Firearm Legislation and Fatal Police Shootings in the United States

Aaron J. Kivisto, PhD, Bradley Ray, PhD, and Peter L. Phalen, MA

Objectives. To examine whether stricter firearm legislation is associated with rates of fatal police shootings.

Methods. We used a cross-sectional, state-level design to evaluate the effect of state-level firearm legislation on rates of fatal police shootings from January 1, 2015, through October 31, 2016. We measured state-level variation in firearm laws with legislative scorecards from the Brady Center, and for fatal police shootings we used The Counted, an online database maintained by *The Guardian*.

Results. State-level firearm legislation was significantly associated with lower rates of fatal police shootings (incidence rate ratio = 0.961; 95% confidence interval = 0.939, 0.984). When we controlled for sociodemographic factors, states in the top quartile of legislative strength had a 51% lower incidence rate than did states in the lowest quartile. Laws aimed at strengthening background checks, promoting safe storage, and reducing gun trafficking were associated with fewer fatal police shootings.

Conclusions. Legislative restrictions on firearms are associated with reductions in fatal police shootings.

Public Health Implications. Although further research is necessary to determine causality and potential mechanisms, firearm legislation is a potential policy solution for reducing fatal police shootings in the United States. (*Am J Public Health.* Published online ahead of print May 18, 2017: e1–e8. doi:10.2105/AJPH.2017.303770)

The United States has more citizen-owned firearms than any other country in the world, but also some of the most relaxed firearm laws.[1] However, with an estimated 90 deaths per day from firearms and an epidemic of mass shootings, there have been shifts in public opinion indicating greater support for firearm legislation.[2–5] Additionally, several recent high-profile police shootings have resulted in controversy and civil unrest.[6] Responses to these events often focus on changes to police practices rather than on legislative changes. Although studies have examined the relationship between firearm legislation and mortality,[1,7–10] little research has assessed whether firearm legislation has an effect on the rate of people killed by law enforcement agencies, often referred to as fatal police shootings. Part of the reason for this gap in the literature is that it is difficult to examine patterns in fatal police shootings because there is no reliable national data system. Although 2 long-standing national data systems capture fatal injuries, both have been shown to underreport fatal police shootings.[11,12]

In response to this data shortage, *The Guardian*, an independent newspaper from the United Kingdom, launched The Counted on January 1, 2015.[13] The Counted is a Web site that provides publicly available, real-time data on people killed by police and other law enforcement agencies. It does so by monitoring news and open-source reporting projects as well as user submissions. The Counted data have been shown to capture a greater number of fatal police shootings than do existing data systems.[14]

We used data from The Counted to examine fatal police shootings and firearm legislation at the state level. To measure firearm legislation, we used data from the Brady Center's state legislative scorecards, which track legislation across 7 categories: strengthening background checks, restricting guns in public places, enhancing child and consumer safety, curbing gun trafficking, restricting dangerous weapons, restricting dangerous persons, and maintaining a duty to retreat.[15] Our purpose was thus to examine whether stricter firearm legislation is associated with fewer fatal police shootings, and also which specific categories of firearm legislation are most effective.

METHODS

We used a cross-sectional, state-level design to evaluate the effect of state-level firearm legislation on rates of fatal police shootings from January 1, 2015, through October 31, 2016, accounting for pertinent sociodemographic variables. In doing so, we merged several sources of data at the state level for this study. We measured the outcome variable, fatal police shootings, using data from The Counted, which provides a comprehensive list of all people killed by police and other law enforcement agencies in the United States.[13] Data are collected via *The Guardian* reporting and verified crowdsourced information, addressing the limitations of incomplete reporting of fatal police encounters in current Federal Bureau of

ABOUT THE AUTHORS

Aaron J. Kivisto and Peter L. Phalen are with the School of Psychological Sciences, University of Indianapolis, Indianapolis, IN. Bradley Ray is with the School of Public and Environmental Affairs, Indiana University–Purdue University Indianapolis, Indianapolis.

Correspondence should be sent to Aaron J. Kivisto, University of Indianapolis, School of Psychological Sciences, 1400 E. Hanna Ave, Indianapolis, IN 46227 (e-mail: kivistoa@uindy.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

This article was accepted March 2, 2017.

doi: 10.2105/AJPH.2017.303770

Investigation (FBI) statistics.[12–14] The Counted provides the date and location (latitude, longitude, city, state) of the encounter, the deceased's race/ethnicity and gender, whether the deceased was armed and with what, and the mechanism of death (firearm, struck by vehicle, Taser, death in custody, and "other").

