Regression-Adjusted Differences in Mortality Rates by Sex (Males vs. Females)



Note: Figures show difference in predicted mortality rates for males in the given year versus those for females from models with sex-specific mortality rates regressed against county fixed-effects, year dummy variables and year-by-sex interactions and main effects. Dashed lines show 95 percent confidence intervals. Vertical lines show years with a break or reversal in the drug-specific mortality rate trend.

Figure C.4: Regression-Adjusted Differences in Mortality Rates by Age (20-39 vs. 40-59 year olds)



Note: Figures show difference in predicted mortality rates for 20-39 year old in the given year versus those for 40-59 year olds from models with age-specific mortality rates regressed against county fixed-effects, year dummy variables and year-by-age interactions and main effects. Dashed lines show 95 percent confidence intervals. Vertical lines show years with a break or reversal in the drug-specific mortality rate trend.