

Supplementary Online Content

Azad HA, Monuteaux MC, Rees CA, et al. Child access prevention firearm laws and firearm fatalities among children aged 0 to 14 years, 1991-2016. *JAMA Pediatr*. Published online March 2, 2020. doi:10.1001/jamapediatrics.2019.6227

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This supplementary material has been provided by the authors to give readers additional information about their work.

eTable 1. ICD-9 and ICD-10 Codes by Intent and Mechanism

Group	ICD-9 Codes	ICD-10 Codes
All Intents, All Injury	E800-E869, E880-E929, E950-E999	V01-Y36, Y85-Y87, Y89, *U01-*U03
All Intents, Firearm	E922, E955.0-.4, E965.0-.4, E985.0-.4, E970	W32-W34, X72-X74, X93-X95, Y22-Y24, Y35.0, *U01.4
Homicides, All Injury	E960-E969	X85-Y09, Y87.1, *U01-*U02
Homicides, Firearm	E965.0-.4	X93-X95, *U01.4
Suicides, All Injury	E950-959	X60-X84, Y87.0, *U03
Suicides, Firearm	E955.0-.4	X72-X74
Unintentional, All Injury	E800-E869, E880-E929	V01-X59, Y85-Y86
Unintentional, Firearm	E922	W32-W34

eTable 2. Variables and Data Sources

Variable	Definition	Source	Missing Data
Outcome Variables			
Child firearm fatality rates	Rate of firearm fatalities among 0- to 14-year-olds (total, homicide, suicide, and unintentional) per 100,000 persons	For fatalities from 1991-2007: Web-based Injury Statistics Query and Reporting System (WISQARS). ¹ For fatalities from 2008-2016: CDC's Compressed Mortality File (CMF). ²	None
Main Predictor Variable			
State firearm laws	Recklessness laws (injury resulting from providing firearm to a child) and negligence laws related to unsafe storage of firearms with three levels (Negligence-Child Uses, Negligence-Child Accesses, and Negligence-Child Could Access)	State Firearm Laws Database ³	None
Control Variables			
Age	Population aged 0-9 and 10-14 years	WISQARS ¹ , CMF ²	None
State firearm laws	Universal background check law; handgun permit/license law; waiting period law	State Firearm Laws Database ³	None
Household firearm ownership rate	Proportion of households in which someone owns a firearm: Validated proxy derived from standard measure (firearm suicides divided by total suicides [FS/S] but adjusted for hunting license rate (HL); calculated as follows: proxy = (0.62 x FS/S) + 0.92 x HL - 4.478	Calculations made for use as a control variable in prior work ^{4,5}	None
Alcohol consumption	Per capita alcohol consumption among persons aged ≥ 14 years	National Institute on Alcohol Abuse and Alcoholism ⁶	None
Population distribution by age	Percentage of population ages 15-29 years	WISQARS ¹	None
Population distribution by sex	Percentage of population that is male	WISQARS ¹	None
Population distribution by race: Black	Percentage of the population that is black	WISQARS ¹	None
Population distribution by ethnicity: Hispanic	Percentage of the population that is Hispanic	U.S. Census Bureau. Current Population Surveys. Southern Regional Education Board: Population & Demographics ⁷	None
Per capita disposable income	Per capita disposable income (in 2010 U.S. dollars)	Bureau of Economic Analysis. <i>Regional Data. GDP and Personal Income</i> . Washington, DC. U.S. Department of Commerce, Bureau of Economic Analysis	None