The key independent variable was firearm legislation, which we measured using state-level firearm legislative strength scores derived from 2015 data from the Brady Campaign.[15] Since 2010, the Brady Campaign has monitored state-level firearm legislation in the United States and issued annual report cards (except in 2011) on states' firearm legislative strength. Finally, we controlled for state-level covariates using data from the US Census, the FBI's 2015 Uniform Crime Report, and the Centers for Disease Control and Prevention's (CDC's) Web-based Injury Statistics Query and Reporting System.[2,16]

Measures

The 50 states made up the primary study population, and within each state we used The Counted database to identity all fatal encounters with law enforcement during the 22-month study period. Thus, the annualized rate of fatal police shootings per 1 000 000 served as our primary outcome measure.

Our primary independent variable of interest was state-level firearm legislative strength scores. The scoring system employed by the Brady Campaign uses a rationally derived weighting system, such that some categories of firearm laws—thought to be more effective at reducing gun violence—are weighted more heavily than are other, presumably less effective types of laws. For instance, universal background check laws receive 11 points, whereas laws prohibiting open carry of firearms receive only 1 point. Because of the somewhat arbitrary nature of the weighting, and consistent with previous research,[8] we removed all weighting in favor of a 1 law = 1 point scoring system. As shown in Table A (available as a supplement to the online version of this article at http://www.ajph.org), we organized the 42 possible laws according to 7 categories based on the laws' intended purpose, including strengthening background checks, restricting guns in public places, enhancing child and consumer safety, curbing gun trafficking, restricting dangerous weapons, restricting dangerous persons, and maintaining a duty to retreat. State gun laws varied considerably across states, with overall Brady legislative strength scores ranging from 4 to 31 (median = 10; SD = 7.63). Descriptive statistics of states' scores in each firearm legislative category are shown in Table B (available as a supplement to the online version of this article at http://www.ajph.org).

Finally, we considered possible covariates that extant research suggests are important when predicting gun violence: age; percentage of study population that was male, White, Black, Hispanic, unemployed, and college educated; and population density at the state level.[7,8] The median age across states was 38.0 years (range = 30.7–44.5). There was considerable variation across states in the proportion of White (range = 26.74%–94.92%), Black (range = 0.61%–43.30%), and Hispanic (range = 1.46%–47.68%) residents. Unemployment rates averaged 5.04% (SD = 1.09; range = 2.7%–6.9%), and more than 1 in 5 of the study population had completed a college degree (mean = 21.81%; SD = 5.16%; range = 14.96%–45.09%). Because the most recent state-level data on college completion rates from the US Census were collected in 2010, we used Frank's updated 2015 estimates, which were derived from 2010 US Census Current Population Survey data and projected on the basis of net migration and mortality.[17] There was marked variation in population density across states, ranging from 1.29 to 11 020.13 residents per square mile (mean = 412.66; SD = 1537.79). We used the FBI's 2015 Uniform Crime Report to measure state-level violent crime rates per 100 000 (mean = 379.86; SD = 186.69; range = 118.0–1269.1). We used the Web-based Injury Statistics Query and Reporting System to derive a widely used proxy measure of household firearm ownership rates, represented as the percentage of firearm suicides to all suicides.

Statistical Analysis

We calculated annualized rates of fatal police shootings by state, and ranked states on the basis of overall firearm legislative strength. We calculated descriptive statistics for the proportion of victims that were male, armed, and non-White. To test the overall impact of firearm legislative strength on rates of fatal police shootings, and consistent with previous research examining the impact of firearm legislative strength on rates of firearm mortality,[8] we constructed a series of regression models. A goodness-of-fit χ^2 test did not suggest statistically significant departures from a Poisson distribution; therefore, we used Poisson regression with robust standard errors for our primary analyses.[17]

First, we tested the influence of firearm legislative strength on fatal police shootings without adjustment and then constructed a multivariable model that accounted for state-level sociodemographic characteristics. We then grouped states by quartiles of firearm legislative strength and calculated absolute rate differences and standard deviations. We compared incidence rate ratios across 2 models, referenced to states in the lowest quartile of firearm legislative strength. In model 1, we referenced incidence rate ratios for states in the second, third, and fourth quartiles to states in the first quartile without adjustment. We entered sociodemographic characteristics in the multivariable model 2. Finally, we conducted a series of analyses to test whether specific types of firearm legislation were associated with rates of fatal police shootings.

We calculated absolute rate differences, comparing states with the strongest firearm laws in each category to states with the weakest. Then, across 3 models employing Poisson regression with robust standard errors, we calculated incidence rate ratios comparing states with the fewest laws in a given legislative category to states with the most laws in that category. We calculated model 1 without adjustment, and model 2 tested a multivariable model with the sociodemographic covariates of age, education, and violent crime rate.

Because previous research has found that gun ownership rates might serve as both a mediating and confounding variable on the association between firearm legislative strength and firearm fatalities[8] we conducted a series of Sobel–Goodman mediation analyses. Before entering firearm ownership into model 3, we entered each category of firearm legislation shown to be associated with police

shootings in model 2 as an independent variable, with police shootings as the outcome and firearm ownership as a mediator. Model 3 retained all sociodemographic covariates and added household firearm ownership rates. We carried out sensitivity analyses with weighted Brady scores. We analyzed all data using Stata version 14.2 (StataCorp LP, College Station, TX).

