Handgun waiting periods reduce gun deaths

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Handgun waiting periods are laws that impose a delay between the initiation of a purchase and final acquisition of a firearm. We show that waiting periods, which create a "cooling off" period among buyers, significantly reduce the incidence of gun violence. We estimate the impact of waiting periods on gun deaths, exploiting all changes to state-level policies in the Unites States since 1970. We find that waiting periods reduce gun homicides by roughly 17%. We provide further support for the causal impact of waiting periods on homicides by exploiting a natural experiment resulting from a federal law in 1994 that imposed a temporary waiting period on a subset of states.

gun policy | gun violence | waiting period | injury prevention

More than 33,000 people die in gun-related incidents each year in the United States, accounting for as many deaths as motor vehicle accidents (1). This is concerning both in absolute terms and in comparison to other developed countries, all of which have lower rates of gun violence (2). For example, if the United States could lower its firearm death rate to that of Finland (the high-income country with the second highest rate), roughly 20,000 fewer people would die from guns every year. However, there has been no meaningful reduction in the US firearm-related death rate for more than a decade. Moreover, evidence about which policies would be effective at reducing violence remains limited (3), and the types of bills that are enacted depend on the political party in power (4).

One avenue for reducing gun deaths is to draw on insights from behavioral economics and psychology, which suggest that delaying gun purchases, even for a short time, might be an effective policy tool. Visceral factors, such as anger or suicidal impulses, can spur people to inflict harm on others or themselves, but tend to be transitory states (5, 6). For example, Card and Dahl (7) find that there is a 10% increase in domestic violence following an upset loss of the local National Football League team. Moreover, behaviors triggered by such visceral states can be contrary to longer term self-interest (5, 6).

Delaying a gun purchase could create a "cooling off" period that reduces violence by postponing firearm acquisitions until after a visceral state has passed. Increasing the time it takes to acquire a gun might also close the window of opportunity for would-be perpetrators of violence to use their weapons. Finally, a mandatory delay has the potential to deter purchases among people who have malevolent, but temporary, motivations for owning a firearm.

This article explores the impact of "waiting period" laws on firearm-related homicides and suicides using 45 y of data on law changes and mortality at the state level in the United States. A waiting period is a mandatory delay between the purchase and delivery of a gun; it requires purchasers to wait, typically between 2 and 7 d, before receiving their weapons. We exploit plausibly exogenous temporal and geographic variation in waiting period laws to implement a difference-in-differences approach that identifies the causal impact of waiting periods on homicides and suicides.

We find that waiting periods cause large and statistically significant reductions in homicides. Point estimates using our full 45-y sample and all waiting period changes imply a 17% reduction in gun homicides. We provide further evidence of a causal relationship between waiting periods and lower homicide rates

based on a natural experiment in which federal law imposed waiting periods on a subset of states. Estimates from this analysis also suggest that waiting periods reduce gun homicides by 17%. The results of both analyses confirm a large and robust effect of waiting periods on homicides. We also find a negative effect of waiting periods on suicides, but the magnitude and statistical significance of the suicide effect vary across model specification.

Data and Research Design

We construct a panel of every change to waiting period laws in the United States between 1970 and 2014, which we obtained from state statutes and session laws. We combine these changes with annual data on firearm-related deaths from the Centers for Disease Control and Prevention. Fig. 1 shows the number of states with waiting periods over time. Overall, 44 states (including the District of Columbia) have had a waiting period for at least some time between 1970 and 2014. Exploiting the significant geographic and temporal variation in the adoption of waiting periods, we implement a difference-in-differences framework to estimate the causal impact of waiting periods on gun deaths. Essentially, we compare changes in firearm-related deaths within states that adopted waiting periods with changes in firearm-related deaths in other states. We control for changing economic and demographic factors that may be correlated with higher levels of gun violence or with the decision of lawmakers to adopt policies that delay gun purchases.

To support our causal interpretation, we then restrict the analysis to the period from 1990 to 1998, during which federal policy forced many states to implement waiting periods. The Brady Handgun Violence Prevention Act (hereinafter "Brady Act"), which went into effect in February 1994, required background checks on handgun purchases from licensed firearm dealers and created a 5-d waiting period to allow sufficient time for the check. Although it was a federal policy, the Brady Act only created new waiting periods for 19 states, since some states already required a background check and waiting period, and some implemented an "instant check" system that allowed for nearly immediate background checks (thereby obviating the need for a waiting period). We provide further details regarding the Brady Act and affected states in *Identifying Policy Changes* and *Materials and Methods*.

Significance

Waiting period laws that delay the purchase of firearms by a few days reduce gun homicides by roughly 17%. Our results imply that the 17 states (including the District of Columbia) with waiting periods avoid roughly 750 gun homicides per year as a result of this policy. Expanding the waiting period policy to all other US states would prevent an additional 910 gun homicides per year without imposing any restrictions on who can own a gun.

ECONOMIC SCIENCES

Number of States with Waiting Periods and Background Checks
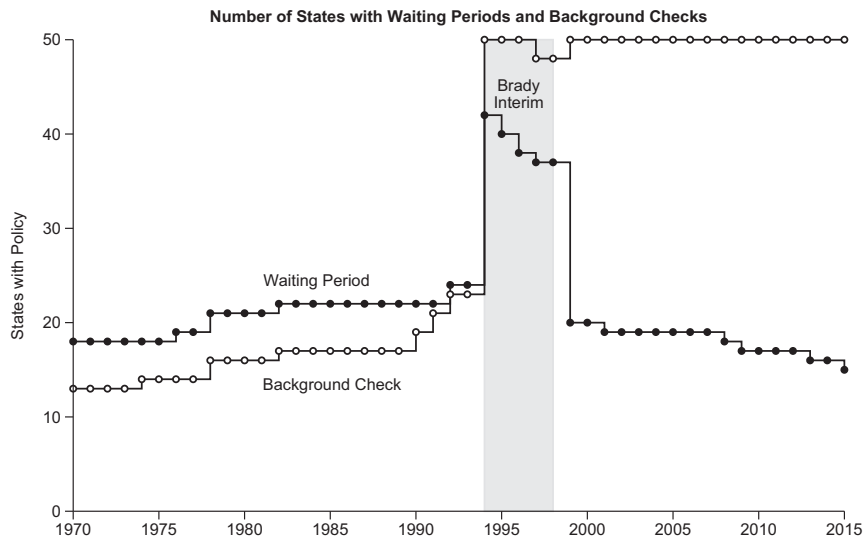
Fig. 1. States with handgun waiting periods and background checks on dealer sales from 1970 to 2015. Many states were required to implement these policies during the Brady interim period between February 1994 and November 1998 (shaded gray). Following prior research (8), Alabama and Ohio are coded as not requiring background checks after the Supreme Court's decision in *Printz v. United States*. Not all states had waiting periods during the Brady interim period because they implemented or already had an instant background check system that obviated the need for a waiting period to investigate gun buyers.