Variable	Definition	Source	Missing Data
Divorce rate	Divorces per 1000 persons	CDC, National Center for Health Statistics. CDC and U.S. Bureau of the Census Statistical Abstracts ⁸	Data interpolated in some years for California, Georgia, Hawaii, Indiana, Louisiana, and Minnesota
Unemployment rate	Percentage of unemployed persons among civilian labor force aged ≥ 16 years	U.S. Bureau of Labor Statistics. Southern Regional Education Board: Economic and Government Data ⁹	None
Poverty rate	Percentage of population living in poverty	U.S. Census Bureau. Current Population Surveys. U.S. Census Bureau Historical Poverty Tables	None
Education	Percentage of adults aged ≥ 25 years with college degree (bachelor's or higher)	U.S. Census Bureau. Current Population Surveys. U.S. Census Bureau Statistical Abstracts and Educational Attainment Reports.	Data interpolated for 1992
Self-reported depression rate	Percentage of adults who report depression or other emotional problems during all of the previous 30 days	Behavioral Risk Factor Surveillance System Surveys. ¹⁰	None
Household income levels	Median household income (in 2010 U.S. dollars)	U.S. Census Bureau. Current Population Surveys. Southern Regional Education Board: Economic and Government Data ⁹	None
Population density	Population per square mile	U.S. Census Bureau	None
Per capita gross domestic product	State gross domestic product divided by population	Bureau of Economic Analysis. <i>Regional Data. GDP and Personal Income</i> . Washington, DC. U.S. Department of Commerce, Bureau of Economic Analysis	None
Degree of urbanization	Percentage of population living in urbanized area or urban cluster	U.S. Census Bureau. Decennial Censuses: 1990, 2000, 2010; U.S. Census Bureau Statistical Abstracts	Data interpolated for 1991-1999 and 2001-2009
Violent crime rate	Rates of aggravated assault, robbery and forcible rape per 100,000 persons	FBI Uniform Crime Reporting Statistics ¹¹	None
Nonviolent crime rate	Rate of property crime (burglary, larceny-theft, and motor vehicle theft) per 100,000 persons	FBI Uniform Crime Reporting Statistics ¹¹	None
Incarceration rate	Number of prisoners with sentences >1 year per 100,000 persons	Department of Justice, Bureau of Justice Statistics, National Prisoner Statistics, Prisoner Series ¹²	Data interpolated for 1992
Law enforcement officers per capita	Number of sworn police officers per 1000 persons	FBI Uniform Crime Reports ¹¹	None

eTable 3. Incidence Rate Ratios and 95% Confidence Intervals by Intent and Age Group for Firearm Fatality Rates in Children 0-14 Years Old, Any Recklessness Laws, by Specific Negligence Laws

Intent	IRR (95% CI)
All Intentions	
States with Recklessness Laws	1.06 (0.97 to 1.16)
States with Negligence: Child Uses Laws	0.91 (0.84 to 0.99) ^a
States with Negligence: Child Accesses Laws	0.87 (0.78 to 0.98) ^a
States with Negligence: Child Could Access Laws	0.72 (0.52 to 0.99) ^a
Homicide	
States with Recklessness Laws	1.05 (0.95 to 1.15)
States with Negligence: Child Uses Laws	0.90 (0.79 to 1.02)
States with Negligence: Child Accesses Laws	0.82 (0.68 to 0.99) ^a
States with Negligence: Child Could Access Laws	0.77 (0.55 to 1.06)
Suicide	
States with Recklessness Laws	1.06 (0.91 to 1.24)
States with Negligence: Child Uses Laws	0.94 (0.83 to 1.07)
States with Negligence: Child Accesses Laws	0.84 (0.72 to 0.98) ^a
States with Negligence: Child Could Access Laws	0.74 (0.50 to 1.10)
Unintentional	
States with Recklessness Laws	1.15 (0.98 to 1.34)
States with Negligence: Child Uses Laws	0.94 (0.80 to 1.10)
States with Negligence: Child Accesses Laws	0.89 (0.79 to 1.04)
States with Negligence: Child Could Access Laws	0.41 (0.32 to 0.51) ^a

^a Statistically significant, alpha = 0.05.

eTable 4. Interaction Terms between Policy and Age Groups (0-9 Years vs 10-14 Years Old) for All-Intent Firearm Fatalities

Intent	Interaction Term IRR (95% CI)
All Intentions	
States with Recklessness Laws	0.88 (0.77 to 1.00)
States with Any Negligence Law	0.90 (0.78 to 1.04)
States with Negligence: Child Uses Laws	0.88 (0.73 to 1.05)
States with Negligence: Child Accesses Laws	0.83 (0.74 to 0.94) ^a
States with Negligence: Child Could Access Laws	1.21 (0.99 to 1.49)