Covariate Selection

Given the lack of research on state-level risk factors for fatal police shootings, we considered possible covariates from the literature on overall state-level firearm fatality rates.[9] We employed a 2-step approach used in previous firearm research to select covariates for the adjusted regression models.[18] First, we identified variables correlated (Spearman's ρ) with the outcome at 0.300 or greater. Then, to address concerns with collinearity, we excluded those covariates that were highly correlated with other covariates. We retained as covariates age, education, violent crime rate, and household gun ownership rate. Table C (available as a supplement to the online version of this article at http://www.ajph.org) shows the association between all possible covariates with the outcome; the full covariate correlation matrix is available in Table D (available as a supplement to the online version of this article at http://www.ajph.org).

RESULTS

As shown in Table 1, there were 2021 fatal police encounters during the 22-month study period. Firearms were the most common cause of death (n = 1835; 90.80%), and because we were concerned with predicting gun violence, we excluded cases in which death might have been accidental, such as killings with motor vehicles (n = 46; 2.28%), Tasers (n = 67; 3.32%), other instruments (n = 2; 0.09%), and deaths in custody (n = 73; 3.61%).

States ranged from a low of 2 fatal police shootings (RI, ND) to a high of 312 (CA), with an average annualized rate per 1 000 000 of 3.53 (SD = 2.03; range = 1.03–10.73). On average, approximately 96% of all victims were male, 53% were armed with a firearm, and 10% were unarmed at the time of the fatal police shooting. Other victims were armed with a variety of potentially deadly objects, including knives, nonlethal firearms, and motor vehicles. The weapon status of victims was unknown in 7% of all cases and disputed in less than 1%. Individuals from racial/ethnic minority groups made up slightly more than one third of all victims.

Figure 1, shows the significant effect of firearm legislative strength on per capita rates of fatal police shootings (incidence rate ratio [IRR] = 0.961; 95% confidence interval [CI] = 0.939, 0.984), such that each 1-point increase in firearm legislative strength was associated with a 4% reduction in mortality. As shown in Table 2, states with the strongest firearm laws evidenced a 56% lower incidence rate of fatal police shootings relative to states with the weakest firearm laws (IRR = 0.436; 95% CI = 0.302, 0.628). Similarly, in the multivariable model accounting for a range of sociodemographic characteristics, states with the strongest firearm laws continued to evidence rates of fatal police shootings more than 50% lower than in states with the weakest firearm legislation (IRR = 0.488; 95% CI = 0.287, 0.828). States in the second and third quartiles of legislative strength did not exhibit significantly different rates of fatal police shootings than did states in the first quartile. Incidence rate ratios and confidence intervals are presented for all covariates in Table E (available as a supplement to the online version of this article at http://www.ajph.org). Sensitivity analyses using weighted firearm legislative strength scores revealed generally similar incidence rate ratios across the unadjusted and adjusted models, although effects in the adjusted model were rendered nonsignificant. Full results of the sensitivity analysis are available in Table F (available as a supplement to the online version of this article at http://www.ajph.org).

Given that there were 7 categories of firearm legislation containing a total of 42 possible laws, we next examined the relationship between specific categories of firearm legislation and rates of fatal police shootings. As shown in Table 3, increased legislative strength scores in 5 of the 7 categories were associated with lower rates of fatal police shootings in the unadjusted models, with incidence rate ratios ranging from 0.471 (guns in public places) to 0.838 (duty to retreat). After we controlled for age, education, and violent crime rates in model 2, laws strengthening background checks (IRR = 0.715; 95% CI = 0.558, 0.916), promoting safe storage via child and consumer safety laws (IRR = 0.679; 95% CI = 0.490, 0.942), and curbing gun trafficking (IRR = 0.657; 95% CI = 0.505, 0.856) remained significantly associated with rates of fatal police shootings. Although laws strengthening background checks were rendered nonsignificant after we included household firearm ownership rates in model 3, laws targeting child and consumer safety (IRR = 0.707; 95% CI = 0.509, 0.983) and gun trafficking (IRR = 0.708; 95% CI = 0.546, 0.918) continued to predict rates of fatal police shootings. Incidence rate ratios and confidence intervals are presented for all covariates in Table G (available as a supplement to the online version of this article at http://www.ajph.org). Sobel–Goodman tests showed a significant indirect effect of household firearm ownership rates on the association between background check laws and police shootings ($P = .03$), whereas gun ownership rates showed marginal but nonsignificant indirect effects on the association between trafficking ($P = .06$) and child and consumer safety ($P = .05$) laws on rates of police shootings.