Results

We begin by examining the effect of waiting periods across the full sample period from 1970 to 2014. The results of Table 1 show that waiting periods are associated with a 17% reduction in gun homicides. This effect is equivalent to ~36 fewer gun homicides per year for a state with an average number of gun deaths. Waiting periods also lead to a 7–11% reduction in gun suicides (depending on the control variables used in the specification), which is equivalent to 22–35 fewer gun suicides per year for the average state. The results in Table 1 use a log-linear specification; we

Table 1. Effects of handgun waiting periods and background checks on violence, 1970–2014

	1970–2014		1977–2014
Type of violence	(1)	(2)	(3)
All homicide			
Waiting period	−0.127 (0.059)**	−0.137 (0.059)**	−0.132 (0.050)**
Background check		0.049 (0.082)	0.025 (0.081)
Gun homicide			
Waiting period	−0.188 (0.077)**	−0.187 (0.086)**	−0.186 (0.071)**
Background check		−0.004 (0.103)	0.022 (0.107)
Non-gun homicide			
Waiting period	−0.016 (0.051)	−0.048 (0.060)	−0.035 (0.037)
Background check		0.153 (0.076)**	0.036 (0.057)
All suicide			
Waiting period	−0.047 (0.021)**	−0.070 (0.023)***	−0.024 (0.011)**
Background check		0.113 (0.061)*	0.023 (0.020)
Gun suicide			
Waiting period	−0.097 (0.034)***	−0.120 (0.031)***	−0.074 (0.017)***
Background check		0.111 (0.073)	0.029 (0.028)
Non-gun suicide			
Waiting period	−0.017 (0.038)	−0.058 (0.059)	−0.006 (0.033)
Background check		0.199 (0.072)***	0.084 (0.031)**

Coefficients represent the effects of waiting periods and background checks on the natural logarithm of deaths per 100,000 adult residents. All models include state and year fixed effects. Models 1–2 include only the policy variables shown. Model 3 follows the specification of Ludwig and Cook (8) and includes alcohol consumption, poverty, income, urbanization, black population, and seven age groups. Model 3 uses fewer years of data due to missing control variables in earlier years. Summary statistics for all variables are included in Table S1. The 1970–2014 period includes 2,295 state-year observations; the model for gun homicides omits three state-years, and the model for non-gun homicides omits two state years because the death count was zero and the model is specified with a logged dependent variable. Similarly, the 1977–2014 period includes 1,938 state-years, but omits two state-years for gun homicides and one state-year for non-gun homicides. SEs, shown in parentheses, are clustered by state. Alternative model specifications presented in Tables S7 and S8 are not logged and include all state-years. *P < 0.10; **P < 0.05; ***P < 0.01.

present models with state-specific trends, models linear in the rate of violence, and Poisson models as part of Tables S3 and S5. The conclusion that waiting periods reduce gun homicides is robust across all specifications. The conclusion regarding suicides is robust to all specifications except those that include state-specific, linear trends (Table S3). Both conclusions are robust across models with and without controls for state-level economic and demographic changes. We also investigate the robustness of the results to the exclusion of individual states in Fig. S1.

To further support the hypothesis that waiting periods lead to a reduction in gun homicides, we then focus on a natural experiment created by the Brady Act, a federal law that forced some states to adopt new waiting period and background check policies between 1994 and 1998. Ludwig and Cook (8) also use the Brady Act to study whether background checks and waiting periods affect violence. They compare "Brady states" that were subject to the Brady Act with "Brady-exempt states" that were not. However, some states that were classified as Brady states already had waiting periods and background checks before the Brady Act, and other states chose to implement an "instant" background check system instead of requiring a waiting period. As a result, the coding of Brady states in the study by Ludwig and Cook (8) fails to capture all states that had preexisting waiting periods. In contrast, we precisely code which states had waiting periods (before 1994) and which implemented waiting periods only because of the Brady Act. In total, our coding differs from theirs for 16 states. This additional accuracy allows us to assess the causal impact of waiting periods resulting from the Brady Act. The full list of differences between our coding and prior research, along with supporting citations, can be found in Table S4.

We find that waiting periods led to large and statistically significant reductions in gun violence (Table 2) during the Brady interim period. Specifically, the results of column 3 of Table 2 show that waiting periods implemented during the Brady interim years resulted in a 17% reduction in gun homicides. This is equivalent to roughly 39 fewer homicides per year for the average state. There was also a 6% reduction in gun suicides (i.e.,

17 fewer suicides per year for the average state). Both results are robust across models with and without controls for state-level economic and demographic changes. Notably, exploiting the Brady Act as a natural experiment produces similar estimates as the longer sample period from 1970 to 2014.

Tables 1 and 2 also show that waiting periods have no significant effect on non-gun homicides, suggesting that people subject to waiting period laws do not substitute other means of committing homicide. This is consistent with other research (9) finding no increase in non-gun homicides in response to policies restricting access to firearms. Results for non-gun suicides, however, are less clear; some specifications suggest partial substitution toward non-gun methods of suicide in response to handgun waiting periods.

Discussion

Our results show that waiting periods reduce gun homicides. Waiting periods for gun purchases are supported not only by the American Medical Association but also by a majority of Americans and a majority of gun owners (10, 11). Our point estimates, based on 45 y of data, suggest that the 17 states (including the District of Columbia) with waiting periods as of 2014 avoid ~750 gun homicides. Expanding the waiting period policy to states that do not currently have it would prevent an additional 910 gun homicides per year. Waiting periods would therefore reduce gun violence without imposing any restrictions on who can own a gun.

