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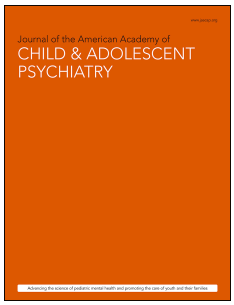


Adolescent Suicide, Household Firearm Ownership, and the Effects of Child Access Prevention Laws

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RH = Firearm Access and Adolescent Suicide

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Supplemental Material
Editorial

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**Abstract**

**Objective**

This study has three objectives: (1) to examine the association between state-level firearm ownership and suicide among high school aged adolescents, (2) to compare the strength of the firearm ownership-suicide association among adolescents relative to adults, and (3) to evaluate the relationship between 11 child access prevention (CAP) laws and suicide.

**Method**

Using an ecological time series cross-sectional design, we model suicide rates from January 1, 1991 to December 31, 2017 as a function of household firearm ownership and states' implementation of CAP provisions using fixed effect negative binomial models.

**Results**

There were 37,652 suicides among adolescents between the ages of 14 and 18 years during the study period and more than half of all suicides (51.5%, n=19,402) involved firearms. Each 10 percentage-point increase in states' firearm ownership was associated with a 39.3% (35.1% to 43.5%) increase in firearm suicide, which in turn contributed a 6.8% (2.5% to 11.1%) increase in all cause suicide. The association between firearm ownership and suicide was approximately two times stronger among adolescents relative to adults. Policies mandating locks and safe storage were associated with a 13.1% (2.7% to 22.3%) reduction in adolescent firearm suicide and an unexplained 8.7% (1.2% to

15.7%) reduction in non-firearm suicide. CAP provisions were associated with reduced firearm suicide across the lifespan but effects were stronger among adolescents.

**Conclusion**

There is an increased risk of adolescent suicide associated with household firearm ownership, and safe storage provisions are associated with decreased adolescent firearm suicide.

**Key words:** Youth firearm suicide; child access prevention; firearm ownership; lethal means

## INTRODUCTION

In 2017 the suicide rate among adolescents continued to increase and remains among the leading causes of death for this age group.[1–3] Despite evidence-based efforts to reduce suicidal behavior among youth[4], population-level rates of youth suicide attempts have not changed significantly since 2007[5,6] and there have been increases among high school aged adolescents (ages 14 to 18) in serious consideration of suicide, making a suicide plan, and injuries due to suicide attempts.[7] Importantly, one of the key factors in suicide risk is the lethality of the methods available to at-risk populations. Firearms remain the most lethal means of suicide[8] and account for nearly half of all suicides among adolescents.[1] Because adolescent suicide attempts are frequently linked to impulsive decision-making, access to the most lethal method, firearms, may be a particularly volatile combination driving increased youth suicide.[9]

Researchers have identified a relationship between state-level household firearm ownership and overall suicide rates; however, fewer studies have focused on the association with adolescent suicide. Recently, Knopov, Sherman, Raifman, Larson, and Seigel[10] addressed several limitations in this research area by examining the relationship between household firearm ownership and rates of suicide in a nationally representative sample of U.S. youth ages 10 to 19. They used a large national sample and accounted for differences in socioeconomic and individual youth behavioral risk factors linked to suicide[11,12] to reveal that household firearm ownership was a significant predictor of increased firearm suicides among youth. Household gun ownership was unrelated to other non-firearm methods of suicide.[10]

Legislated policy interventions may help to prevent firearm related violence and some policies may also differentially impact youth suicide by reducing access to firearms among adolescents. For example, the Protection of Lawful Commerce in Arms Act of 2005 (PLCAA) is federal law that requires licensed dealers to provide a firearm storage or safety device appropriate to every handgun sold; however, 24 states have enacted additional firearm safe-storage provisions, in many cases enacting multiple provisions, ranging from one (Michigan and Pennsylvania) to 11 total state laws (Massachusetts). These include provisions similar to PLCAA safety lock requirements, expanding mandatory safety locks to all firearm sales, safety lock regulations and standards, criminal liability for the firearm owner if a child accesses or uses the firearm, and criminal liability for the firearm owner that depends on the age of the child.[13] Together, these child access prevention (CAP) laws vary by state and involve a variety of legislative strategies.