DISCUSSION

This study found that stricter state-level firearm legislation was associated with lower rates of fatal police shootings. For states with the strongest firearm laws, the incidence rate of fatal police shootings was more than 50% lower than for states with the weakest firearm laws. We used data from The Counted to assess rates of fatal police shootings; following existing research that looks at firearm homicide and suicide rates,[8] we used data from the Brady Center, which calculates firearm legislative scores by state. Consistent with previous research on fatal police shootings, we found that the majority of fatalities were caused by firearms and that in slightly more than half of these cases the victim was also armed.[6,19,20] Victims were overwhelmingly male and disproportionally from a racial/ethnic minority group.[6,20,21]

TABLE 1—State Firearm Legislative Strength, Fatal Law Enforcement Encounter Rates, and Victim Characteristics: United States, January 1, 2015–October 31, 2016

State Firearm Legislation			Fatal Police Encounters (n = 2021)				Victim Characteristics, %[a]			
Rank	State	Brady Score[b]	Total Fatal Encounters[c]	Annualized Fatal Encounter Rate per Million[d]	Total Fatal Police Shootings[c]	Annualized Fatal Police Shooting Rate per Million[e]	Male	Armed With Firearm	Unarmed	Non-White Racial/ Ethnic Status
1	California	31	340	4.74	312	4.35	95	36	14	63
2	Maryland	30	31	2.82	28	2.54	86	32	18	71
	New Jersey	30	36	2.19	29	1.77	93	38	10	48
4	Connecticut	28	9	1.37	7	1.06	100	29	0	14
5	New York	26	48	1.32	38	1.05	92	58	18	47
6	Hawaii	25	11	4.19	7	2.67	100	57	0	71
	Massachusetts	25	21	1.69	19	1.53	100	37	0	58
8	Illinois	23	44	1.87	43	1.82	97	70	7	63
9	Rhode Island	19	3	1.55	2	1.03	100	50	0	100
10	Delaware	18	5	2.88	4	2.31	100	50	25	25
	Minnesota	18	26	2.58	25	2.48	96	40	16	36
12	Washington	17	45	3.42	38	2.89	92	47	5	34
13	Iowa	15	9	1.57	9	1.57	89	56	22	33
	Pennsylvania	15	39	1.66	34	1.45	97	50	9	47
15	Michigan	14	35	1.92	29	1.59	93	62	10	41
16	Florida	12	129	3.47	117	3.15	96	51	16	50
	Oregon	12	30	4.06	27	3.66	96	52	4	7
	Virginia	12	41	2.67	36	2.34	94	58	14	53
19	Colorado	11	61	6.10	57	5.70	98	61	7	41
	Tennessee	11	41	3.39	40	3.31	98	60	8	30
	Wisconsin	11	30	2.84	29	2.74	97	48	10	38
22	Indiana	10	34	2.80	29	2.39	97	48	14	38
	Maine	10	3	1.23	3	1.23	100	67	0	0
	North Carolina	10	53	2.88	49	2.66	94	69	4	35
	Oklahoma	10	60	8.37	53	7.39	100	51	13	32
	South Carolina	10	35	3.90	34	3.79	94	65	6	35
27	Nebraska	9	16	4.60	14	4.03	93	50	7	21
	Nevada	9	31	5.85	31	5.85	94	65	10	42
	Ohio	9	59	2.77	53	2.49	98	55	13	45
	Utah	9	17	3.10	16	2.91	100	50	0	6
	West Virginia	9	21	6.21	19	5.62	95	68	5	16
32	New Hampshire	8	5	2.05	5	2.05	100	40	0	0
	North Dakota	8	2	1.44	2	1.44	100	50	50	50
	Texas	8	188	3.73	171	3.40	96	60	9	54
35	Alaska	7	11	8.13	10	7.39	90	60	0	60
	Louisiana	7	44	5.14	42	4.90	98	48	10	57
	Missouri	7	40	3.59	39	3.50	95	56	8	36
	South Dakota	7	7	4.45	7	4.45	100	43	14	43

Continued

TABLE 1—*Continued*

State Firearm Legislation			Fatal Police Encounters (n = 2021)				Victim Characteristics, %[a]			
Rank	State	Brady Score[b]	Total Fatal Encounters[c]	Annualized Fatal Encounter Rate per Million[d]	Total Fatal Police Shootings[c]	Annualized Fatal Police Shooting Rate per Million[e]	Male	Armed With Firearm	Unarmed	Non-White Racial/ Ethnic Status
39	Alabama	6	41	4.60	38	4.27	89	58	5	32
	Arizona	6	85	6.79	83	6.63	92	51	10	41
	Georgia	6	63	3.36	52	2.78	96	60	10	44
	Montana	6	9	4.75	9	4.75	100	56	11	0
	New Mexico	6	42	10.99	41	10.73	95	76	5	56
	Vermont	6	3	2.61	3	2.61	100	33	33	0
45	Kentucky	5	37	4.56	33	4.07	100	61	9	24
	Mississippi	5	20	3.65	16	2.92	100	56	13	25
	Wyoming	5	8	7.45	8	7.45	88	25	0	0
48	Arkansas	4	23	4.21	19	3.48	100	58	16	16
	Idaho	4	12	3.96	11	3.63	100	91	0	18
	Kansas	4	18	3.37	15	2.81	93	60	20	20
State mean ±SD		12.14 ±7.61	39.84 ±53.64	3.88 ±2.14	36.16 ±49.22	3.53 ±2.03	95.96 ±3.88	53.01 ±12.49	10.17 ±9.14	37.68 ±23.05

Source. Police shootings are from *The Guardian*'s online database The Counted and firearm legislative strength is from The Brady Center's legislative scorecards.