Materials and Methods

Our main specifications are of the form:

$$r_{it} = \alpha_i + \lambda_t + \beta W_{it} + \gamma B_{it} + \delta' X_{it} + \epsilon_{it},$$

where r_{it} is the natural logarithm of the rate of violence (homicides or suicides) per 100,000 adult residents, W_{it} is an indicator for handgun waiting periods and B_{it} is an indicator for whether background checks are required for dealer handgun sales. We include an indicator variable for background checks on handgun purchases from licensed firearm dealers because a major source of policy variation in our dataset (the Brady Act) also affected

Table 2. Effects of handgun waiting periods and background checks on violence, 1990–1998

Type of violence	Brady period, 1990–1998		
	(1)	(2)	(3)
All homicide			
Waiting period	−0.073 (0.084)	−0.130 (0.077)*	−0.145 (0.060)**
Background check		0.091 (0.064)	0.010 (0.053)
Gun homicide			
Waiting period	−0.103 (0.093)	−0.179 (0.087)**	−0.181 (0.068)**
Background check		0.120 (0.080)	0.033 (0.065)
Non-gun homicide			
Waiting period	−0.019 (0.068)	−0.035 (0.064)	−0.072 (0.050)
Background check		0.025 (0.044)	−0.043 (0.039)
All suicide			
Waiting period	−0.016 (0.021)	−0.022 (0.023)	−0.036 (0.020)*
Background check		0.009 (0.022)	−0.007 (0.019)
Gun suicide			
Waiting period	−0.039 (0.024)	−0.053 (0.028)*	−0.066 (0.021)***
Background check		0.023 (0.028)	−0.003 (0.024)
Non-gun suicide			
Waiting period	0.050 (0.021)**	0.035 (0.022)	0.018 (0.022)
Background check		0.024 (0.023)	0.009 (0.018)

Coefficients represent the effects of waiting periods and background checks on the natural logarithm of deaths per 100,000 adult residents. All models include state and year fixed effects. Models 1–2 include only the policy variables shown. Model 3 follows the specification of Ludwig and Cook (8) and includes alcohol consumption, poverty, income, urbanization, black population, and seven age groups. Summary statistics for all variables are included in Table S2. The sample includes 459 state-year observations for all models. SEs, shown in parentheses, are clustered by state. *P < 0.10; **P < 0.05; ***P < 0.01.

background check policies. As seen in Tables 1 and 2, the estimated impact of background checks depends on model specification. We also incorporate time-varying state-level control variables that may influence rates of gun violence (8), X_{it}, including alcohol consumption, poverty, income, urbanization, black population, and seven age groups. Summary statistics for these variables are included in Tables S1 and S2. The α_i and λ_t parameters represent state and year fixed effects. These fixed effects control for stable, state-specific factors affecting violence and time-varying factors that affect all states identically. It is impossible to control for all time-varying, state-specific factors that affect gun violence. For example, policing tactics, drug use, and environmental factors such as lead exposure might not have changed uniformly across states over time and may also affect violence. However, the consistency between our estimates during the short (Brady interim) period and the longer period (including all waiting period changes since 1970) supports our interpretation of the results. The model parameters are estimated via least squares weighted by state population. We then calculate the percentage effect of waiting periods on violence using the estimator described by Kennedy (12).

We code a state as having a waiting period if it imposes any mandatory delay on the purchase of a handgun or has a permitting system for dealer and private sales. (In Table S5, we estimate models with a separate control variable for handgun permit systems and show that the effect of waiting periods is not limited to states with permitting systems.) Currently, 10 states and the District of Columbia impose an explicit waiting period on handgun sales, and an additional five states have permitting systems for private and dealer sales that result in a delay of firearm purchases. Forty-four states have had a handgun waiting period at some point since 1970, although 19 implemented the policy only due to the Brady Act's interim provisions, in effect from February 1994 to November 1998. These provisions required local law enforcement agencies to conduct background checks on handgun purchases from licensed firearm dealers and required a 5-d waiting period to conduct the check. Some states already required background checks and/or waiting periods before the Brady Act, and were therefore not affected by the new law, but other states were forced to adopt a new waiting period due to the federal policy change. When the permanent provisions of the Brady Act took effect on November 30, 1998, the federal waiting period requirement was replaced with an instant background check system [the National Instant Criminal Background Check System (NICS)]. As a result, many states discarded their waiting periods after 1998 because the NICS eliminated the need for a waiting period to investigate purchasers' backgrounds. We use the subset of waiting period changes that resulted from the Brady Act as a natural experiment to provide further support for our analysis of the full sample period from 1970 to 2014.

Although nine states have also had a waiting period on long-guns (i.e., rifles and shotguns) sometime since 1970, we focus on handgun waiting periods because handguns account for 70–80% of firearm homicides (13) and because a major source of variation in our data, the Brady Act's interim period, only affected handgun sales.

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Supporting Information

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Summary Statistics

Tables S1 and S2 provide summary statistics for variables used in the main analyses. Table S1 shows summary statistics for variables used for analyses presented in Table 1, covering the full 1970–2014 sample period. Table S2 shows summary statistics for variables used for the analysis of the Brady interim period in Table 2, covering 1990–1998.

Identifying Policy Changes

In our first set of analyses, covering 1970–2014, we extend prior coding of policy changes by including an additional 36 y of data with 25 changes in waiting period policies. Our approach to identifying changes in waiting period policies also improves on Ludwig and Cook's (8) classification of states affected by the Brady Handgun Violence Prevention Act. Prior research coded all states subject to the Brady Act's interim provisions as treatment states, but some of these states already had background checks and/or waiting periods before the interim period. Table S4 details the differences between our coding and that of Ludwig and Cook (8). In total, our coding differs for 16 states; the table footnotes provide supporting citations for each difference. We find that these improvements more accurately measure the effects of waiting periods on homicides, which we now find to be robust and statistically significant at conventional levels, even when we restrict the sample to the same years examined in prior research.

Robustness: State-Specific Trends

If states that do and do not adopt waiting periods have different trends in violence before the implementation of the waiting period, then one might be concerned that our results reflect these different trends rather than the impact of the waiting period policy. To allow for the possibility of differential secular trends, Table S3 estimates a log-linear model with linear trends that vary by state for the 1970–2014 time period [We do not estimate models with state-specific trends for the analysis of the Brady interim period (1990–1998) because there is too little pretreatment data to identify preexisting, state-specific trends in gun violence (14)]. This model produces similar estimates for the effect of waiting periods on homicides, suggesting that differential trends are not the main driver of the results and providing further support for our interpretation. The results for suicides, however, differ across specification and are not robust to the inclusion of control variables and state-specific trends in suicide. The model without trends in column 3 of Table 1 suggests that waiting periods reduce gun suicides by 7%, while the model in column 3 of Table S3 suggests no reduction. The results of Table S3 also suggest that any decrease in gun suicides due to waiting periods is offset by an increase in non-gun suicides.