The present study has three objectives: (1) to examine the association between state-level firearm ownership rates and suicide among high school aged adolescents, (2) to compare the strength of the firearm ownership-suicide association among adolescents relative to adults, and (3) to evaluate the relationship between specific types of CAP laws and suicide. Prior research has demonstrated that firearm ownership is associated with suicide among youth ages 10 to 19,[10] that states with any CAP laws have a reduction in adolescent suicide,[14] and that CAP laws pertaining to the accessibility of firearms in the home are associated with reduced firearm fatalities, including suicides, in children aged 0 to 14 years.[15] These findings have been limited, however, by the inclusion of youth spanning a broad developmental range that incorporates widely varying levels of suicide

risk as well as an deemphasis on specific policy effects in favor of broad categories of laws. In this study we extend this literature by examining the influence of firearm ownership on suicide among high school aged adolescents, a population of particular relevance to suicide prevention research.[16] We also estimate the effects of each specific CAP provision on suicide in this population and among adults to consider whether CAP provisions confer similar protections across the lifespan.

## METHOD

### Study Design and Data

We use an ecological time series cross-sectional design that merges several sources of state-level data from 1991 to 2017 to evaluate the effects of household firearm ownership on high school aged adolescent suicide and to test the effects of CAP laws on firearm suicide in this population. Using state-years as the unit of analysis, suicide rates per 100,000 adolescents between the ages of 14 and 18 served as the primary dependent variable and suicide rates among adults ages 19 and older served as a comparison. Data from 1991 to 2004 came from the Centers for Disease Control and Prevention's (CDC's) Web-Based Injury Statistics Query and Reporting System (WISQARS).[1] Due to more restrictive data protections for more recent years, state-level death data is suppressed when there were fewer than 10 events; however, we were provided with unsuppressed data from 2005 to 2017 following review by the National Center for Health Statistics (NCHS), Division of Vital Statistics and the National Association of Public Health Statistics and Information Systems (NAPHSIS).

The primary independent variables include state-level household firearm ownership rates and states' enactment of CAP provisions. Due to the absence of annual

survey data on state firearm ownership rates we used a validated proxy measure used by recent researchers[17,18] that has been shown to correlate with survey estimates of firearm ownership at 0.95.[19] This proxy measure incorporates the ratio of firearm suicides to total suicides (FS/S) and per capita hunting license data (firearm ownership % = (0.62 x FS/S) + (0.88 x per capita hunting licenses) – 4.48). Data for this proxy came from the CDC's WISQARS[1] and the U.S. Fish and Wildlife Service.[20] Given concerns related to the use of a firearm ownership proxy that includes the ratio of firearm suicides to total suicides to predict firearm suicide outcomes, two sensitivity analyses using alternative proxy measures of firearm ownership were carried out using annual hunting license data and representative state survey data from the 2001, 2002, and 2004 Behavioral Risk Factor Surveillance System (BRFSS).

Data on CAP laws came from the State Firearm Laws Database,[21] which provides panel data on the presence or absence of each of 133 possible firearm laws. The database is organized into fourteen categories of laws, one of which includes 11 provisions targeting the prevention of child access to firearms.[22] Table 1 contains a complete list of the 11 CAP provisions, as well as the number of states with each provision during the period covered by the present study. Provisions were grouped into one of three categories, including safe storage regulations and standards; criminal liability for child access or use, and criminal liability based on the age of the child. Table S1, available online, shows states' enactment timelines for these provisions.

