Replication code for tables, figures, and appendix material from:

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10.1016/j.jhealeco.2017.07.009. (Earlier version released as NBER Working Paper No. 23192,
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A non-technical summary of this paper is available via the 2017 NBER Bulletin on Aging and
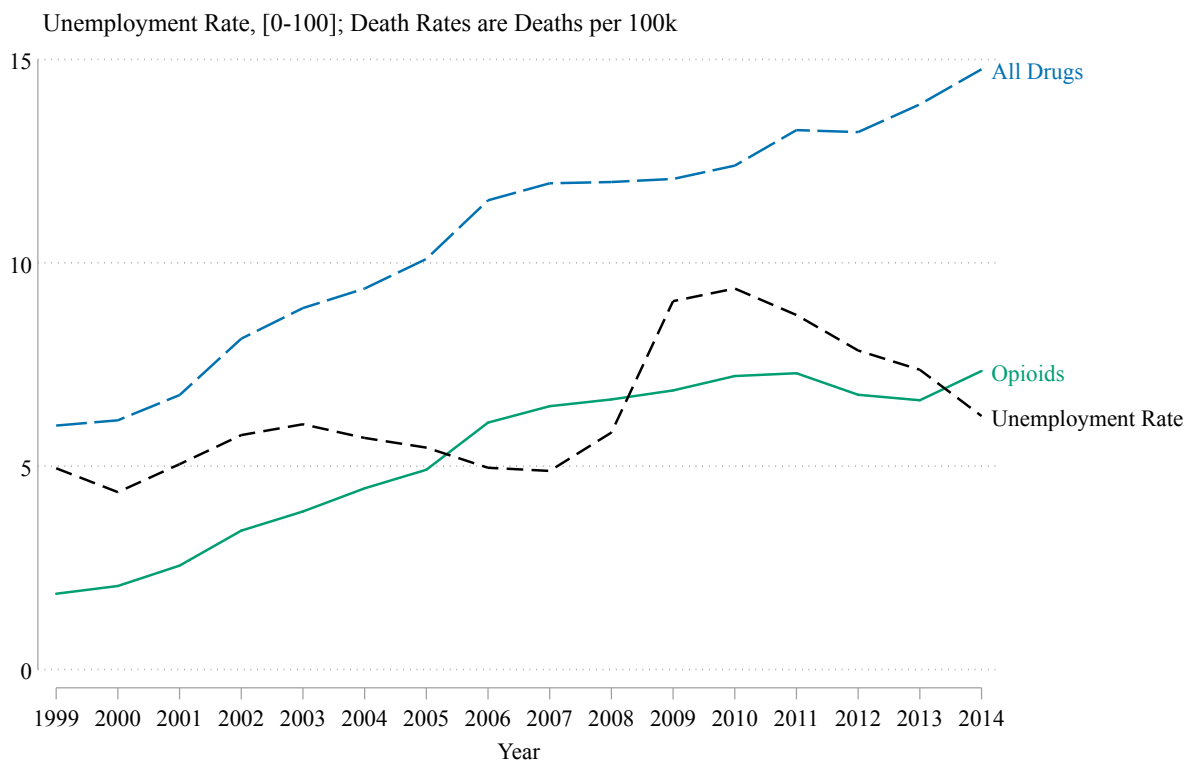Health 2017, Number 3 at https://www.nber.org/aginghealth/2017no3/w23192.shtml.

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Unemployment Rate, [0-100]; Death Rates are Deaths per 100k

Source: Author calculations using National Vital Statistics System of the Centers for Disease Control and Prevention Multiple Cause of Death (MCOD) files for 1999-2014, together with unemployment rates from the Bureau of Labor Statistics.

Figure 2: Total Opioid Death Rate by Race, 1999-2014
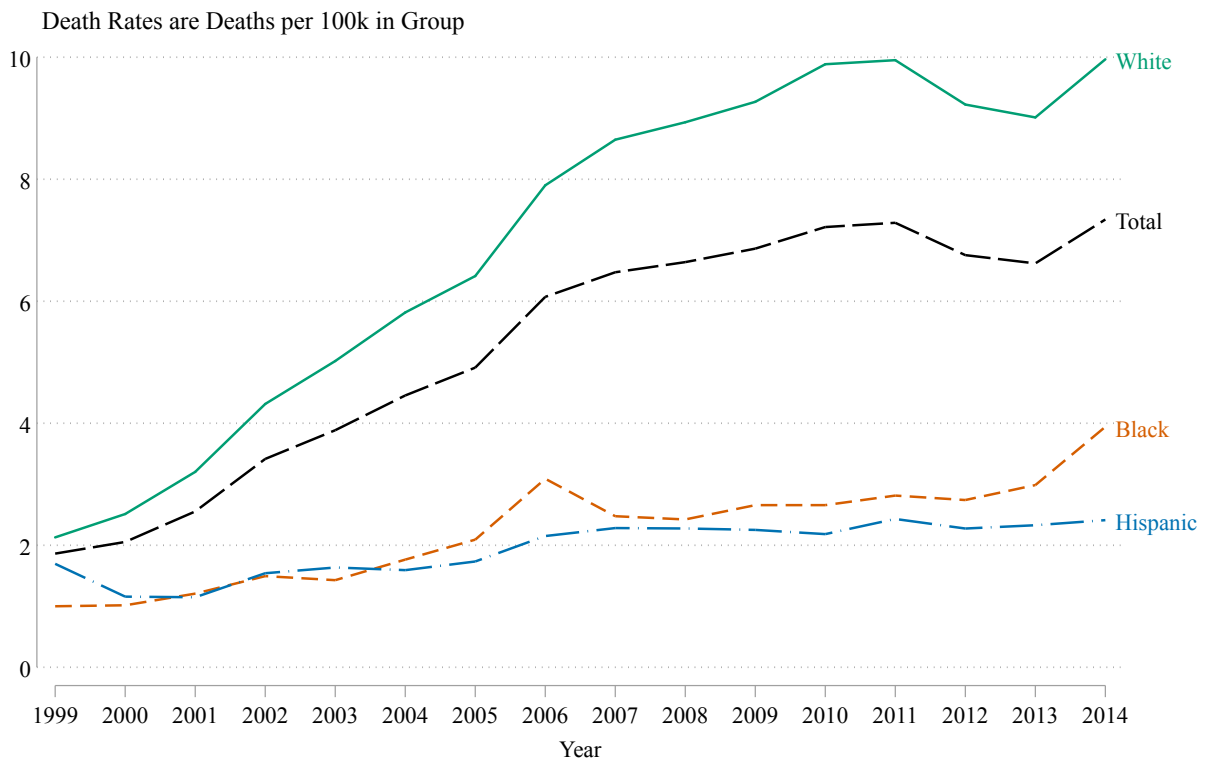
Source: Author calculations using National Vital Statistics System of the Centers for Disease Control and Prevention Multiple Cause of Death (MCOD) files for 1999-2014.

Figure 3: Opioid and All Drug Overdose ED Visit Rate, 2006-2014

ED Visit Rates are Visits per 100k
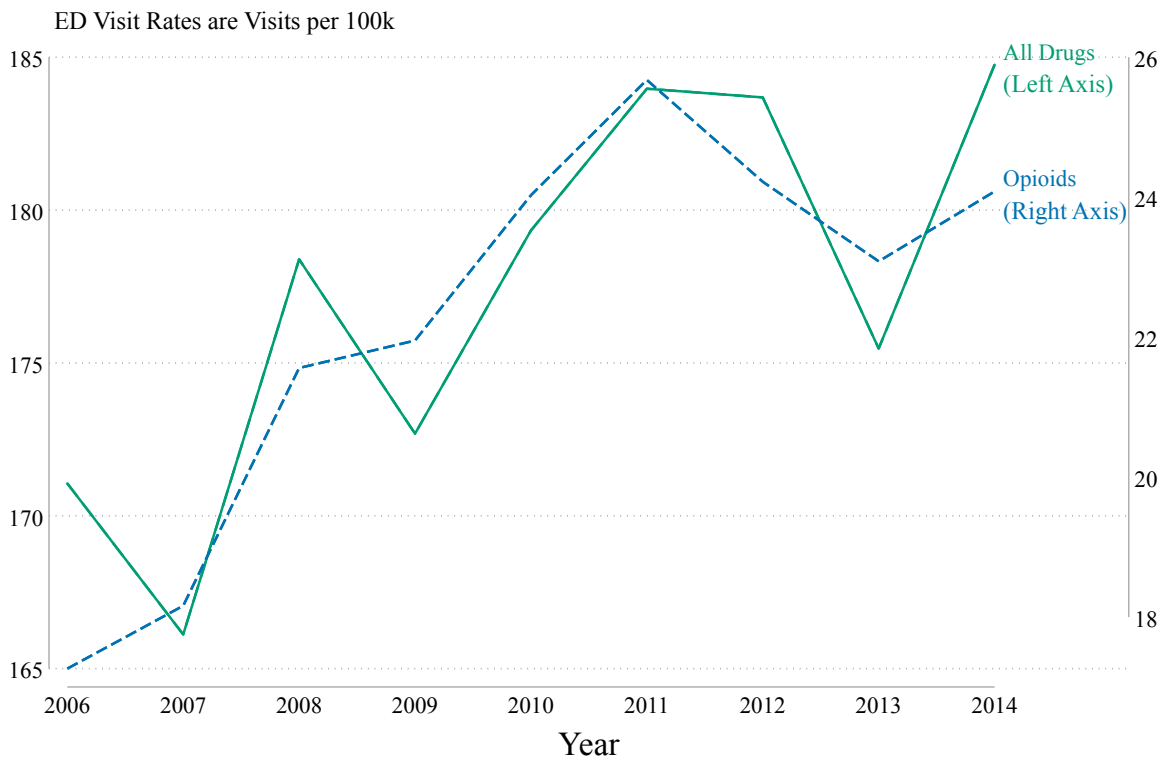
Source: Author calculations using the Healthcare Cost and Utilization Project's Nationwide Emergency Department Sample for 2006-2014.