Robustness: Falsification Exercise and Dynamic Effects

To shed further light on the dynamics of the effects shown in Table 1, Table S6 reestimates the model in column 3 of Table 1, but includes leads and lags of the policy change, specifically including indicator variables for the years before and after implementation of a waiting period. We find that the impact of waiting periods does not appear until the waiting period has been adopted, providing further support for our causal interpretation. Violence appears to fall soon after implementation, although the single-year estimates are imprecise.

Robustness: Other Changes in Gun Policy

While the results overall point to the causal effect of waiting periods, one might still be concerned that other gun policy changes are correlated with the timing of waiting period changes. To address this concern, we provide evidence that the effects reported in Table 1 are robust to the inclusion of controls for other gun policies in a state. Specifically, in Table S5, we reestimate the models of columns 2 and 3 in Table 1, but include additional variables for handgun permit and concealed carry policies to account for potential correlation between the implementation of these policies and waiting periods. The results in Table S5 show that the inclusion of other gun policies in the model does not change our conclusion that waiting periods reduce gun homicides and suicides. Our study uses a natural experiment embedded in the Brady Act to identify the impact of waiting periods; estimating the causal impact of exogenous changes to other gun policies is beyond the scope of this study. Other research focuses on the impact of handgun permits (15, 16) and concealed carry laws (17–20).

Alternative Model Specifications

Alternative specifications for the effect of waiting periods on homicides and suicides produce similar point estimates (Tables S7 and S8). The estimates in Table S7 are based on models linear in the rate of violence. The results in columns 2 and 3 imply that waiting periods reduce gun homicides by roughly 18% and gun suicides by 5–9% for a state with an average rate of violence. Results for the Poisson model (Table S8) imply reductions of 18–20% and 7–11.6% for gun homicides and suicides, respectively, while estimates based on the log-linear model presented in the main text and Table 1 imply 17% and 7–11% reductions.

Additionally, we examine unweighted, least-squares estimates (Tables S9 and S10). The coefficient estimates on the waiting period dummy from the unweighted regressions are attenuated relative to the weighted results. This suggests that the effect of waiting period policies is heterogeneous, with larger states experiencing greater reductions in violence than smaller states (21). To ensure our results are not driven by outlier states, we reestimate the model of gun homicide and suicide rates (column 3 of Table 1), but exclude one state at a time. Fig. S1 shows the 51 resulting coefficients (one from excluding each state and the District of Columbia) for homicides and suicides. The coefficient estimates are consistently negative. As expected from the difference between the weighted and unweighted estimates, large states like Pennsylvania and Florida seem to exert downward pressure on the coefficient.

Complete Coefficient Estimates

Table S11 presents coefficient estimates for all variables included in model 3 of Table 1. This model uses the same control variables as prior research by Ludwig and Cook (8).
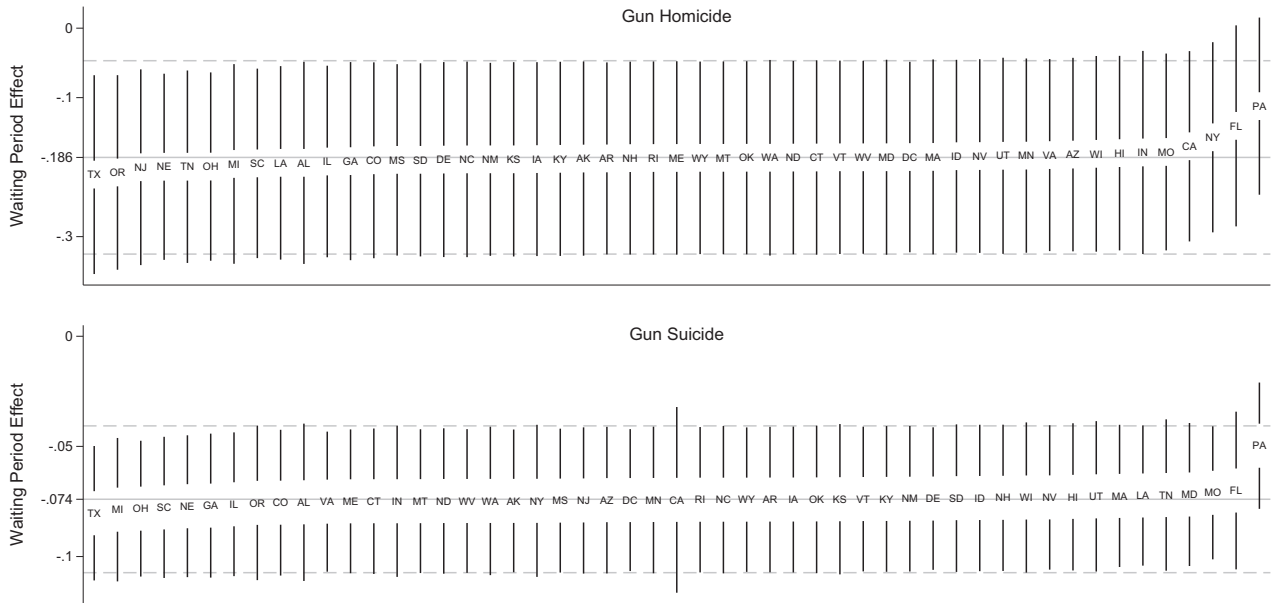
Fig. S1. Estimates of the effect of waiting periods on gun homicides and suicides, dropping each state individually from the analysis and reestimating model 3 of Table 1. Bars are 1.96 ± SE of the waiting period coefficient. Solid lines mark the full sample estimates, and dashed lines are 1.96 ± full sample SE.