[a]Percentage of total number of victims of fatal police shootings.

[b]Legislative strength scores reflects number of state-level firearm laws (1 law = 1 point; see online Table A for details) derived from the 2015 Brady Campaign scorecard.

[c]Total numbers of fatal police encounters based on data from the 22-month period spanning January 1, 2015, to October 31, 2016.

[d]Annualized rate of fatal police encounters per million includes all causes of death, including firearms, struck by vehicle, Taser, death in custody, and other. Annualized rates were calculated by dividing the total number of deaths by the number of months (n = 22) in the study period and multiplying the quotient by 12. This product term was divided by the 2015 state population and multiplied by 1 000 000.

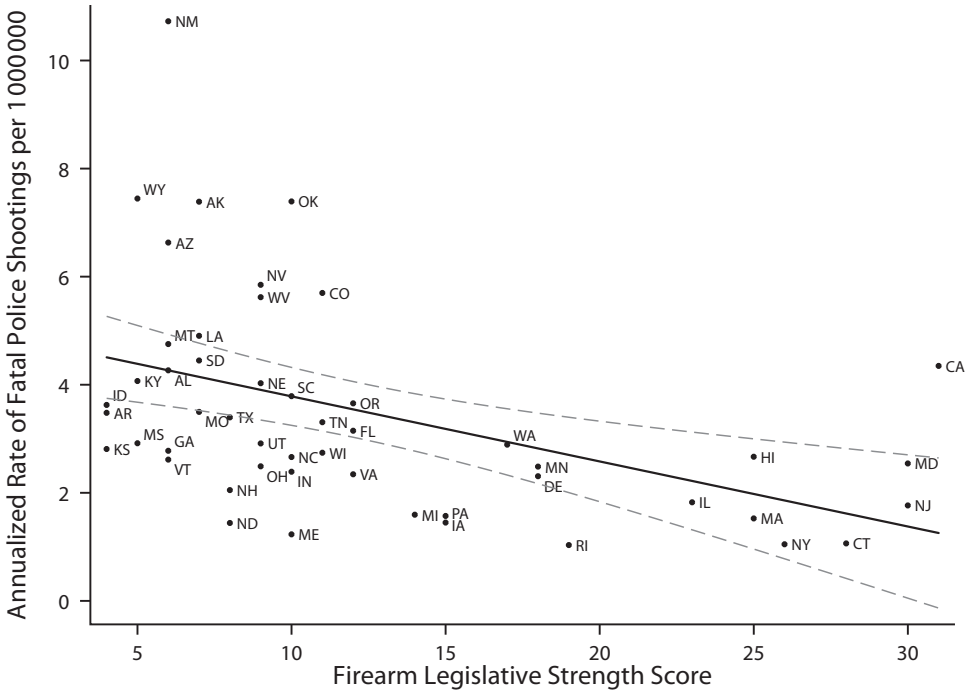
[e]Annualized rate of fatal police shootings was calculated by dividing the total number of firearm-related deaths by the number of months (n = 22) in the study period and multiplying the quotient by 12. This product term was divided by the 2015 state population and multiplied by 1 000 000.

Given the lack of research examining state-level risks for fatal shootings by law enforcement officers, we drew from the extant literature on risks associated with state-level firearm fatality rates. Using the approach of Swedler et al.[18] to select the most parsimonious set of covariates, we found that state-level sociodemographic factors such as age, education, violent crime rate, and household gun ownership rate were associated with fatal police shootings.[7–10] However, even after controlling for these factors, we found that states with the strongest firearm laws had lower incidence rates of fatal police shootings relative to states with the weakest firearm laws. In examining which legislation had the strongest effect on fatal police shootings, we found that legislation aimed at strengthening background checks, promoting safe storage via child and consumer safety laws, and curbing gun trafficking were associated with lower rates of fatal police shootings, even when we controlled for age, education, and violent crime. The effect of background check laws on rates of fatal police shootings was shown to function through their impact on firearm ownership rates, whereas gun trafficking and child and consumer safety laws remained significantly associated with police shootings even after we controlled for firearm ownership. Given this pattern of findings, it is possible that different types of firearm legislation influence police shootings through distinct mechanisms. Whereas background check legislation appears to exert its effect on police shootings through its influence on the number of firearms in the community, other categories of legislation, such as those targeting gun trafficking and safe storage, likely function by preventing guns already in the community from falling into the wrong hands.