Figure 4: Drug Overdose ED Visit Rate by Major Drug Type, 2006-2014

ED Visit Rates are Visits per 100k

Table 1: Emergency Department Data: Geographic Detail and Years Used in Analysis

State	County-Level Data	County-Level Years	State-Level Data	State-Level Years
Arizona	Yes	2005-2014	Yes	2005-2013
Florida	Yes	2005-2014	Yes	2005-2013
Hawaii	No		Yes	2003-2010, 2013
Iowa	No		Yes	2004-2013
Illinois	No		Yes	2009-2013
Kentucky	Yes	2008-2012	Yes	2008-2013
Maryland	Yes	2002-2012	Yes	2005-2013
Minnesota	No		Yes	2001-2013
North Carolina	No		Yes	2007-2013
Nebraska	No		Yes	2001-2011, 2013
New Hampshire	No		Yes	2003-2009
New Jersey	Yes	2004, 2006-2013	No	
South Carolina	No		Yes	2005-2013
Tennessee	No		Yes	2005-2013
Utah	No		Yes	2000-2013
Vermont	No		Yes	2002-2013

Note: County-level data are constructed from the micro-data (visit-level) provided by the Healthcare Cost and Utilization Project's (HCUP) State Emergency Department Databases (SEDD). The state-level data is taken directly from the "State Statistics on All ED Visits" portion of HCUPNet, available at https://hcupnet-archive.ahrq.gov.

Table 2: County-Level Summary Statistics for Drug Related Deaths and ED Visits

	Mean	S.D.	Min.	Max.	N
Mortality Data					
Unemployment Rate, [0-100]	6.39	2.59	0.70	30.30	50148
Year	2006.50	4.61	1999.00	2014.00	50162
All					
Population, in 100k	0.95	3.07	0.00	101.17	50162
Opioid Death Rate per 100k	5.35	4.84	0.00	127.80	50162
Drug Death Rate per 100k	10.77	6.92	0.00	194.46	50162
White					
Population, in 100k	0.63	1.48	0.00	31.22	50162
Opioid Death Rate per 100k	7.03	6.14	0.00	161.64	50162
Drug Death Rate per 100k	13.07	8.61	0.00	234.19	50162
Black					
Population, in 100k	0.12	0.54	0.00	14.08	50162
Opioid Death Rate per 100k	2.28	4.65	0.00	4166.67	49661
Drug Death Rate per 100k	8.50	9.67	0.00	8333.33	49661
Hispanic					
Population, in 100k	0.14	1.10	0.00	48.98	50162
Opioid Death Rate per 100k	2.00	3.87	0.00	1492.54	50120
Drug Death Rate per 100k	5.25	6.53	0.00	3571.43	50120
Emergency Department Data					
Unemployment Rate, [0-100]	7.95	3.25	2.20	25.50	1873
Year	2009.50	2.86	2002.00	2014.00	1873
All					
Population, in 100k	2.21	4.24	0.02	40.87	1873
Opioid Overdose ED Visit Rate per 100k	13.54	8.41	0.00	145.84	1873
Drug Overdose ED Visit Rate per 100k	97.52	36.91	0.00	460.87	1873
White					
Population, in 100k	1.34	2.29	0.02	23.73	1873
Opioid Overdose ED Visit Rate per 100k	17.18	10.31	0.00	152.56	1828
Drug Overdose ED Visit Rate per 100k	109.05	42.06	0.00	464.01	1828
Black					
Population, in 100k	0.34	0.82	0.00	5.69	1873
Opioid Overdose ED Visit Rate per 100k	9.46	7.93	0.00	246.31	1828
Drug Overdose ED Visit Rate per 100k	90.60	38.24	0.00	4347.83	1828

Source: Mortality data are at the county-year and come from the Centers for Disease Control and Prevention's Multiple Cause of Death files from 1999-2014 and are adjusted as in text. ED data at the county-year level and are provided via the Healthcare Cost and Utilization Project's State Emergency Department Databases (SEDD). SEDD data come from Arizona (2005-2014), Kentucky (2008, 2010-2012), Florida (2005-2014), Maryland (2002-2012), and New Jersey (2004, 2006-2103). See text for ICD-9 definitions of outcomes. County level unemployment data come from Bureau for Labor Statistics. Unemployment rate, death rates, and ED visit rates are all weighted by total county population of group. Hispanic ED visits are omitted as the ED data do not contain a reliable indicator of Hispanic ethnicity.

Table 3: The estimated effect of county-level unemployment on the rate of opioid/drug mortality and emergency department visits across multiple specifications.

	(1)	(2)	(3)
Opioid Death Rate per 100k			
Unemployment Rate, [1-100]	0.22***	0.19***	0.19***
	(0.05)	(0.04)	(0.05)
Mean of Dependent Variable	5.35	5.35	5.35
Observations	50148	50148	50148
Drug Death Rate per 100k			
Unemployment Rate, [1-100]	0.29***	0.18***	0.36***
	(0.08)	(0.05)	(0.07)
Mean of Dependent Variable	10.77	10.77	10.77
Observations	50148	50148	50148
Opioid Overdose ED Visit Rate per 100k			
Unemployment Rate, [0-100]	0.57**	1.10***	0.95***
	(0.26)	(0.30)	(0.28)
Mean of Dependent Variable	13.54	13.54	13.54
Observations	1873	1873	1873
Drug Overdose ED Visit Rate per 100k			
Unemployment Rate, [0-100]	0.71	1.54	1.19
	(0.88)	(1.04)	(1.20)
Mean of Dependent Variable	97.52	97.52	97.52
Observations	1873	1873	1873
County Fixed-Effects	Yes	Yes	Yes
Year Fixed-Effects	Yes	Yes	Yes
County Specific Time Trends	No	Yes	No
State-by-Year Fixed-Effects	No	No	Yes

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors clustered at the county level in parentheses. Each regression is weighted by total county population.

Table 4: The estimated effect of county-level unemployment on the rate of opioid/drug mortality and emergency department visits for our preferred specification across race/ethnicity.

	(1) All	(2) White	(3) Black	(4) Hispanic
Opioid Death Rate per 100k				
Unemployment Rate, [0-100]	0.19***	0.23***	–0.14**	0.04
	(0.05)	(0.05)	(0.07)	(0.03)
Mean of Dependent Variable	5.46	6.33	2.19	1.60
Observations	50148	50148	49647	50106
Drug Death Rate per 100k				
Unemployment Rate, [0-100]	0.36***	0.48***	–0.13	0.11*
	(0.07)	(0.08)	(0.10)	(0.06)
Mean of Dependent Variable	9.46	10.71	6.16	3.45
Observations	50148	50148	49647	50106
Opioid Overdose ED Visit Rate per 100k				
Unemployment Rate, [0-100]	0.95***	0.91**	1.25***	
	(0.28)	(0.37)	(0.45)	
Mean of Dependent Variable	16.91	18.92	7.18	.
Observations	1873	1828	1828	1828
Drug Overdose ED Visit Rate per 100k				
Unemployment Rate, [0-100]	1.19	1.01	–1.07	
	(1.20)	(1.29)	(1.97)	
Mean of Dependent Variable	117.43	123.45	99.26	.
Observations	1873	1828	1828	1828
County Fixed-Effects	Yes	Yes	Yes	Yes
Year Fixed-Effects	Yes	Yes	Yes	Yes
County Time Trends	Yes	Yes	Yes	Yes
State-by-Year Fixed-Effects	Yes	Yes	Yes	Yes

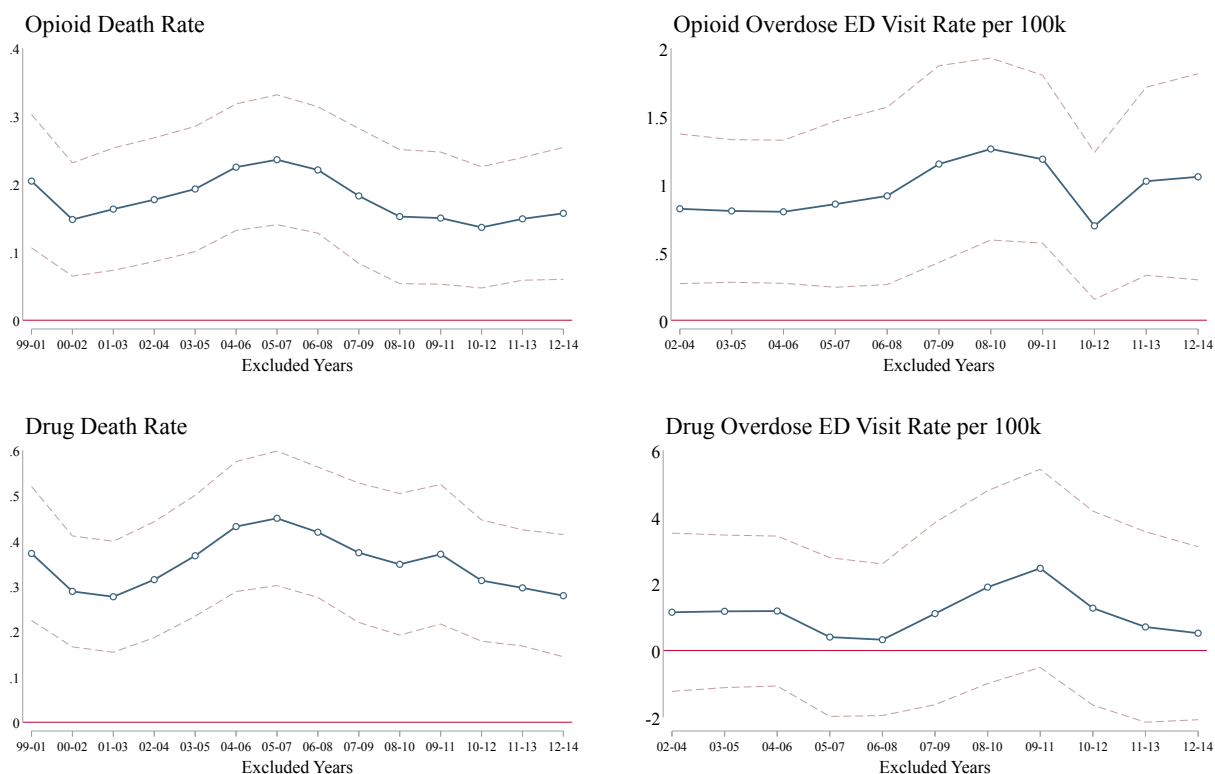*Note:* * p < 0.1, ** p < 0.05, *** p < 0.01. Robust standard errors clustered at the county level in parentheses. All specifications include county fixed-effects, year fixed-effects, and state-by-year fixed effects. Each regression is weighted by county population of group. Hispanic ED visits are omitted as the ED data do not contain a reliable indicator of Hispanic ethnicity.