Table S1. State-level summary statistics: 1970–2014 (Table 1)

Variable	Mean	SD	p5	p10	p50	p90	p95
Years 1970–2014							
Gun homicide rate	5.7	4.9	1.0	1.4	4.4	11.1	14.4
Homicide rate	8.5	6.7	2.1	2.6	6.8	15.6	19.4
Gun suicide rate	10.2	4.2	3.1	4.0	10.2	15.0	17.1
Suicide rate	17.3	4.7	10.2	11.9	16.7	23.7	26.0
Handgun waiting period	0.45	0.49	0	0	0	1	1
Background checks	0.64	0.48	0	0	1	1	1
Years 1977–2014 (Control variables for model 3)							
Alcohol consumption	2.9	0.8	2.0	2.1	2.7	3.8	4.3
Income per capita	25.4	5.8	17.2	18.6	24.8	32.6	35.7
Demographics, %							
Poverty	13.1	4.0	7.9	8.7	12.5	18.5	20.9
Urban areas	64.2	20.1	29.5	35.5	64.9	89.0	91.9
Black	11.2	11.8	0.4	0.7	7.4	27.5	32.1
Ages 0–14 y	21.4	2.4	17.9	18.7	21.3	24.3	25.8
Ages 15–17 y	4.5	0.6	3.7	3.9	4.4	5.5	5.8
Ages 18–24 y	10.9	1.6	8.9	9.2	10.3	13.4	13.8
Ages 25–34 y	15.1	2.2	12.0	12.5	15.0	17.9	18.7
Ages 35–44 y	14.0	1.9	10.8	11.3	14.1	16.3	16.9
Ages 45–54 y	12.0	2.2	9.0	9.3	12.0	14.9	15.4
Ages 55–64 y	9.7	1.7	7.6	7.9	9.2	12.3	12.9

Homicide and suicide rates are adult (21+) deaths per 100,000 adult residents. Alcohol consumption is measured in gallons of ethanol per capita, and income is measured in thousands of 1998 dollars. Demographic control variables are percentages of total state population. Columns beginning with "p" represent percentiles of the distribution; for example, "p10" means the 10th percentile.

Table S2. State-level summary statistics: 1990–1998 (Table 2)

Variable	Mean	SD	p5	p10	p50	p90	p95
Gun homicide rate	5.9	6.1	1.0	1.4	4.6	10.4	12.3
Homicide rate	8.8	8.0	2.1	2.7	7.0	14.7	18.3
Gun suicide rate	10.2	4.0	3.2	4.0	10.6	15.0	17.3
Suicide rate	16.6	4.5	9.6	11.4	16.1	22.7	24.9
Handgun waiting period	0.63	0.47	0	0	1	1	1
Background checks	0.74	0.43	0	0	1	1	1
Alcohol consumption	2.6	0.6	2.0	2.1	2.6	3.1	4.1
Income per capita	24.3	3.8	19.1	19.9	23.9	29.1	31.7
Demographics, %							
Poverty	13.3	4.0	8.2	8.9	12.5	19.0	21.1
Urban areas	63.5	19.9	29.0	35.1	63.9	87.5	91.1
Black	11.1	12.0	0.4	0.5	7.3	27.5	31.9
Ages 0–14 y	21.9	1.9	19.4	20.0	21.6	24.1	25.2
Ages 15–17 y	4.3	0.5	3.5	3.7	4.2	4.9	5.1
Ages 18–24 y	9.9	0.9	8.4	8.9	9.9	11.0	11.6
Ages 25–34 y	15.7	1.6	13.1	13.7	15.6	17.7	18.4
Ages 35–44 y	16.0	1.0	14.4	14.8	15.9	17.1	17.7
Ages 45–54 y	11.5	1.2	9.7	10.0	11.5	13.1	13.5
Ages 55–64 y	8.2	0.7	7.1	7.5	8.2	8.9	9.1

Homicide and suicide rates are adult (21+) deaths per 100,000 adult residents. Alcohol consumption is measured in gallons of ethanol per capita; income is thousands of 1998 dollars. Demographic control variables are percentages of total state population. Columns beginning with "p" represent percentiles of the distribution; for example, "p10" means the 10th percentile.

Table S3. States that implemented background checks and waiting periods during the Brady Act's interim period from February 1994 through November 1998, according to Ludwig and Cook (8) and this study

State	Ludwig and Cook (8)		New coding (this study)	
	Background check	Waiting period	Background check	Waiting period
Alabama*	■	■	■	■
Alaska	■	■	■	■
Arizona†	■	■	■	□ Feb–Oct 1994
Arkansas	□	□	□ Feb 1994–June 1997	□ Feb 1994–June 1997
California				
Colorado	■		■	
Connecticut				
Delaware				
District of Columbia				
Florida				
Georgia‡	■	■	■	□ Feb 1994–Dec 1995
Hawaii				
Idaho§	■	■	■	□ Feb–May 1994
Illinois				
Indiana				
Iowa				
Kansas	■	■	■	■
Kentucky	■	■	■	■
Louisiana	■	■	■	■
Maine	■	■	■	■
Maryland				
Massachusetts				
Michigan				
Minnesota¶	■			
Mississippi	■	■	■	■
Missouri				
Montana	■	■	■	■
Nebraska#	■	■		
Nevada‖			■	
New Hampshire**	■	■	■	□ Feb–Dec 1994
New Jersey				
New Mexico	■		■	■
New York				
North Carolina††	■	■		
North Dakota	■		■	■
Ohio‡‡	□	□	□ Feb 1994–June 1997	
Oklahoma	■	■	■	■
Oregon				
Pennsylvania§§	■	■	■	
Rhode Island¶¶	■			
South Carolina##	■	■	■	
South Dakota‖‖	■	■		
Tennessee***	■	■		
Texas	■		■	■
Utah	■		■	
Vermont	■	■	■	■
Virginia				
Washington†††	■			
West Virginia	■	■	■	■
Wisconsin				
Wyoming	■	■	■	■

The coding of states in boldface differs; an explanation of differences is provided in table footnotes. Dates are noted for cases in which policies changed during the interim period. ■, state got policy for full interim period; □, state got policy for part of interim period.

*Alabama had a 2-d waiting period on handgun purchases before implementation of the Brady Act (Code of Ala. § 13A-11-77).

†Arizona created an instant check background system in October 1994, and therefore had effectively no waiting period for most of the Brady Act's interim period (Ariz. Rev. Stat. Ann. § 13–3114).

‡Georgia implemented an instant check system in January 1996 (Ga. Code Ann. § 16-11-170).