^a Statistically significant, alpha = 0.05.

eTable 5. Population Attributable Fraction, Deaths Attributable to States with No Negligence Law

Year	All Firearm Deaths			Firearm Homicides			Firearm Suicides			Unintentional Firearm Deaths		
	Total Deaths	PAF	Attributable Deaths	Total Deaths	PAF	Attributable Deaths	Total Deaths	PAF	Attributable Deaths	Total Deaths	PAF	Attributable Deaths
1992	892	0.32	282	479	0.54	259	175	-0.27	-47	216	0.51	109
1993	951	0.19	178	537	-0.09	-51	187	0.47	87	205	0.44	91
1994	867	0.19	165	461	0.15	68	188	0.15	28	185	0.25	46
1995	849	0.01	11	458	0.02	11	184	-0.11	-20	181	0.27	48
1996	690	0.07	51	376	NA	NA	162	-0.11	-17	138	NA	NA
1997	627	0.11	71	343	0.23	80	127	0.23	29	142	-0.27	-38
1998	611	0.14	86	313	0.24	75	154	-0.09	-13	121	0.23	28
1999	487	-0.03	-15	280	0.00	1	103	-0.23	-24	88	0.37	33
2000	435	0.10	43	226	0.34	76	110	-0.11	-12	86	NA	NA
2001	414	0.12	50	246	0.23	58	90	-0.06	-5	72	-0.09	-7
2002	417	0.14	60	261	0.01	2	86	0.45	39	60	0.21	13
2003	380	0.08	30	235	-0.03	-7	74	0.71	52	56	-0.63	-35
2004	355	0.17	60	223	0.29	66	59	0.21	12	63	0.13	8
2005	402	0.00	1	228	NA	NA	84	0.12	10	75	-0.63	-47
2006	406	0.10	41	283	0.20	56	62	0.47	29	53	-0.40	-21
2007	395	0.16	62	261	0.15	38	53	0.04	2	65	0.27	17
2008	376	0.05	18	252	0.06	14	50	0.02	1	62	0.14	9
2009	353	0.34	121	232	0.35	81	64	0.30	19	48	NA	NA
2010	379	-0.12	-47	218	-0.07	-15	81	-0.31	-25	62	-0.05	-3
2011	397	-0.11	-43	217	0.02	4	92	-0.32	-30	74	-0.25	-18
2012	411	-0.10	-40	241	-0.21	-51	105	0.41	43	58	0.08	5
2013	409	0.22	89	193	0.19	36	138	0.19	27	69	0.33	23
2014	457	0.24	108	223	0.10	23	174	0.50	87	49	0.07	4
2015	442	0.17	73	247	0.04	9	140	0.28	40	48	0.16	8
2016	488	0.11	56	236	-0.11	-27	160	0.47	75	74	0.03	2
Total (95% CI)	13697	0.09 (0.04 to 0.13) ^a	1230 (610 to 1836) ^a	7684	0.09 (0.02 to 0.15) ^a	677 (163 to 1180) ^a	3058	0.14 (0.07 to 0.21) ^a	434 (217 to 643) ^a	2576	0.10 (0.01 to 0.18) ^a	248 (20 to 466) ^a