Table 5: The estimated effect of state-level unemployment on the rate of opioid/drug mortality and emergency department visits across multiple specifications and race/ethnicity.

	All		White		Black		Hispanic	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Opioid Death Rate per 100k								
Unemployment Rate, [0-100]	0.24***	0.33***	0.45***	0.41***	0.09	0.14	0.05	8.68***
	(0.08)	(0.08)	(0.10)	(0.11)	(0.06)	(0.09)	(0.05)	(2.96)
Mean of Dependent Variable	5.35	5.35	7.02	7.02	2.28	2.28	2.00	2.00
Observations	816	816	816	816	816	816	816	816
Drug Death Rate per 100k								
Unemployment Rate, [0-100]	0.24**	0.35***	0.54***	0.40***	0.19	0.34**	0.05	0.18**
	(0.10)	(0.11)	(0.11)	(0.14)	(0.12)	(0.14)	(0.07)	(0.09)
Mean of Dependent Variable	10.75	10.75	13.05	13.05	8.49	8.49	5.25	5.25
Observations	816	816	816	816	816	816	816	816
Opioid ED Visit Rate per 100k								
Unemployment Rate, [0-100]	3.24***	3.17***	5.51***	4.56***	0.74	1.04		
	(0.59)	(0.84)	(1.16)	(1.61)	(0.70)	(0.82)		
Mean of Dependent Variable	50.50	50.50	65.98	65.98	29.05	29.05	.	.
Observations	138	138	101	101	73	73	67	67
Drug ED Visit Rate per 100k								
Unemployment Rate, [0-100]	2.70	5.43	5.88	4.84	8.74	4.00		
	(2.76)	(3.45)	(6.68)	(6.99)	(5.40)	(5.40)		
Mean of Dependent Variable	318.67	318.67	352.22	352.22	264.87	264.87	.	.
Observations	139	139	106	106	100	100	89	89
State Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Specific Time Trends	No	Yes	No	Yes	No	Yes	No	Yes

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors clustered at the state level in parentheses. Each regression is weighted by total state population of group. Hispanic ED visits are omitted as the ED data do not contain a reliable indicator of Hispanic ethnicity.

Figure A1: The estimated effect of county-level unemployment on the rate of opioid/drug mortality and emergency department visits excluding various three-year bins.

Note: Each point is from a separate regression that corresponds to our preferred specification in the text. Each regression has county fixed-effects, year fixed-effects, and state-by-year fixed effects. Each regression excludes the years noted. 95% confidence intervals are displayed by dashed lines and are calculated using robust standard errors clustered at the county level. Each regression is weighted by total county population.

Figure A2: The estimated effect of county-level unemployment on the rate of opioid/drug mortality and emergency department visits excluding population density quintiles.
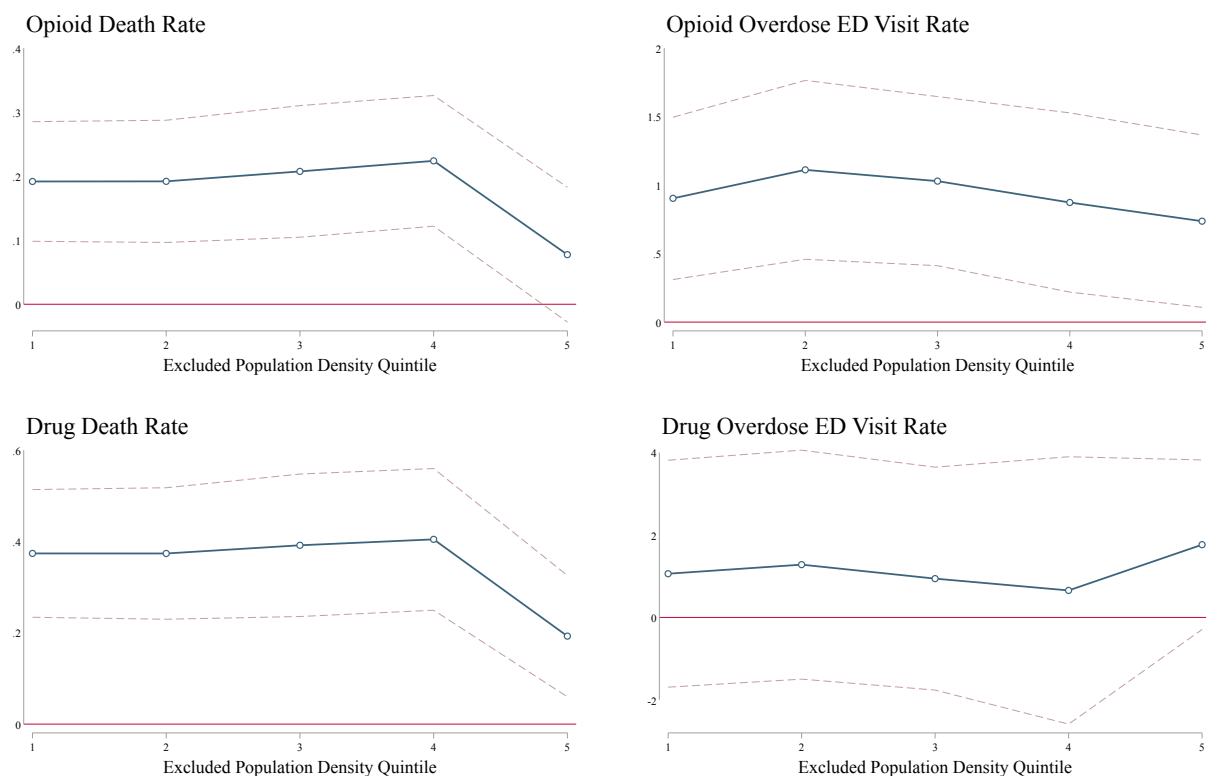
Note: Each point is from a separate regression that corresponds to our preferred specification in the text. Each regression has county fixed-effects, year fixed-effects, and state-by-year fixed effects. Each regression excludes the quintile noted. 95% confidence intervals are displayed by dashed lines and are calculated using robust standard errors clustered at the county level. Each regression is weighted by total county population.

Figure A3: The estimated effect of county-level unemployment on the rate of opioid/drug mortality and emergency department visits excluding % graduated high school quintiles

Note: Each point is from a separate regression that corresponds to our preferred specification in the text. Each regression has county fixed-effects, year fixed-effects, and state-by-year fixed effects. Each regression excludes the quintile noted. 95% confidence intervals are displayed by dashed lines and are calculated using robust standard errors clustered at the county level. Each regression is weighted by total county population.

Figure A4: The estimated effect of county-level unemployment on the rate of opioid/drug mortality and emergency department visits excluding % non-white quintiles
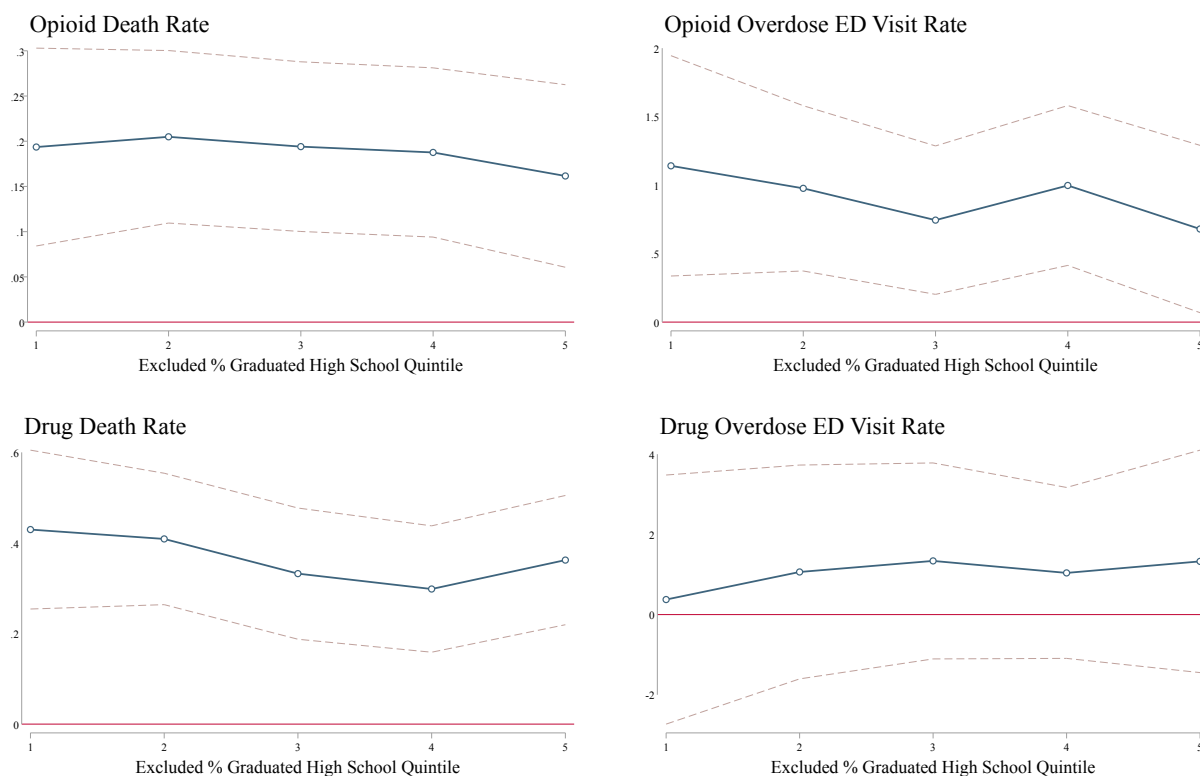