§Idaho implemented an instant check system in June 1994 (Ida. Code § 19-5403).

¶Minnesota created a permit system in 1977 that required background checks and a 7-d waiting period for handgun purchases (Minn. Stat. § 624.7131 et seq.).

#Nebraska was exempt from the Brady Act (22, 23). Furthermore, it created a handgun permit system with a background check and 2-d waiting period in 1991 (Neb. Rev. Stat. § 69-2404 et seq.).

‖Ludwig and Cook (8) say Nevada was classified as a control state because it's pre-Brady Act laws were strict enough to warrant an exemption even though it was subject to the Brady Act. We cannot find evidence of this; Nevada had neither a background check nor waiting period requirement before implementation of the Brady Act (24) and was subject to the act's provisions (23). We classify the state as not having a waiting period because the state implemented an instant check system (25).

**New Hampshire implemented an instant check system in January 1995 (N.H. Rev. Stat Ann. § 159-C).

††We classify North Carolina as a control state because it implemented a handgun permit system in 1919 (N.C. Gen. Stat. § 14-402 et seq.). An explicit background check requirement was not added to the statutes until 1995, but the law previously required superior court clerks to certify that handgun permit applicants were of "good moral character" and included felonies, indictments, fugitive status, and mentally ill persons among those not of such character (N.C. Gen. Stat. § 14-404).

‡‡Ohio was subject to the Brady Act's interim provisions (22, 23) but had instant background checks (25), and is therefore coded as not implementing a waiting period. Like Ludwig and Cook (8), we code Ohio as stopping background checks after the Supreme Court's decision in *Printz v. United States* in June of 1997. We cannot find a statute or executive order for Ohio, and therefore rely exclusively on federal government reports (22, 23, 25).

§§Pennsylvania already had a 2-d waiting period before implementation of the Brady Act (24). We therefore code the state as only implementing the Brady Act's background check provisions. The state abandoned its waiting period in 1998 when instant checks became available (text and legislative history of 18 Pa.C.S.A. § 6111).

¶¶Rhode Island was subject to the Brady Act despite requiring both a background check and waiting period as part of its handgun permit process before 1994 (24). It therefore did not newly implement background checks or waiting periods as a result of the Brady Act (R.I. Gen. Laws § 11-47-35 et seq.).

##South Carolina's Law Enforcement Division ran an instant check system at the time the Brady Act was implemented (22, 25, 26), and is therefore coded as not implementing a waiting period. South Carolina's governor created the instant check system by executive order (26).

‖‖South Dakota had a 2-d waiting period before implementation of the Brady Act (since at least 1935) that was not repealed until 2009 (S.D. Codified Laws § 23-7-9).

***Tennessee was subject to the Brady Act even though it already required a background check and 15-d waiting period (24) (Tenn. Code Ann. § 39-17-1316). It is therefore coded as not newly implementing these laws due to the Brady Act's interim provisions.

†††Washington had background checks before the Brady Act but was not Brady-exempt because it did not require the chief law enforcement officer in the area where the purchaser lived to conduct the check (Wash. Rev. Code Ann. § 9.41.090).

Table S4. Effects of handgun waiting periods and background checks on violence, including state-specific trends, 1970–2014

Type of violence	1970–2014		1977–2014
	(1)	(2)	(3)
All homicide			
Waiting period	−0.118 (0.049)**	−0.129 (0.049)**	−0.086 (0.045)*
Background check		0.033 (0.057)	0.001 (0.047)
Gun homicide			
Waiting period	−0.181 (0.066)***	−0.195 (0.071)***	−0.124 (0.050)**
Background check		0.043 (0.077)	0.014 (0.068)
Non-gun homicide			
Waiting period	−0.011 (0.039)	−0.014 (0.038)	−0.030 (0.047)
Background check		0.011 (0.051)	−0.015 (0.035)
All suicide			
Waiting period	0.015 (0.013)	0.017 (0.013)	0.022 (0.016)
Background check		−0.005 (0.017)	−0.006 (0.015)
Gun suicide			
Waiting period	−0.044 (0.017)**	−0.045 (0.020)**	−0.012 (0.016)
Background check		0.002 (0.018)	−0.017 (0.017)
Non-gun suicide			
Waiting period	0.056 (0.019)***	0.050 (0.020)**	0.048 (0.024)*
Background check		0.020 (0.022)	0.019 (0.024)

Coefficients represent the effects of waiting periods and background checks on the natural logarithm of deaths per 100,000 adult residents. Models mirror Table 1, but include a state-specific, linear trend in addition to state and year fixed effects. Models 1–2 include only the policy variables shown. Model 3 follows the specification of Ludwig and Cook (8) and uses fewer years of data due to missing control variables in earlier years. SEs, shown in parentheses, are clustered by state. *$P < 0.10$; **$P < 0.05$; ***$P < 0.01$.

Table S5. Effect of handgun waiting periods relative to adoption year, 1977–2013

Time relative to waiting period	Homicides			Suicides		
	All	Gun	Non-gun	All	Gun	Non-gun
	(1)	(2)	(3)	(4)	(5)	(6)
2 y before	−0.024 (0.047)	−0.038 (0.056)	0.004 (0.060)	0.015 (0.021)	0.001 (0.024)	0.045 (0.031)
1 y before	−0.053 (0.051)	−0.076 (0.060)	−0.014 (0.052)	0.025 (0.017)	0.003 (0.018)	0.046 (0.029)
Adoption year	−0.087 (0.054)	−0.106 (0.077)	−0.063 (0.051)	0.008 (0.021)	−0.014 (0.026)	0.006 (0.034)
1 y after	−0.147 (0.060)**	−0.178 (0.080)**	−0.11 (0.065)*	−0.032 (0.022)	−0.082 (0.026)***	−0.016 (0.032)
2 y after	−0.147 (0.058)**	−0.176 (0.082)**	−0.086 (0.043)*	−0.004 (0.016)	−0.061 (0.023)***	0.039 (0.030)
3 y after	−0.145 (0.060)**	−0.198 (0.083)**	−0.048 (0.053)	−0.007 (0.017)	−0.063 (0.022)***	0.04 (0.034)
4+ y after	−0.129 (0.053)**	−0.188 (0.072)**	−0.021 (0.041)	−0.022 (0.012)*	−0.071 (0.016)***	−0.006 (0.037)

Models mirror column 3 of Table 1, but include an indicator variable for years before and after implementation of the waiting period *$P < 0.10$; **$P < 0.05$; ***$P < 0.01$.