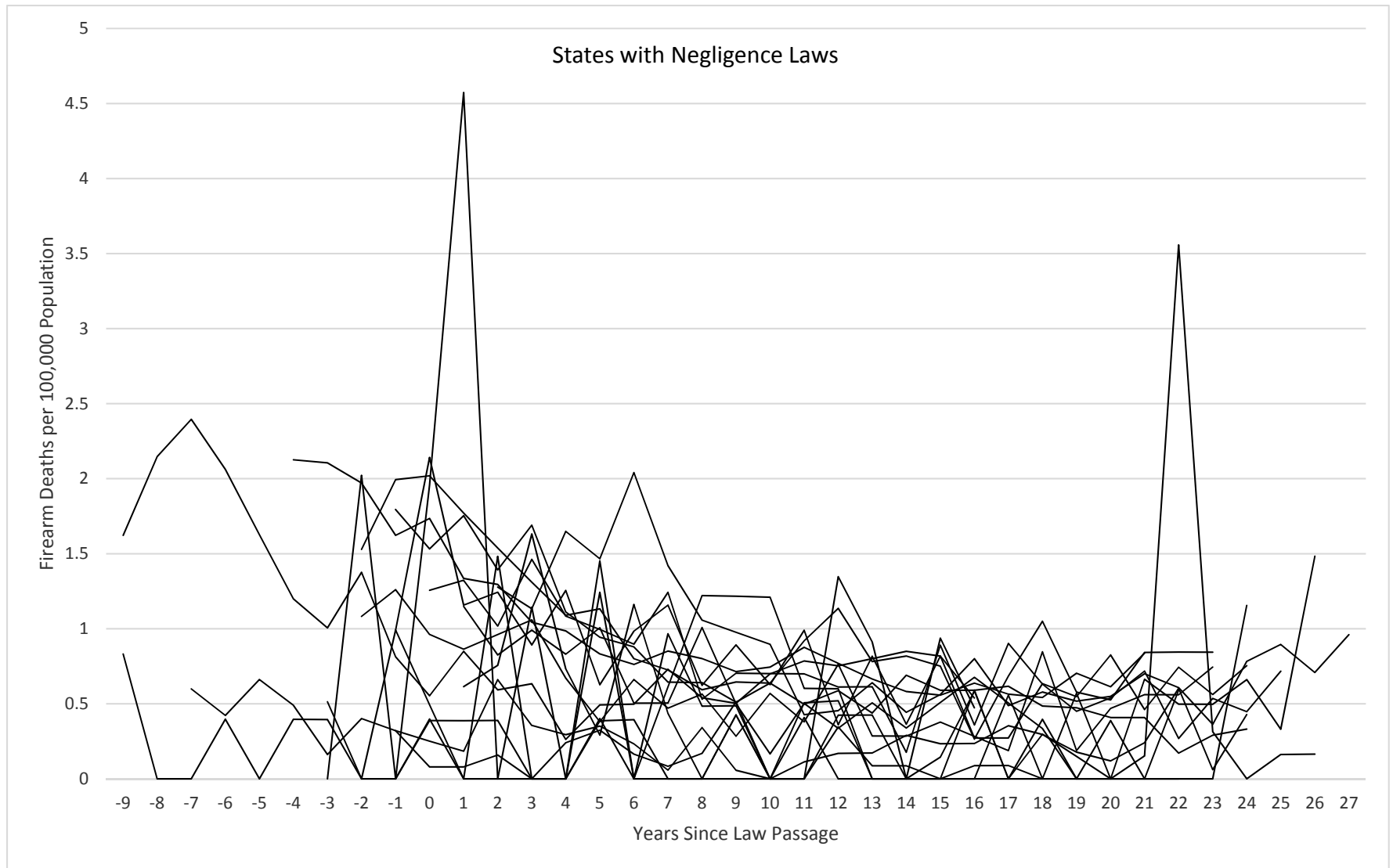
^a Statistically significant, alpha = 0.05.

eTable 6. Population Attributable Fraction, Deaths Attributable to States without a Negligence-Child Could Access Law