Note: Each point is from a separate regression that corresponds to our preferred specification in the text. Each regression has county fixed-effects, year fixed-effects, and state-by-year fixed effects. Each regression excludes the quintile noted. 95% confidence intervals are displayed by dashed lines and are calculated using robust standard errors clustered at the county level. Each regression is weighted by total county population.

Figure A5: The estimated effect of county-level unemployment on the rate of opioid/drug mortality and emergency department visits excluding change in % manufacturing employment (1990-2007) quintiles
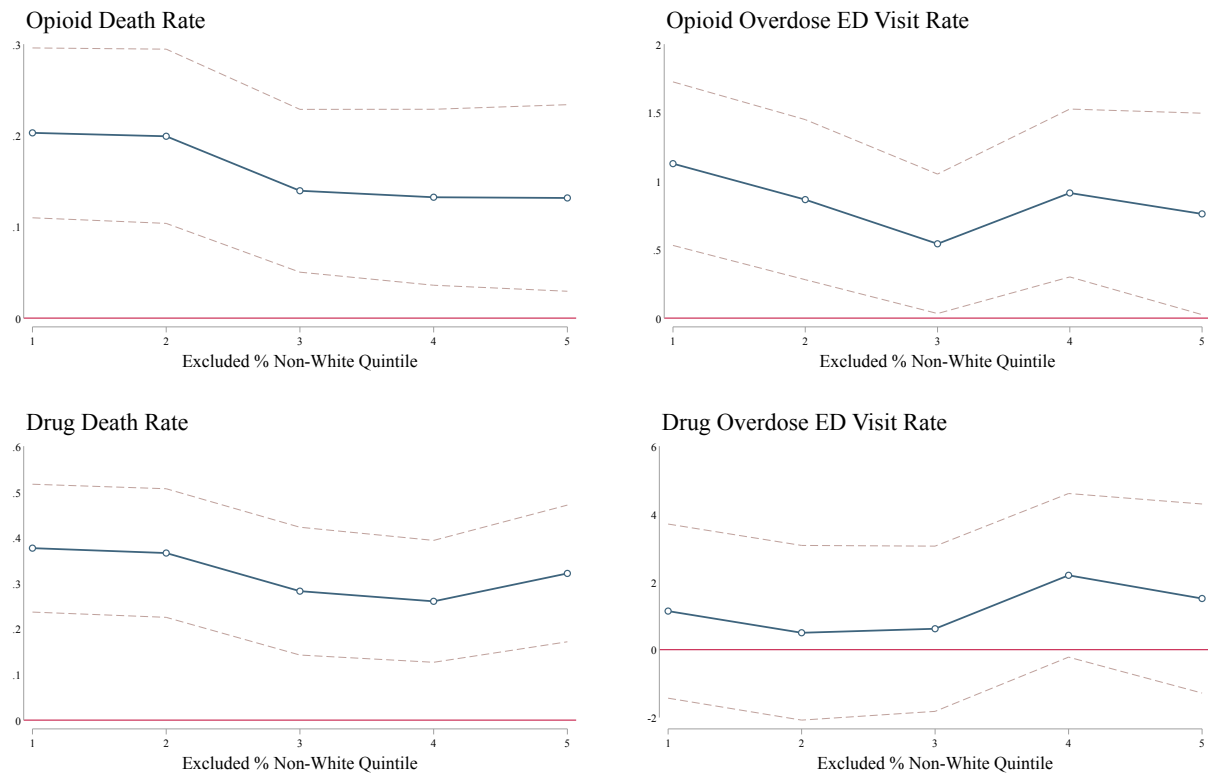

Note: Each point is from a separate regression that corresponds to our preferred specification in the text. Each regression has county fixed-effects, year fixed-effects, and state-by-year fixed effects. Each regression excludes the quintile noted. 95% confidence intervals are displayed by dashed lines and are calculated using robust standard errors clustered at the county level. Each regression is weighted by total county population. Data on change in manufacturing employment come from Autor et al. (2013). The lower the quintile, the larger the decrease in the share of manufacturing employment.

Figure A6: The estimated effect of county-level unemployment on the rate of opioid/drug mortality and emergency department visits excluding change in import exposure (1990-2007) quintiles
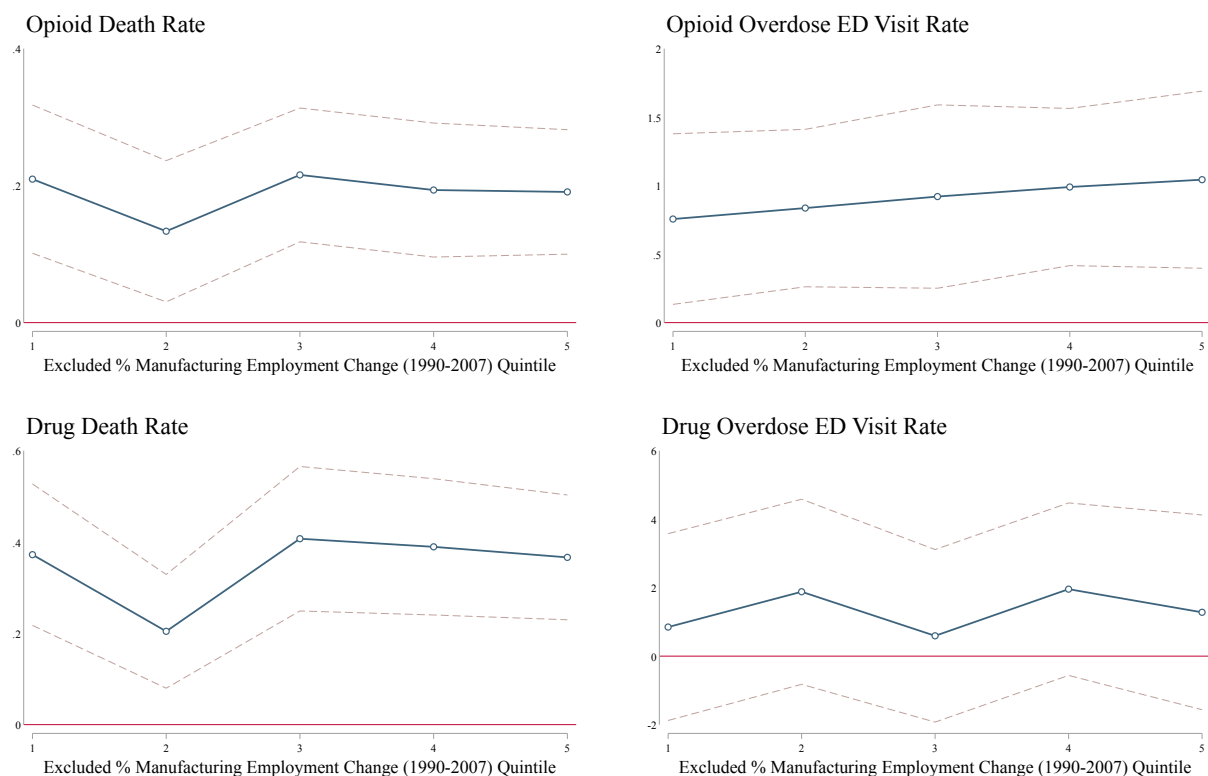

Note: Each point is from a separate regression that corresponds to our preferred specification in the text. Each regression has county fixed-effects, year fixed-effects, and state-by-year fixed effects. Each regression excludes the quintile noted. 95% confidence intervals are displayed by dashed lines and are calculated using robust standard errors clustered at the county level. Each regression is weighted by total county population. Data on change in manufacturing employment come from Autor et al. (2013). The lower the quintile, the smaller the change in import exposure.