Limitations

Some limitations should be considered when interpreting these results. First, our analysis is state level and cross-sectional, and so we were unable to look at the regional differences in implementation or enforcement of laws. Second, we were unable to determine causality or the possibility of alternative explanations for this relationship. For example, it is possible that states with stricter gun legislation also have better training for police officers and more stringent hiring practices, or that states that are already safe are more likely to implement stricter gun laws. However, given the nature of the data and the scope of this study, we were unable to examine such temporal elements that could eliminate possible confounding factors.

Third, we controlled for those state-level factors that are significant in other research on firearm legislation and mortality. However, studies have not yet examined fatal police shooting in this way, and so there may be factors that we did not consider. Fourth, the Brady scores used in this study do not allow for fine-grained distinctions between laws within categories. For example, although our findings suggest that background check



Note. Line represents regression line with 95% confidence interval ($P < .001$).

Source. Police shootings are from *The Guardian*'s online database The Counted and firearm legislative strength is from The Brady Center's legislative scorecards.

FIGURE 1—State-Level Firearm Legislation and Fatal Police Shootings: United States, January 1, 2015–October 31, 2016

legislation is associated with decreases in fatal police shootings, it is possible that screening for felonies decreases fatalities whereas screening for mental illness does not. Additional research is needed to determine how specific laws are related to rates of fatal police shootings.

Finally, although both have been used in previous research, neither the Brady scoring system nor The Counted data have been empirically validated. However, at least 1 study suggests that The Counted data, along with other open-source databases, contain more complete information than do official government data.[12] Moreover, the consistency in findings between this study and others suggests the face validity of The Counted data; therefore, although this might be seen as a limitation, it is also an innovative approach toward examining social phenomenon where little validated data exist.

Public Health Implications

This study suggests that in states where there are weaker gun laws, the citizens are more likely to be killed by law enforcement

TABLE 2—Change in Overall Fatal Police Shootings by State-Level Firearm Legislative Strength Quartile: United States, January 1, 2015–October 31, 2016

Firearm Legislative Strength Quartile	Absolute Rate (SD)[a]	Absolute Rate Difference[b]	Incidence Rate Ratio (95% CI)	
			Model 1[c]	Model 2[d]
1 (4–6 laws)	4.68 (2.44)	1 (Ref)	1 (Ref)	1 (Ref)
2 (7–9 laws)	4.00 (1.73)	0.67	0.856 (0.591, 1.240)	0.753 (0.521, 1.087)
3 (10–14 laws)	3.33 (1.72)	1.35	0.712 (0.476, 1.064)	0.741 (0.503, 1.092)
4 (15–31 laws)	2.04 (0.92)	2.64	0.436 (0.302, 0.628)	0.488 (0.287, 0.828)

Note. CI = confidence interval.

Source. Police shootings are from *The Guardian*'s online database The Counted and firearm legislative strength is from The Brady Center's legislative scorecards.

[a]Mean annualized rate of fatal police shootings per 1 000 000.

[b]Absolute rate difference in annualized fatal police shootings per 1 000 000 referenced to quartile 1.

[c]Unadjusted incidence rate ratio referenced to quartile 1.

[d]Model 2 is adjusted for age, education, violent crime rate, and household gun ownership rate.

TABLE 3—Change in Rates of Fatal Police Shootings Across States With the Weakest and Strongest Firearm Legislation, by Legislative Category: United States, January 1, 2015–October 31, 2016

Firearm Legislative Category[a]	Incidence Rate Ratio (95% CI)			Absolute Rate Difference[e]
	Model 1[b]	Model 2[c]	Model 3[d]	
Strengthen background checks	0.527 (0.335, 0.830)	0.715 (0.558, 0.916)	0.787 (0.583, 1.062)	1.70
Guns in public places	0.471 (0.303, 0.731)	1.130 (0.839, 1.522)	1.226 (0.926, 1.623)	0.05
Child and consumer safety	0.575 (0.375, 0.880)	0.679 (0.490, 0.942)	0.707 (0.509, 0.983)	1.50
Curb gun trafficking	0.654 (0.410, 1.043)	0.657 (0.505, 0.856)	0.708 (0.546, 0.918)	2.00
Restrict dangerous weapons	0.581 (0.383, 0.881)	1.020 (0.711, 1.465)	1.297 (0.874, 1.923)	1.13
Restrict dangerous persons	0.589 (0.380, 0.912)	0.756 (0.570, 1.003)	0.810 (0.605, 1.084)	1.57
Duty to retreat	0.838 (0.598, 1.176)	1.201 (0.832, 1.735)	1.385 (0.969, 1.980)	0.60

Note. CI = confidence interval.

Source. Police shootings are from *The Guardian*'s online database The Counted and firearm legislative strength is from The Brady Center's legislative scorecards.