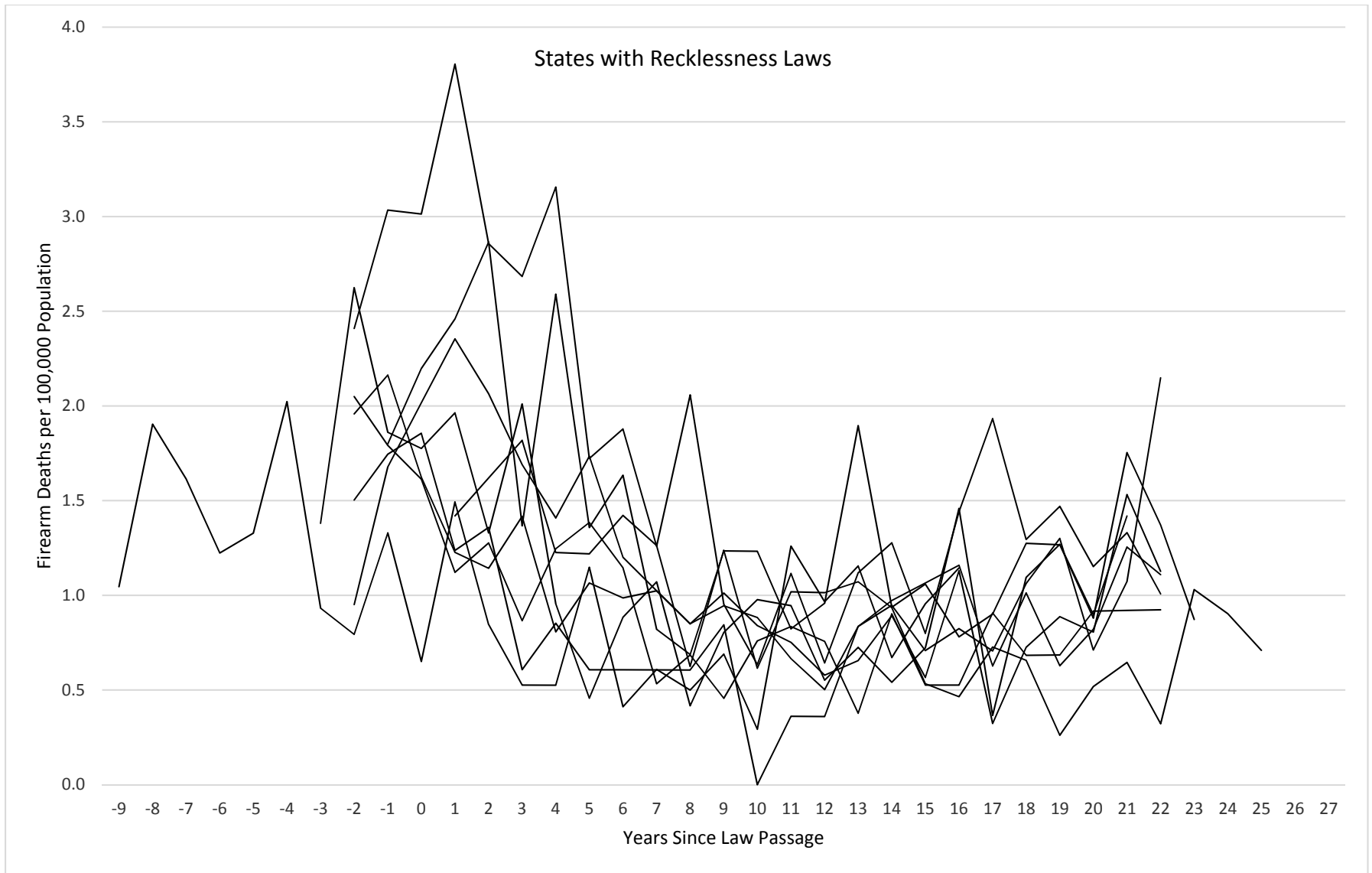
Year	All Firearm Deaths			Firearm Homicides			Firearm Suicides			Unintentional Firearm Deaths		
	Total Deaths	PAF	Attributable Deaths	Total Deaths	PAF	Attributable Deaths	Total Deaths	PAF	Attributable Deaths	Total Deaths	PAF	Attributable Deaths
1993	951	0.41	390	537	0.09	49	187	0.65	122	205	NA	NA
1994	867	0.34	295	461	0.39	179	188	0.14	26	185	0.56	103
1995	849	0.32	273	458	0.37	167	184	0.26	47	181	0.65	118
1996	690	0.15	105	376	0.11	42	162	-0.22	-35	138	0.54	75
1997	627	0.15	91	343	-0.01	-3	127	0.64	81	142	0.51	73
1998	611	0.25	155	313	0.20	62	154	0.14	21	121	0.82	100
1999	487	0.21	103	280	0.38	107	103	-0.17	-18	88	0.35	31
2000	435	0.17	73	226	0.16	36	110	0.43	47	86	NA	NA
2001	414	NA	NA	246	NA	NA	90	-0.03	-2	72	1.00	72
2002	417	0.08	34	261	0.11	30	86	-0.16	-13	60	1.00	60
2003	380	0.01	2	235	0.11	25	74	0.48	36	56	-1.29	-72
2004	355	0.31	110	223	0.52	117	59	-0.15	-9	63	0.59	37
2005	402	0.28	112	228	0.82	186	84	-0.88	-74	75	-0.69	-51
2006	406	-0.13	-52	283	0.36	101	62	-1.11	-69	53	1.00	53
2007	395	0.06	22	261	0.00	-1	53	-0.57	-30	65	NA	NA
2008	376	0.04	15	252	-0.18	-45	50	NA	NA	62	1.00	62
2009	353	0.53	187	232	0.57	132	64	-0.59	-38	48	1.00	48
2010	379	0.17	64	218	-0.02	-4	81	0.20	16	62	1.00	62
2011	397	-0.23	-93	217	-0.37	-81	92	-0.57	-53	74	0.42	31
2012	411	0.15	60	241	-0.21	-51	105	0.83	87	58	0.43	25
2013	409	0.46	187	193	0.71	136	138	-0.23	-32	69	NA	NA
2014	457	0.71	326	223	0.67	150	174	0.75	130	49	0.53	26
2015	442	0.42	184	247	0.22	55	140	0.61	85	48	1.00	48
2016	488	NA	NA	236	0.50	117	160	0.45	72	74	0.88	65
Total (95% CI)	13697	0.29 (0.17 to 0.38) ^a	3929 (2394 to 5267) ^a	7684	0.28 (0.13 to 0.41) ^a	2159 (1009 to 3121) ^a	3058	0.19 (-0.03 to 0.37)	589 (-102 to 1135)	2576	0.65 (0.47 to 0.77) ^a	1665 (1206 to 1973) ^a