Table S6. Estimates of the waiting period effect, controlling for other gun policies

Type of violence	1970–2014 (1)	1977–2014 (2)
All homicide		
Waiting period	−0.141 (0.061)**	−0.137 (0.051)**
Background check	0.054 (0.065)	0.019 (0.068)
Handgun permit	0.021 (0.089)	0.051 (0.091)
Shall-issue CCW	0.002 (0.104)	0.056 (0.095)
May-issue CCW	0.006 (0.118)	0.062 (0.097)
Gun homicide		
Waiting period	−0.201 (0.086)**	−0.194 (0.074)**
Background check	0.010 (0.084)	0.007 (0.090)
Handgun permit	0.075 (0.093)	0.084 (0.125)
Shall-issue CCW	−0.019 (0.119)	0.078 (0.118)
May-issue CCW	−0.035 (0.137)	0.046 (0.118)
Non-gun homicide		
Waiting period	−0.033 (0.055)	−0.035 (0.033)
Background check	0.135 (0.055)**	0.042 (0.053)
Handgun permit	−0.077 (0.100)	0.006 (0.054)
Shall-issue CCW	0.063 (0.083)	0.045 (0.062)
May-issue CCW	0.110 (0.096)	0.118 (0.073)
All Suicide		
Waiting period	−0.037 (0.023)	−0.016 (0.011)
Background check	0.066 (0.029)**	0.012 (0.017)
Handgun Permit	−0.167 (0.070)**	−0.092 (0.036)**
Shall-issue CCW	0.044 (0.040)	0.013 (0.026)
May-issue CCW	0.025 (0.046)	0.014 (0.026)
Gun suicide		
Waiting period	−0.083 (0.031)***	−0.066 (0.019)***
Background check	0.064 (0.034)*	0.015 (0.023)
Handgun permit	−0.196 (0.078)**	−0.101 (0.037)***
Shall-issue CCW	0.007 (0.048)	0.008 (0.031)
May-issue CCW	−0.029 (0.063)	−0.012 (0.039)
Non-gun suicide		
Waiting period	−0.021 (0.047)	−0.001 (0.030)
Background check	0.119 (0.050)**	0.062 (0.030)**
Handgun permit	−0.156 (0.062)**	−0.059 (0.040)
Shall-issue CCW	0.176 (0.049)***	0.085 (0.028)***
May-issue CCW	0.152 (0.054)***	0.093 (0.027)***

Coefficients estimate the effect of waiting periods and background checks on the number of deaths per 100,000 adult residents. Models mirror those of Table 1. Model 1 includes only the policy variables shown. Model 2 follows the specification of Ludwig and Cook (8) and uses fewer years of data due to missing control variables in earlier years. SEs, shown in parentheses, are clustered by state. *$P < 0.10$; **$P < 0.05$; ***$P < 0.01$. CCW, carrying of a concealed weapon.

Table S7. Alternative specifications for the effect of handgun waiting periods and background checks on violence from 1970 to 2014: Linear rate

	1970–2014	1977–2014	
Type of violence	(1)	(2)	(3)
All homicide			
Waiting period	−1.372 (0.772)*	−1.332 (0.790)*	−1.138 (0.477)**
Background check		−0.190 (1.046)	−0.412 (0.960)
Gun homicide			
Waiting period	−1.185 (0.627)*	−1.054 (0.686)	−1.010 (0.412)**
Background check		−0.627 (0.806)	−0.398 (0.791)
Non-gun homicide			
Waiting period	−0.187 (0.186)	−0.278 (0.191)	−0.129 (0.131)
Background check		0.436 (0.324)	−0.014 (0.219)
All suicide			
Waiting period	−0.906 (0.325)***	−1.238 (0.391)***	−0.459 (0.167)***
Background check		1.600 (1.157)	0.070 (0.328)
Gun suicide			
Waiting period	−0.882 (0.277)***	−0.912 (0.327)***	−0.533 (0.203)**
Background check		0.143 (0.669)	−0.453 (0.338)
Non-gun suicide			
Waiting period	−0.024 (0.222)	−0.326 (0.357)	0.073 (0.174)
Background check		1.458 (0.615)**	0.524 (0.189)***

Coefficients estimate the effect of waiting periods and background checks on the number of deaths per 100,000 adult residents. All models include state and year fixed effects and mirror those of Table 1. Model 3 uses fewer years of data due to missing control variables in earlier years. The analysis covering 1970–2014 includes 2,295 state-years; the analysis with control variables covering 1977–2014 includes 1,938 state-years. SEs, shown in parentheses, are clustered by state. *$P < 0.10$; **$P < 0.05$; ***$P < 0.01$.

Table S8. Alternative specifications for the effect of handgun waiting periods and background checks on violence from 1970 to 2014: Poisson

	1970–2014		1977–2014
Type of violence	(1)	(2)	(3)
All homicide			
Waiting period	−0.153 (0.049)***	−0.155 (0.050)***	−0.125 (0.051)**
Background check		0.007 (0.076)	−0.002 (0.084)
Gun homicide			
Waiting period	−0.209 (0.064)***	−0.198 (0.072)***	−0.177 (0.074)**
Background check		−0.039 (0.094)	−0.007 (0.112)
Non-gun homicide			
Waiting period	−0.031 (0.046)	−0.060 (0.050)	−0.012 (0.036)
Background check		0.100 (0.072)	0.001 (0.055)
All suicide			
Waiting period	−0.047 (0.019)**	−0.076 (0.023)***	−0.032 (0.010)***
Background check		0.127 (0.070)*	0.032 (0.021)
Gun suicide			
Waiting period	−0.089 (0.026)***	−0.116 (0.030)***	−0.075 (0.017)***
Background check		0.111 (0.075)	0.032 (0.030)
Non-gun suicide			
Waiting period	−0.010 (0.031)	−0.053 (0.053)	0.001 (0.032)
Background check		0.207 (0.078)***	0.088 (0.031)***

Coefficients are based on a Poisson model for the count of deaths using adult population as the exposure variable. All models include state and year fixed effects and mirror those of Table 1. Model 3 uses fewer years of data due to missing control variables in earlier years. The analysis covering 1970–2014 includes 2,295 state-years; the analysis with control variables covering 1977–2014 includes 1,938 state-years. SEs, shown in parentheses, are clustered by state. *$P < 0.10$; **$P < 0.05$; ***$P < 0.01$.