Figure A7: The effect of county-level unemployment on the rate of opioid ED visits and the rate of ED visits for various placebos.
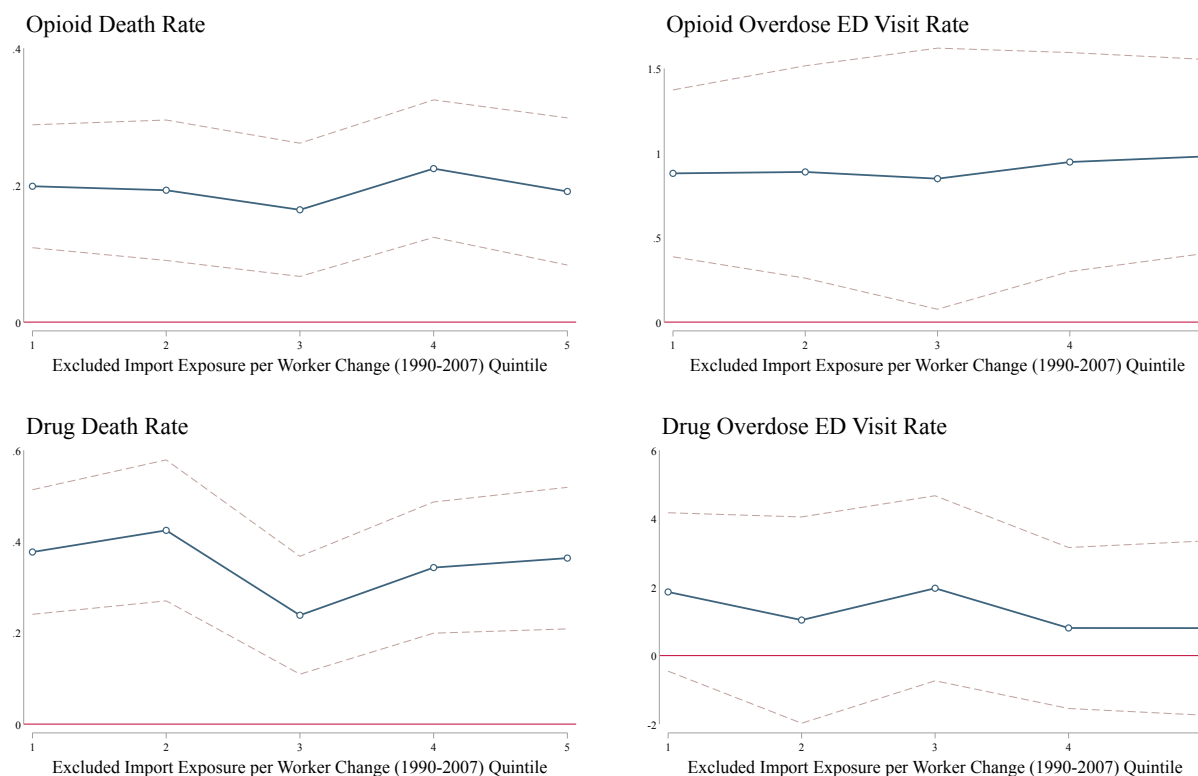

Note: Each point is from a separate regression that corresponds to our preferred specification in the text. Each regression has county fixed-effects, year fixed-effects, and state-by-year fixed effects. 95% confidence intervals are displayed by bracketed lines and are calculated using robust standard errors clustered at the county level. Each regression is weighted by total county population.

Figure A8: The effect of county-level unemployment on the opioid ED visit rate across various age groups and expected payer.
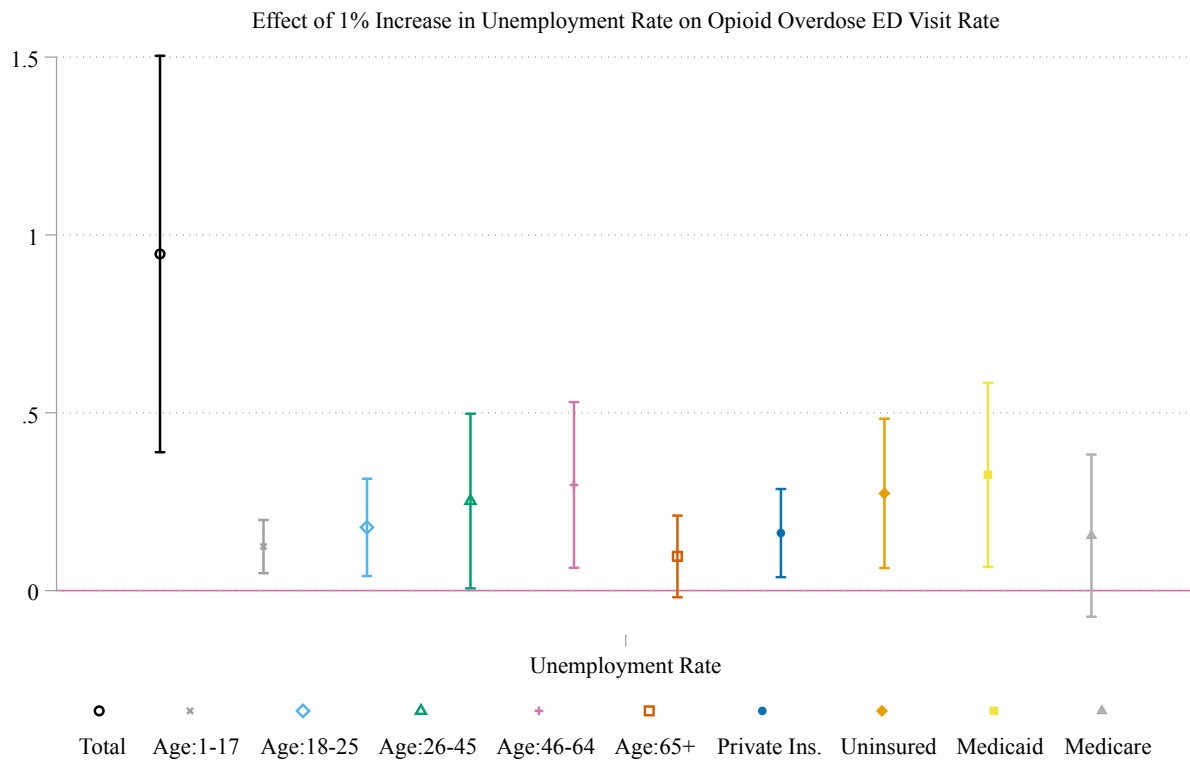
Effect of 1% Increase in Unemployment Rate on Opioid Overdose ED Visit Rate

Unemployment Rate

○ Total × Age:1-17 ◇ Age:18-25 △ Age:26-45 + Age:46-64 □ Age:65+ ● Private Ins. ◆ Uninsured ■ Medicaid ▲ Medicare
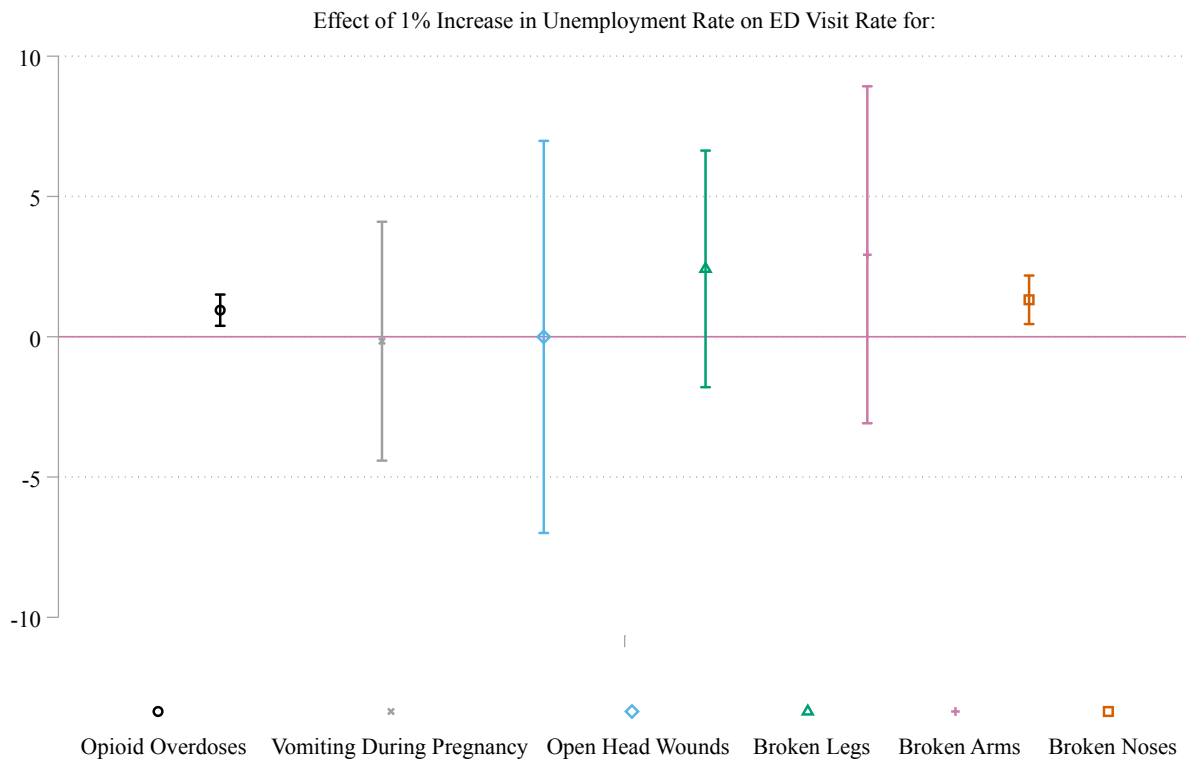
Note: Each point is from a separate regression that corresponds to our preferred specification in the text. Each regression has county fixed-effects, year fixed-effects, and state-by-year fixed effects. 95% confidence intervals are displayed by bracketed lines and are calculated using robust standard errors clustered at the county level. Each regression is weighted by total county population.