^a Statistically significant, alpha = 0.05.

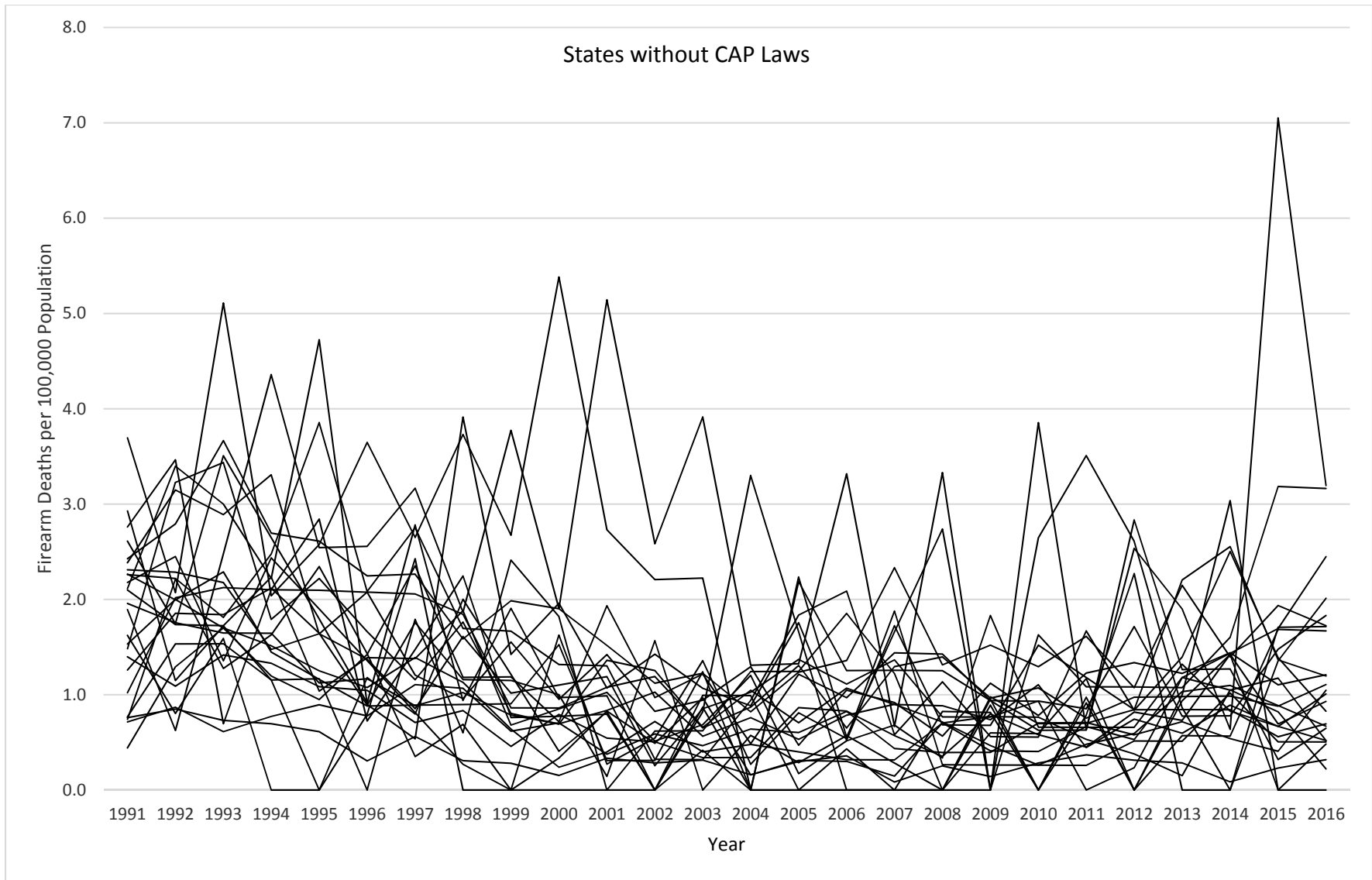
eFigure. State Level Firearm Death Rate per 100,000 Population, by Law Type.