[a]Low and high scores for each category are as follows: strengthen Brady background checks, 0 (24 states), 1–5 (26 states); guns in public places, 0–2 (23 states), 3–6 (27 states); child and consumer safety, 0 (6 states), 1–4 (44 states); curb gun trafficking, 0 (26 states), 1–6 (24 states); restrict dangerous weapons, 0 (40 states), 1–3 (10 states); restrict dangerous persons, 0–4 (24 states), 5–8 (26 states); duty to retreat, 0 (27 states), 1 (23 states).

[b]Unadjusted incidence rate ratio.

[c]Model 2 is multivariable, adjusted for sociodemographic characteristics (age, education, and violent crime rate).

[d]Model 3 is adjusted for all sociodemographic characteristics in model 2 and firearm ownership rates.

[e]Absolute rate difference in annualized fatal police shootings per 1 000 000 referenced to states with the weakest firearm legislative strength by category of legislation.

(Figure 1); therefore, a clear policy recommendation is for states to strengthen gun legislation to reduce the rate of fatal police shootings. Less apparent, however, is the mechanism linking firearm legislation to rates of fatal police shootings, even after accounting for the influence of state-level firearm ownership rates. Although speculative at this point, it is possible that in states with weaker gun laws police are more likely to encounter an armed suspect, which in turn increases the likelihood of officers responding with deadly force. Police officers in the United States are more likely than are those in other countries to have experiences in which they encounter an armed suspect,[19] and it is likely that this occurs more often in states with weaker gun laws. Moreover, this study and others find that more than half of all shootings involve instances in which a suspect possessed a firearm, which is a factor often cited in the use of deadly force.[6,20–23] Similarly, it is also likely that police officers in states with weaker gun laws understand, implicitly at least, that they are policing in environments where dangerous individuals have ready access to firearms, priming them to respond with deadly force. Expanding on research documenting the effects of implicit racial stereotypes on police perceptions of danger,[24] misperception of weapons,[25] and shoot–don't shoot decisions,[26] future research might examine the influence of state-level firearm legislation on these mediators of officers' split-second decision-making.

One reason that fatal police shootings might not result in public calls for legislative change is the lack of research, which is likely the result of unreliable data on fatal police shootings; only recently have independent Web sites started tracking data like those used in this study. Thus, another policy implication is the need for dependable vital-records data on law enforcement–related fatalities. However, it is also important to consider that although mass shootings produce a shift in public opinion toward supporting firearm legislation,[4] the response following high-profile fatal police shootings often focuses on police training, tactics, and policies.[27,28] For example, following the events in Ferguson, Missouri, the White House invested in a community policing initiative that supported body-worn cameras and officer training.[29] Since then, the majority of large cities have indicated plans to implement body cameras, which have received increased public support; however, there is limited evidence showing that such measures result in reductions in the use of force,[30–32] and at least 1 study suggests increases in fatal shootings.[33]

Although further research is necessary to determine causality, our study suggests an association between stricter firearm legislation and lower rates of fatal police shootings. Firearm legislation may affect not only criminal homicide and suicide rates but also rates of firearm mortality caused by police officers. Researchers should explore whether and how firearm legislation affects fatal police shootings. AJPH

CONTRIBUTORS

A. J. Kivisto conceptualized the study and designed the analysis. A. J. Kivisto and P. L. Phalen analyzed the data. All authors contributed to writing the article and approved the final draft.

HUMAN PARTICIPANT PROTECTION

All data were publically available for download. This study is non–human participant research and institutional review board approval was not needed.

REFERENCES

1. Hemenway D. *Private Guns, Public Health*. Ann Arbor, MI: University of Michigan Press; 2004.

2. *Web-Based Injury Statistics Query and Reporting System*. Atlanta, GA: Centers for Disease Control and Prevention; 2014.

3. Hemenway D, Miller M. Public health approach to the prevention of gun violence. *N Engl J Med*. 2013;368(21):2033–2035.

4. McGinty EE, Webster DW, Vernick JS, Barry CL. Public opinion on proposals to strengthen US gun laws: findings from a 2013 survey. In: Webster DW, Vernick JS, eds. *Reducing Gun Violence in America: Informing Policy With Evidence and Analysis*. Baltimore, MD: Johns Hopkins University Press; 2013:239–257.

5. Grinshteyn E, Hemenway D. Violent death rates: the US compared with other high-income OECD countries, 2010. *Am J Med*. 2016;129(3):266–273.

6. Klinger D, Rosenfeld R, Isom D, Deckard M. Race, crime, and the micro-ecology of deadly force. *Criminol Public Policy*. 2016;15(1):193–222.

7. Kalesan B, Mobily ME, Keiser O, Fagan JA, Galea S. Firearm legislation and firearm mortality in the USA: a cross-sectional, state-level study. *Lancet*. 2016;387(10030):1847–1855.

8. Fleegler EW, Lee LK, Monuteaux MC, Hemenway D, Mannix R. Firearm legislation and firearm-related

fatalities in the United States. *JAMA Intern Med*. 2013; 173(9):732–740.