Table S9. Unweighted estimates of the effects of handgun waiting periods and background checks on violence: Full sample period

Type of violence	1970–2014		1977–2014
	(1)	(2)	(3)
All homicide			
Waiting period	−0.007 (0.050)	−0.012 (0.052)	−0.047 (0.051)
Background check		0.018 (0.047)	0.022 (0.050)
Gun homicide			
Waiting period	−0.042 (0.060)	−0.029 (0.066)	−0.067 (0.066)
Background check		−0.049 (0.068)	0.011 (0.068)
Non-gun homicide			
Waiting period	0.055 (0.049)	0.020 (0.053)	−0.003 (0.044)
Background check		0.134 (0.049)***	0.039 (0.047)
All suicide			
Waiting period	−0.020 (0.017)	−0.045 (0.017)**	−0.028 (0.012)**
Background check		0.097 (0.029)***	0.032 (0.018)*
Gun suicide			
Waiting period	−0.044 (0.023)*	−0.070 (0.021)***	−0.063 (0.018)***
Background check		0.098 (0.032)***	0.051 (0.023)**
Non-gun suicide			
Waiting period	−0.016 (0.034)	−0.064 (0.041)	−0.029 (0.029)
Background check		0.186 (0.044)***	0.087 (0.032)***

This table mirrors Table 1, but models are not population-weighted. *$P < 0.10$; **$P < 0.05$; ***$P < 0.01$.

Table S10. Unweighted estimates of the effects of handgun waiting periods and background checks on violence: Brady period

Type of violence	Brady period, 1990–1998		
	(1)	(2)	(3)
All homicide			
Waiting period	−0.047 (0.033)	−0.048 (0.035)	−0.012 (0.040)
Background check		0.003 (0.035)	−0.019 (0.043)
Gun homicide			
Waiting period	−0.081 (0.044)*	−0.070 (0.048)	−0.015 (0.051)
Background check		−0.032 (0.053)	−0.045 (0.065)
Non-gun homicide			
Waiting period	0.005 (0.034)	−0.006 (0.039)	0.009 (0.039)
Background check		0.033 (0.037)	−0.012 (0.038)
All suicide			
Waiting period	0.018 (0.016)	0.023 (0.017)	0.008 (0.017)
Background check		−0.014 (0.022)	0.000 (0.014)
Gun suicide			
Waiting period	−0.019 (0.019)	−0.019 (0.023)	−0.010 (0.019)
Background check		−0.000 (0.026)	−0.017 (0.017)
Non-gun suicide			
Waiting period	0.040 (0.019)**	0.035 (0.020)*	0.015 (0.022)
Background check		0.013 (0.024)	0.036 (0.023)

This table mirrors Table 1, but models are not population-weighted. *$P < 0.10$; **$P < 0.05$.

Table S11. Effects of handgun waiting periods on violence, 1970–2014

	Homicides			Suicides		
	All	Gun	Non-gun	All	Gun	Non-gun
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Waiting period	−0.132**	−0.186**	−0.035	−0.024**	−0.074***	−0.006
	(0.050)	(0.071)	(0.037)	(0.011)	(0.017)	(0.033)
Background check	0.025	0.022	0.036	0.023	0.029	0.084**
	(0.081)	(0.107)	(0.057)	(0.020)	(0.028)	(0.031)
Alcohol consumption	0.155**	0.142*	0.198***	0.144***	0.147***	0.128***
	(0.065)	(0.075)	(0.071)	(0.039)	(0.045)	(0.045)
Poverty	−0.004	−0.006	−0.003	0.001	0.002	−0.005
	(0.006)	(0.007)	(0.005)	(0.002)	(0.002)	(0.004)
Income	−0.002	0.003	−0.003	−0.009***	−0.011**	−0.021***
	(0.011)	(0.013)	(0.011)	(0.003)	(0.004)	(0.005)
Urban	0.002	0.001	0.003	0.003	0.002	0.009**
	(0.006)	(0.007)	(0.006)	(0.003)	(0.003)	(0.004)
Black	0.035*	0.040*	0.022	0.004	0.024*	−0.011
	(0.020)	(0.023)	(0.016)	(0.009)	(0.012)	(0.010)
Age under 14 y	0.033	0.057	0.005	−0.003	0.002	0.013
	(0.038)	(0.055)	(0.027)	(0.015)	(0.017)	(0.021)
Age 15–17 y	−0.136**	−0.106	−0.145*	−0.084**	−0.171***	−0.068
	(0.062)	(0.077)	(0.073)	(0.035)	(0.040)	(0.052)
Age 18–24 y	0.015	0.017	0.014	0.002	0.037*	0.010
	(0.046)	(0.061)	(0.047)	(0.020)	(0.021)	(0.025)
Age 25–34 y	−0.035	−0.038	−0.015	0.016	0.013	0.041
	(0.034)	(0.045)	(0.029)	(0.019)	(0.022)	(0.026)
Age 35–44 y	−0.008	−0.038	0.044	−0.009	0.005	0.024
	(0.051)	(0.063)	(0.047)	(0.017)	(0.023)	(0.023)
Age 45–54 y	0.056	0.107**	0.009	0.037**	0.027	0.016
	(0.034)	(0.046)	(0.029)	(0.016)	(0.020)	(0.028)
Age 55–64 y	0.029	−0.025	0.126***	0.020	0.022	0.090**
	(0.061)	(0.085)	(0.044)	(0.022)	(0.033)	(0.036)
Observations	1,938	1,936	1,937	1,938	1,938	1,938
Adjusted R^2	0.91	0.90	0.85	0.92	0.97	0.84

This table reports coefficients for all variables included in model 3 of Table 1. The dependent variable is the natural logarithm of adult deaths (21+) per 100,000 adult residents. The observation count for gun homicides is two less than the full sample count because North Dakota had no adult gun homicides in 2008 and Vermont had no adult gun homicides in 2009. The observation count for non-gun homicides is one less than the full sample count because North Dakota had no adult non-gun homicides in 2003. All models include state and year fixed effects. SEs, shown in parentheses, are clustered by state. *$P < 0.10$; **$P < 0.05$; ***$P < 0.01$.