Panel A. States with Negligence Laws, by Years since Law Passage.



Panel B. States with Recklessness Laws, by Years since Law Passage.



Panel C. States with No CAP Laws, by Year.

eReferences

1. Centers for Disease Control and Prevention. Injury Prevention and Control: Data & Statistics (WISQARS). <http://www.cdc.gov/injury/wisqars/index.html>. Accessed April 30, 2019.
2. National Center for Health Statistics. Compressed Mortality File, 1999-2016 (machine readable data file and documentation, CD-ROM Series 20, No. 2V) as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Hyattsville, Maryland. 2017.
3. State Firearm Laws Database. Boston: Boston University School of Public Health. Available at <http://statefirearmlaws.org>. Accessed October 17, 2018.
4. Diez C, Kurland RP, Rothman EF, *et al*. State intimate partner violence-related firearm laws and intimate partner homicide rates in the United States, 1991-2015. *Ann. Intern. Med.* 2017;167(8):536-543. Doi:10.7326/M16-2849.
5. U.S. Fish & Wildlife Service. Historical hunting license data. 2017.
6. LaVallee RA, Yi H. Apparent per capita alcohol consumption: National, State, and Regional Trends, 1977-2016. *National Institute on Alcohol Abuse and Alcoholism*. 2018.
7. Southern Regional Education Board. Population & Demographics. Atlanta: Southern Regional Education Board; 2013
8. Centers for Disease Control and Prevention. Divorce rates by state: 1990, 1995, and 1999-2017. Accessed at <https://www.cdc.gov/nchs/data/dvs/state-divorce-rates-90-95-99-17.pdf>. Accessed August 29, 2019
9. Southern Regional Education Board. Economic and Government Data: Employment and Unemployment in the Civilian Labor Force. Atlanta: Southern Regional Education Board; 2013
10. Centers for Disease Control and Prevention. Behavioral Risk Factor Surveillance System annual surveys, 1991-2016.
11. Federal Bureau of Investigation. Uniform Crime Reporting statistics. 2017.
12. U.S. Department of Justice. National prisoner statistics. Prisoner Series reports. 2017.