Figure A9: All Drug Death Rate by Race, 1999-2014

Death Rates are Deaths per 100k in Group
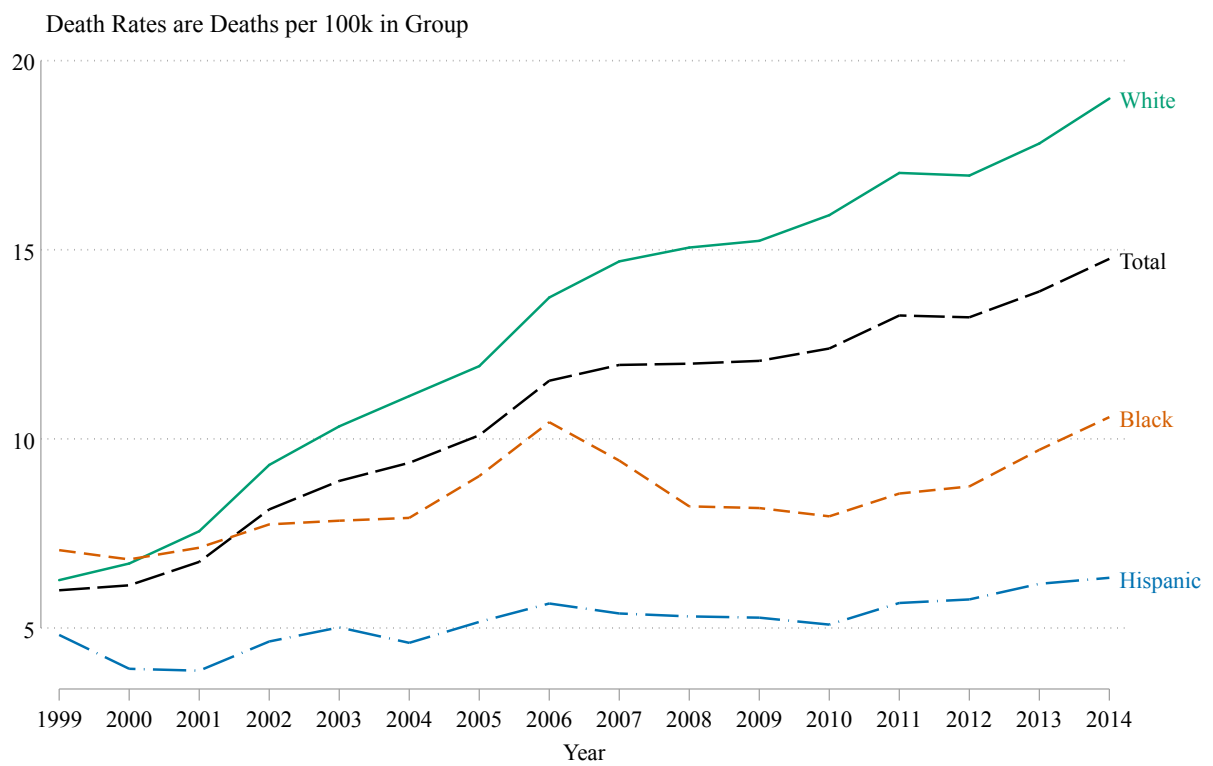
Figure A10: Simulated Power Analysis For All Drug Overdose ED Visit Rate

Power (% of cases where imposed true treatment effect is correctly identified)

Imposed True Treatment Effect Size
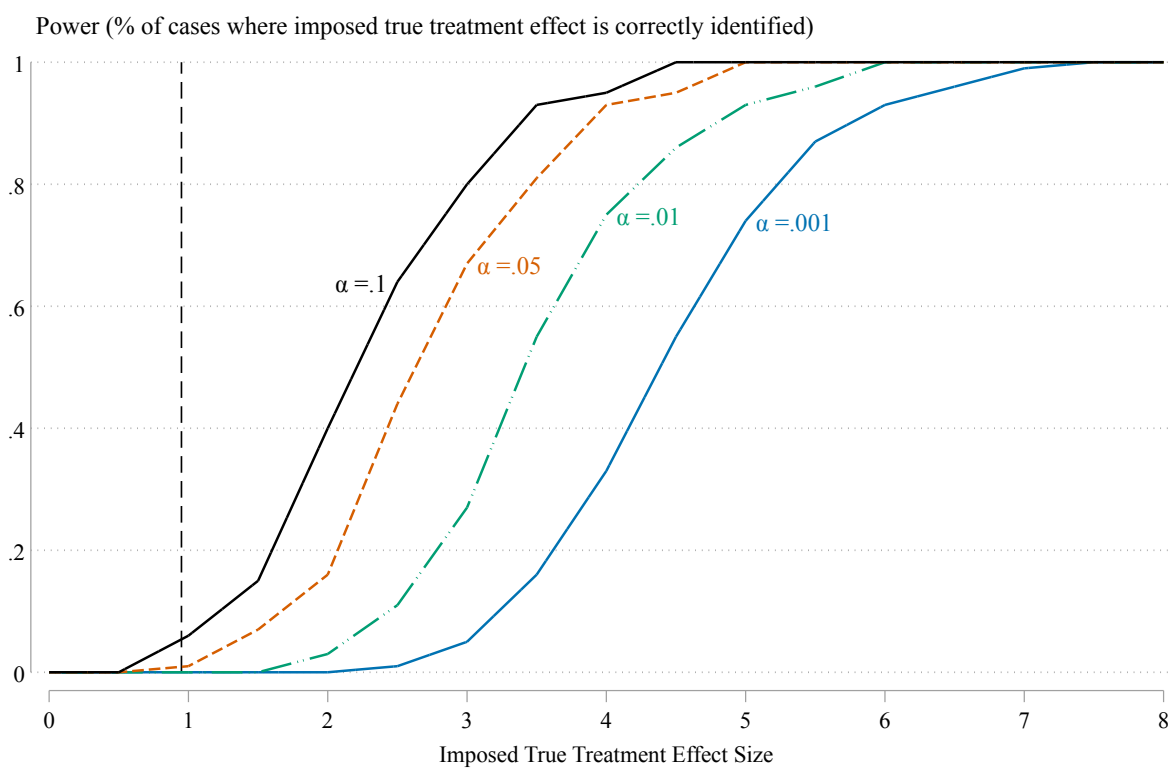
Note: The dashed vertical line is the estimated effect size of 1 percentage point increase in the unemployment rate on the opioid overdose ED visit rate. α is the probability of a type I error.

Table A1: The estimated effect of county-level unemployment on the rate of opioid/drug mortality and emergency department visits across various types of time trends.

	Opioid Death Rate (1)	All Drug Death Rate (2)	Opioid ED Visit Rate (3)	Drug ED Visit Rate (4)
All Races/Ethnicities				
No Time Trends	0.19***	0.36***	0.95***	1.19
	(0.05)	(0.07)	(0.28)	(1.20)
5 County Time Trends by Pop. Quintile	0.19***	0.36***	0.92***	1.28
	(0.05)	(0.07)	(0.28)	(1.29)
100 County Time Trends by Pop. Percentile	0.18***	0.33***	0.66**	–0.32
	(0.04)	(0.06)	(0.29)	(0.97)
Top 1% of Counties Have a Specific Trend, 99 Other Trends by Pop. Percentile	0.16***	0.26***	0.68**	–0.78
	(0.04)	(0.06)	(0.30)	(0.95)
Top 5% of Counties Have a Specific Trend, 19 Other Trends by Pop. Vigintile	0.12***	0.18***	0.82***	0.44
	(0.04)	(0.05)	(0.27)	(1.06)
Commuter Zone Specific Time Trends	0.10**	0.18***	0.32	–2.01*
	(0.04)	(0.06)	(0.32)	(1.21)
County Specific Time Trends	0.03	0.01	0.49	–1.49
	(0.05)	(0.05)	(0.38)	(1.33)
Observations	50148	50148	1873	1873
County Fixed-Effects	Yes	Yes	Yes	Yes
Year Fixed-Effects	Yes	Yes	Yes	Yes
State-by-Year Fixed-Effects	Yes	Yes	Yes	Yes

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors clustered at the county level in parentheses. Each regression is weighted by total county population.