9. Safavi A, Rhee P, Pandit V, et al. Children are safer in states with strict firearm laws: a National Inpatient Sample study. *J Trauma Acute Care Surg*. 2014;76(1):146–151.

10. Prickett KC, Martin-Storey A, Crosnoe R. State firearm laws, firearm ownership, and safety practices among families of preschool-aged children. *Am J Public Health*. 2014;104(6):1080–1086.

11. Barber C, Azrael D, Cohen A, et al. Homicides by Police: comparing counts from the National Violent Death Reporting System, Vital Statistics, and Supplementary Homicide Reports. *Am J Public Health*. 2016; 106(5):922–927.

12. Williams HE, Bowman SW, Jung JT. The limitations of government databases for analyzing fatal officer-involved shootings in the United States. *Crim Justice Policy Rev*. 2016. Available at: http://journals.sagepub.com/doi/pdf/10.1177/0887403416650927. Accessed April 5, 2017.

13. *The Guardian*. The Counted. Available at: https://www.theguardian.com/us-news/series/counted-us-police-killings. Accessed November 1, 2016.

14. Krieger N, Chen JT, Waterman PD, Kiang MV, Feldman J. Police killings and police deaths are public health data and can be counted. *PLoS Med*. 2015;12(12): e1001915.

15. Brady Campaign to Prevent Gun Violence. Legislative scorecards. Available at: http://www.bradycampaign.org. Accessed November 1, 2016.

16. Federal Bureau of Investigation. *Uniform Crime Reports*. Washington, DC: Dept of Justice; 2015.

17. Frank MW. Inequality and growth in the United States: evidence from a new state-level panel of income inequality measures. *Econ Inq*. 2009;47(1):55–68.

18. Swedler DI, Simmons MM, Dominici F, Hemenway D. Firearm prevalence and homicides of law enforcement officers in the United States. *Am J Public Health*. 2015; 105(10):2042–2048.

19. Hirschfield PJ. Lethal policing: making sense of American exceptionalism. *Sociol Forum (Randolph, N J)*. 2015;30(4):1109–1117.

20. Ross CT. A multi-level Bayesian analysis of racial bias in police shootings at the county-level in the United States, 2011–2014. *PLoS One*. 2015;10(11):e0141854.

21. Buehler JW. Racial/ethnic disparities in the use of lethal force by US police, 2010–2014. *Am J Public Health*. 2017;107(2):295–297.

22. Miller L. Why cops kill: the psychology of police deadly force encounters. *Aggress Violent Behav*. 2015;22: 97–111.

23. Maskaly J, Donner CM. A theoretical integration of social learning theory with terror management theory: towards an explanation of police shootings of unarmed suspects. *Am J Crim Justice*. 2015;40(2):205–224.

24. Correll J, Park B, Judd CM, Wittenbrink B. The police officer's dilemma: using race to disambiguate potentially threatening individuals. *J Pers Soc Psychol*. 2002;83(6):1314–1329.

25. Correll J, Park B, Judd CM, Wittenbrink B. The influence of stereotypes on decisions to shoot. *Eur J Soc Psychol*. 2007;37(6):1102–1117.

26. Payne K. Weapon bias: split-second decisions and unintended stereotyping. *Curr Dir Psychol Sci*. 2006;15(6): 287–291.

27. Jackson BA. *Strengthening Trust Between Police and the Public in an Era of Increasing Transparency*. Arlington, VA: RAND Corporation; 2015.

28. Kahn KB, Martin KD. Policing and race: disparate treatment, perceptions, and policy responses. *Soc Issues Policy Rev*. 2016;10(1):82–121.

29. The White House. FACT SHEET: Strengthening Community Policing. Available at: https://obamawhitehouse.archives.gov/the-press-office/2014/12/01/fact-sheet-strengthening-community-policing. Accessed November 26, 2016.

30. The Economist/YouGov Poll. 2015. Available at: http://cdn.yougov.com/cumulus_uploads/document/rcrwgep1rx/tabs_OPI_police_body_cams_20150429.pdf. Accessed April 3, 2017.

31. Ariel B, Farrar WA, Sutherland A. The effect of police body-worn cameras on use of force and citizens' complaints against the police: a randomized controlled trial. *J Quant Criminol*. 2015;31(3):509–535.

32. Jennings WG, Lynch MD, Fridell LA. Evaluating the impact of police officer body-worn cameras (BWCs) on response-to-resistance and serious external complaints: evidence from the Orlando Police Department (OPD) experience utilizing a randomized controlled experiment. *J Crim Justice*. 2015;43(6):480–486.

33. Pang M-S, Pavlou PA. Armed with technology: the impact on fatal shootings by the police. 2016. Available at: https://www.bja.gov/bwc/pdfs/SSRN-id2808662.pdf. Accessed February 22, 2017.