Table A2: Summary Statistics for Appendix

	Mean	S.D.	Min.	Max.	N
State-Level Mortality Data					
Unemployment Rate, [0-100]	6.31	2.14	2.30	13.70	815
Median Income, $1000s	48.06	7.66	29.30	76.17	815
Employment to Population Ratio	70.20	4.23	46.67	83.48	815
Year	2006.51	4.61	1999.00	2014.00	815
All					
Population, in 100k	58.73	65.69	4.92	388.02	815
Opioid Death Rate per 100k	5.35	3.11	0.00	28.70	815
Heroin Death Rate per 100k	1.53	1.59	0.00	11.76	815
Drug Death Death Rate per 100k	10.77	4.18	1.82	34.23	815
Drug Death Rate per 100k, Exluding Opioids	5.41	2.00	0.34	15.60	815
Drug Death Rate per 100k, Exluding Opioids and Her	4.17	1.43	0.34	15.14	815
White					
Population, in 100k	39.05	34.80	1.62	163.90	815
Opioid Death Rate per 100k	7.03	4.13	0.00	29.70	815
Heroin Death Rate per 100k	1.75	1.87	0.00	13.06	815
Drug Death Rate per 100k	13.07	5.58	0.97	35.37	815
Black					
Population, in 100k	7.46	8.71	0.03	32.49	815
Opioid Death Rate per 100k	2.28	1.81	0.00	25.79	815
Heroin Death Rate per 100k	1.26	1.58	0.00	19.73	815
Drug Death Rate per 100k	8.50	4.59	0.00	39.58	815
Hispanic					
Population, in 100k	8.86	21.85	0.05	149.89	815
Opioid Death Rate per 100k	2.00	1.86	0.00	21.57	815
Heroin Death Rate per 100k	1.22	1.13	0.00	11.55	815
Drug Death Rate per 100k	5.25	3.33	0.00	28.37	815
State-Level Emergency Department Data					
Unemployment Rate, [0-100]	6.99	2.57	2.60	11.20	140
Median Income, $1000s	49.07	7.39	38.59	71.84	140
Employment to Population Ratio	70.83	5.25	61.70	82.41	140
Year	2008.11	3.30	2000.00	2013.00	140
All					
Population, in 100k	51.01	45.58	6.15	196.00	140
Opioid ED Visit Rate per 100k	50.50	18.85	9.07	87.22	139
Heroin ED Visit Rate per 100k	9.79	10.57	0.54	52.10	131
Drug ED Visit Rate per 100k	318.67	58.18	139.17	493.38	140
White					
Population, in 100k	35.10	27.28	2.72	111.87	140
Opioid ED Visit Rate per 100k	65.98	28.06	3.94	115.12	103
Heroin ED Visit Rate per 100k	11.25	12.38	0.63	64.21	99
Drug ED Visit Rate per 100k	352.23	98.26	2.52	557.93	108
Black					
Population, in 100k	6.99	8.95	0.05	31.37	140
Opioid ED Visit Rate per 100k	29.05	12.54	10.03	82.50	74
Heroin ED Visit Rate per 100k	12.37	17.58	0.48	60.70	46
Drug ED Visit Rate per 100k	264.87	62.22	87.78	522.99	101
Hispanic					
Population, in 100k	6.43	10.65	0.07	46.48	140
Opioid ED Visit Rate per 100k	18.85	11.20	4.19	73.56	70
Heroin ED Visit Rate per 100k	6.95	7.20	1.32	70.13	37
Drug ED Visit Rate per 100k	161.30	67.82	18.45	610.70	93
County-Level Variables for Mortality Data					
% High School Graduates, 2010	77.36	8.84	0.00	97.00	3135
Population per sq. Mile, 2010	215.51	1224.37	0.04	47038.61	3134
% Non-White, 2010	0.21	0.20	0.00	0.97	3135
Median Income, $1000s	43.14	10.75	20.58	119.08	3135
County-Level Variables for Emergency Department Data					
% High School Graduates, 2010	73.18	10.17	49.20	93.10	247
Population per sq. Mile, 2010	364.23	1006.97	4.51	10192.12	247
% Non-White, 2010	0.20	0.18	0.01	0.85	247
Median Income, $1000s	45.75	15.06	19.83	108.23	1873
Heroin Overdose ED Visits per 100k	4.72	12.72	0.00	180.18	1873
White Heroin Overdose ED Visits per 100k	4.04	11.84	0.00	180.18	1828
Black Heroin Overdose ED Visits per 100k	0.38	1.95	0.00	31.07	1828
Hispanic Heroin Overdose ED Visits per 100k	0.25	1.13	0.00	24.78	1828
Drug ED Visit Rate per 100k, Exluding Opioids	100.52	46.63	0.00	441.26	1873
Drug ED Visit Rate per 100k, Exluding Opioids and Heroin	95.92	48.76	−67.95	441.26	1873
Vomiting During Pregnancy ED Visits per 100k	95.30	44.62	0.00	332.43	1873
Open Head Wound ED Visits per 100k	851.25	162.30	246.09	1954.58	1873
Broken Leg ED Visits per 100k	284.51	75.39	105.89	882.06	1873
Broken Arm ED Visits per 100k	583.51	126.05	209.62	1462.88	1873
Broken Nose ED Visits per 100k	63.51	16.62	6.92	242.00	1873

Table A3: The estimated effect of county-level unemployment on the rate of opioid/drug mortality and emergency department visits for our preferred specification with median income across race/ethnicity.

	(1) All	(2) White	(3) Black	(4) Hispanic
Opioid Death Rate per 100k				
Unemployment Rate, [0-100]	0.16***	0.19***	–0.15**	0.03
	(0.05)	(0.05)	(0.07)	(0.03)
Median Income, $1000s	–0.04**	–0.08***	–0.02	–0.01
	(0.02)	(0.02)	(0.04)	(0.01)
Mean of Dependent Variable	5.46	6.33	2.19	1.60
Observations	50148	50148	49647	50106
Drug Death Rate per 100k				
Unemployment Rate, [0-100]	0.34***	0.42***	–0.09	0.11*
	(0.07)	(0.08)	(0.09)	(0.06)
Median Income, $1000s	–0.04	–0.11***	0.08	–0.01
	(0.04)	(0.04)	(0.06)	(0.02)
Mean of Dependent Variable	9.46	10.71	6.16	3.45
Observations	50148	50148	49647	50106
Opioid Overdose ED Visit Rate per 100k				
Unemployment Rate, [0-100]	0.92***	0.90**	1.10***	
	(0.28)	(0.36)	(0.41)	
Median Income, $1000s	–0.09	–0.05	–0.32***	–0.09
	(0.10)	(0.12)	(0.12)	(0.09)
Mean of Dependent Variable	16.91	18.92	7.18	.
Observations	1873	1828	1828	1828
Drug Overdose ED Visit Rate per 100k				
Unemployment Rate, [0-100]	1.25	0.98	–0.50	
	(1.19)	(1.27)	(1.88)	
Median Income, $1000s	0.20	–0.07	1.17*	0.39
	(0.37)	(0.38)	(0.70)	(0.58)
Mean of Dependent Variable	117.43	123.45	99.26	.
Observations	1873	1828	1828	1828
County Fixed-Effects	Yes	Yes	Yes	Yes
Year Fixed-Effects	Yes	Yes	Yes	Yes
County Specific Time Trends	No	No	No	No
State-by-Year Fixed-Effects	Yes	Yes	Yes	Yes

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors clustered at the county level in parentheses. All specifications include county fixed-effects, year fixed-effects, and state-by-year fixed effects. Each regression is weighted by county population of group. Hispanic ED visits are omitted as the ED data do not contain a reliable indicator of Hispanic ethnicity.

Table A4: The estimated effect of state-level employment-to-population ratio on the rate of opioid/drug mortality and emergency department.

	All		White		Black		Hispanic	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Opioid Death Rate per 100k								
Employment to Population Ratio	–0.09***	–0.13***	–0.21***	–0.18***	0.01	–0.02	0.02	–0.02
	(0.03)	(0.03)	(0.03)	(0.04)	(0.02)	(0.02)	(0.03)	(0.03)
Mean of Dependent Variable	5.35	5.35	7.02	7.02	2.28	2.28	2.00	2.00
Observations	816	816	816	816	816	816	816	816
Drug Death Rate per 100k								
Employment to Population Ratio	–0.12***	–0.14***	–0.27***	–0.21***	–0.03	0.01	–0.02	–0.04
	(0.04)	(0.04)	(0.04)	(0.05)	(0.04)	(0.03)	(0.04)	(0.05)
Mean of Dependent Variable	10.75	10.75	13.05	13.05	8.49	8.49	5.25	5.25
Observations	816	816	816	816	816	816	816	816
Opioid ED Visit Rate per 100k								
Employment to Population Ratio	–1.15***	–0.31	–1.64*	–1.61	–0.04	–1.10*		
	(0.38)	(0.57)	(0.89)	(1.20)	(0.59)	(0.59)		
Mean of Dependent Variable	50.50	50.50	65.98	65.98	29.05	29.05	.	.
Observations	138	138	101	101	73	73	67	67
Drug ED Visit Rate per 100k								
Employment to Population Ratio	–0.08	1.39	–2.62	1.29	–6.45*	–1.09		
	(1.38)	(1.55)	(3.43)	(4.69)	(3.81)	(3.65)		
Mean of Dependent Variable	318.67	318.67	352.22	352.22	264.87	264.87	.	.
Observations	139	139	106	106	100	100	89	89
State Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Specific Time Trends	No	Yes	No	Yes	No	Yes	No	Yes

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors clustered at the state level in parentheses. Each regression is weighted by total state population of group. Hispanic ED visits are omitted as the ED data do not contain a reliable indicator of Hispanic ethnicity.

Table A5: The estimated effect of county-level unemployment on the rate of non-opioid and non-heroin drug mortality and emergency department visits.

	(1) All Drugs	(2) Only Opioids	(3) Only Heroin	(4) All Excluding Opioids	(5) All Excluding Both
Deaths per 100k					
Unemployment Rate, [0-100]	0.36***	0.19***	0.07***	0.17***	0.10***
	(0.07)	(0.05)	(0.02)	(0.04)	(0.03)
Mean of Dependent Variable	10.77	5.35	1.53	5.41	4.17
Observations	50148	50148	50148	50148	50148
ED Visits per 100k					
Unemployment Rate, [0-100]	1.19	0.95***	−0.68**	0.25	0.94
	(1.20)	(0.28)	(0.31)	(1.12)	(1.19)
Mean of Dependent Variable	97.52	13.54	5.81	83.98	78.28
Observations	1873	1873	1873	1873	1873
County Fixed-Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed-Effects	Yes	Yes	Yes	Yes	Yes
County Specific Time Trends	No	No	No	No	No
State-by-Year Fixed-Effects	Yes	Yes	Yes	Yes	Yes

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors clustered at the county level in parentheses. Each regression is weighted by county population of group.

Table A6: The estimated effect of county-level unemployment on the rate of heroin mortality and emergency department visits across multiple specifications.

	(1)	(2)	(3)
Heroin Death Rate per 100k			
Unemployment Rate, [0-100]	0.01	–0.01	0.07***
	(0.03)	(0.02)	(0.02)
Mean of Dependent Variable	1.53	1.53	1.53
Observations	50148	50148	50148
Heroin Overdose ED Visit Rate per 100k			
Unemployment Rate, [0-100]	0.37	1.08**	–0.68**
	(0.38)	(0.47)	(0.31)
Mean of Dependent Variable	5.81	5.81	5.81
Observations	1873	1873	1873
County Fixed-Effects	Yes	Yes	Yes
Year Fixed-Effects	Yes	Yes	Yes
County Specific Time Trends	No	Yes	No
State-by-Year Fixed-Effects	No	No	Yes

Note: * p < 0.1, ** p < 0.05, *** p < 0.01. Robust standard errors clustered at the county level in parentheses. Each regression is weighted by total county population.

Table A7: The estimated effect of county-level unemployment on the white rate of opioid/drug mortality and emergency department visits across multiple specificationsn.

	(1)	(2)	(3)
White Opioid Death Rate per 100k			
Unemployment Rate, [1-100]	0.37***	0.23***	0.23***
	(0.05)	(0.05)	(0.05)
Mean of Dependent Variable	7.03	7.03	7.03
Observations	50148	50148	50148
White Drug Death Rate per 100k			
Unemployment Rate, [1-100]	0.51***	0.22***	0.48***
	(0.07)	(0.06)	(0.08)
Mean of Dependent Variable	13.07	13.07	13.07
Observations	50148	50148	50148
White Opioid Overdose ED Visit Rate per 100k			
Unemployment Rate, [0-100]	0.69**	1.43***	0.91**
	(0.31)	(0.36)	(0.37)
Mean of Dependent Variable	17.18	17.18	17.18
Observations	1828	1828	1828
White Drug Overdose ED Visit Rate per 100k			
Unemployment Rate, [0-100]	1.20	2.30*	1.01
	(0.98)	(1.18)	(1.29)
Mean of Dependent Variable	109.05	109.05	109.05
Observations	1828	1828	1828
County Fixed-Effects	Yes	Yes	Yes
Year Fixed-Effects	Yes	Yes	Yes
County Specific Time Trends	No	Yes	No
State-by-Year Fixed-Effects	No	No	Yes

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors clustered at the county level in parentheses. Each regression is weighted by total white county population.

Table A8: The estimated effect of county-level unemployment on the black rate of opioid/drug mortality and emergency department visits across multiple specifications.

	(1)	(2)	(3)
Black Opioid Death Rate per 100k			
Unemployment Rate, [1-100]	–0.01	0.01	–0.14**
	(0.04)	(0.05)	(0.07)
Mean of Dependent Variable	2.28	2.28	2.28
Observations	49646	49646	49647
Black Drug Death Rate per 100k			
Unemployment Rate, [1-100]	0.08	0.05	–0.13
	(0.10)	(0.08)	(0.10)
Mean of Dependent Variable	8.50	8.50	8.50
Observations	49646	49646	49647
Black Opioid Overdose ED Visit Rate per 100k			
Unemployment Rate, [0-100]	0.33*	0.76**	1.25***
	(0.18)	(0.31)	(0.45)
Mean of Dependent Variable	9.46	9.46	9.46
Observations	1828	1828	1828
Black Drug Overdose ED Visit Rate per 100k			
Unemployment Rate, [0-100]	–1.12	0.20	–1.07
	(1.49)	(1.31)	(1.97)
Mean of Dependent Variable	90.60	90.60	90.60
Observations	1828	1828	1828
County Fixed-Effects	Yes	Yes	Yes
Year Fixed-Effects	Yes	Yes	Yes
County Specific Time Trends	No	Yes	No
State-by-Year Fixed-Effects	No	No	Yes

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors clustered at the county level in parentheses. Each regression is weighted by total black county population.

Table A9: The estimated effect of county-level unemployment on the Hispanic rate of opioid/drug mortality across multiple specifications.

	(1)	(2)	(3)
Hispanic Opioid Death Rate per 100k			
Unemployment Rate, [1-100]	0.03	0.08**	0.04
	(0.04)	(0.03)	(0.03)
Mean of Dependent Variable	2.00	2.00	2.00
Observations	50106	50106	50106
Hispanic Drug Death Rate per 100k			
Unemployment Rate, [1-100]	0.03	0.08	0.11*
	(0.07)	(0.06)	(0.06)
Mean of Dependent Variable	5.25	5.25	5.25
Observations	50106	50106	50106
County Fixed-Effects	Yes	Yes	Yes
Year Fixed-Effects	Yes	Yes	Yes
County Specific Time Trends	No	Yes	No
State-by-Year Fixed-Effects	No	No	Yes

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors clustered at the county level in parentheses. Each regression is weighted by total Hispanic county population. Hispanic ED visits are omitted as the ED data do not contain a reliable indicator of Hispanic ethnicity.

Table A10: The estimated effect of county-level unemployment on the rate of opioid/drug mortality and emergency department across decreasing/increasing unemployment rate relative to prior year.

	(1) Full Sample	(2) Decreasing Unemployment	(3) Increasing Unemployment
Opioid Death Rate per 100k			
Unemployment Rate, [0-100]	0.19***	0.10	0.25***
	(0.05)	(0.07)	(0.05)
Observations	50132	24287	23709
Drug Death Rate per 100k			
Unemployment Rate, [0-100]	0.36***	0.22**	0.43***
	(0.07)	(0.10)	(0.08)
Observations	50132	24287	23709
Opioid Overdose ED Visit Rate per 100k			
Unemployment Rate, [1-100]	0.95***	1.21***	0.97**
	(0.28)	(0.32)	(0.38)
Observations	1873	874	929
Drug Overdose ED Visit Rate per 100k			
Unemployment Rate, [1-100]	1.19	2.04*	0.88
	(1.20)	(1.23)	(1.51)
Observations	1873	874	929
County Fixed-Effects	Yes	Yes	Yes
Year Fixed-Effects	Yes	Yes	Yes
County Specific Time Trends	No	No	No
State-by-Year Fixed-Effects	Yes	Yes	Yes

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors clustered at the county level in parentheses. Each regression is weighted by total county population.

Table A11: The estimated effect of county-level unemployment on moratality rate from opioids, baseline and accounting for variance in imputation procedure. **Note: Estimates are slightly different from results reported in JHE due to random number seed used in Stata.**

	(1) All	(2) White	(3) Black	(4) Hispanic
Baseline: Opioid Death Rate per 100k				
Unemployment Rate, [0-100]	0.1889***	0.2350***	–0.1411**	0.0399
	(0.0453)	(0.0516)	(0.0718)	(0.0289)
Multiple Imputation: Opioid Death Rate per 100k				
Unemployment Rate, [0-100]	0.1889***	0.2350***	–0.1411**	0.0399
	(0.0453)	(0.0516)	(0.0718)	(0.0289)
Observations	50132	50132	49630	50090
County Fixed-Effects	Yes	Yes	Yes	Yes
Year Fixed-Effects	Yes	Yes	Yes	Yes
County Specific Time Trends	No	No	No	No
State-by-Year Fixed-Effects	Yes	Yes	Yes	Yes

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors clustered at the county level in parentheses. Each regression is weighted by county population of group. The specification that accounts for imputation uncertainty is an average of 100 different specifications, each identical except using a different dataset. Each datasets is drawn from the imputed variables to capture the uncertainty in the measurement. Coefficients and standards errors are calculated using Rubin's (1987) rules as outlined in White et al. (2011). Coefficients and standard errors are reported to four decimal points so differences are salient.

Table A12: The estimated effect of county-level unemployment on the rate of emergency department visits for each of the top ED categories.

	(1)	(2)	(3)
Pharmaceutical Overdose ED Visit Rate per 100k			
Unemployment Rate, [0-100]	0.34	0.78	0.48
	(0.72)	(0.87)	(0.85)
Mean of Dependent Variable	66.29	66.29	66.29
Observations	1873	1873	1873
Benzo Overdose ED Visit Rate per 100k			
Unemployment Rate, [0-100]	0.52	0.85**	0.95**
	(0.32)	(0.39)	(0.37)
Mean of Dependent Variable	18.84	18.84	18.84
Observations	1873	1873	1873
Aro. Analgesic Overdose ED Visit Rate per 100k			
Unemployment Rate, [0-100]	–0.20*	–0.31**	0.02
	(0.11)	(0.14)	(0.17)
Mean of Dependent Variable	9.87	9.87	9.87
Observations	1873	1873	1873
Anti-depressant Overdose ED Visit Rate per 100k			
Unemployment Rate, [0-100]	0.17	–0.01	–0.03
	(0.19)	(0.10)	(0.23)
Mean of Dependent Variable	3.83	3.83	3.83
Observations	1873	1873	1873
Insulin Overdose ED Visit Rate per 100k			
Unemployment Rate, [0-100]	–0.04	–0.02	–0.02
	(0.06)	(0.06)	(0.08)
Mean of Dependent Variable	3.54	3.54	3.54
Observations	1873	1873	1873
Cocaine Overdose ED Visit Rate per 100k			
Unemployment Rate, [0-100]	–0.10	–0.11	–0.04
	(0.14)	(0.11)	(0.17)
Mean of Dependent Variable	2.41	2.41	2.41
Observations	1873	1873	1873
Anti-Psychotic Overdose ED Visit Rate per 100k			
Unemployment Rate, [0-100]	–0.08	–0.06	–0.01
	(0.06)	(0.08)	(0.09)
Mean of Dependent Variable	4.05	4.05	4.05
Observations	1873	1873	1873
County Fixed-Effects	Yes	Yes	Yes
Year Fixed-Effects	Yes	Yes	Yes
County Specific Time Trends	No	Yes	No
State-by-Year Fixed-Effects	No	No	Yes

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors clustered at the county level in parentheses. Each regression is weighted by county population of group.