Finally, we included covariates shown to be associated with state-level suicide rates, including race-ethnicity, high school completion, poverty, unemployment, alcohol consumption, and region. For race-ethnicity we calculated the percent of the population

ages 14 to 18 that was Native-American and Black using data from the U.S. Census which were also used to calculate the percentage of adults with a high school diploma and living below the federal poverty threshold. Unemployment data was obtained from the Bureau of Labor Statistics and per capita gallons of spirit alcohol consumption came from the National Institute on Alcohol Abuse and Alcoholism. This study was deemed exempt by the University of Indianapolis Institutional Review Board.

**Statistical Plan**

We used negative binomial regression to estimate the effects of within-state changes in firearm ownership rates and CAP laws on within-state changes in suicide rates. By using each state to serve as its own control, fixed effects models produce relatively unbiased estimates by controlling for omitted variable bias for time-invariant characteristics that are either unmeasured or unobservable.[23] Because unobserved cultural differences across states might influence between-state estimates of the association between firearm ownership, CAP laws, and suicide, a within-state estimation approach is preferable. Only states that enacted or repealed a CAP law during the study period contributed to within-state estimates of the effects of CAP laws (e.g., enacted or repealed a law between 1992 and 2016), so estimates reflect the contributions of differing numbers of states across different laws (see Table 1).

Negative binomial regression was used due to overdispersion departing from the Poisson distribution. To control for the effects of states' overall firearm legislative strength in tests of the CAP laws, a covariate was added to these models that represented the total number of firearm laws, excluding CAP laws. In order to account for within-state secular trends in suicide rates not attributable to CAP provisions, models included

state fixed effects and a time-by-state interaction term. The parallel trends assumption necessary for the identification of causal effects was evaluated and verified using time-trend significance tests using the tvdiff package for time-varying treatment across many treated units.[24] Benjamini and Hochberg's procedure was used to account for multiple testing to constrain the false discovery rate to 10% to balance power with Type I error control in these exploratory analyses.[25] Uncorrected p-values are reported and evaluated relative to Benjamini-Hochberg critical values. Given the upward trajectory in adolescent suicide rates, sensitivity analyses tested the association between firearm ownership and suicide separately during the early (1991 – 1999), middle (2000 – 2008), and late (2009 – 2017) study periods. Analyses were conducted using Stata, Version 15.

**RESULTS**

There were 37,652 suicides among adolescents aged 14 to 18 during the study period (1991-2017) for an overall rate of 6.9 per 100,000. More than half of all adolescent suicides (51.5%, n=19,402) were with a firearm for a rate of 3.6 per 100,000. For comparison, 53.9% of adult suicides used a firearm during the same time period. Mean state-level household firearm ownership rates ranged from 10.1% to 67.5% (M=38.7, SD=12.8) across states.

Table 1 here

Table 2 provides within-state estimates of the association between firearm ownership and suicide among high school aged adolescents and adults as well as the interaction between firearm ownership and youth status on suicide. Estimates show that, holding other factors constant, a state with a 10-percentage point higher firearm ownership rate has a 6.8% (2.5% to 11.1%) greater adolescent all cause suicide rate. All

else held constant, this higher rate of firearm ownership resulted in a 39.3% (35.1% to 43.5%) higher rate of firearm suicide and 36.6% (31.7% to 41.4%) lower rate of non-firearm suicides, indicating that the estimated increases in all-cause suicide are driven by firearms. While household firearm ownership was also associated with adult firearm suicide (IRR=1.018, 95% CI=1.016, 1.020), the magnitude of the association between firearm ownership and suicide was approximately two times greater among adolescents (IRR=1.039, 95% CI=1.035, 1.043). Formal interaction tests show that the association between firearm ownership and suicide was significantly stronger among high school aged adolescents.

Analyses using alternative estimates of household firearm ownership, including the BRFSS and per capita state hunting licenses, both of which were significantly associated with the primary proxy (*r*s = .95 and .83, respectively), were consistent in showing a significant positive association between firearm ownership and adolescent firearm suicide rates. For each 10-percentage point increase in household firearm ownership measured by the BRFSS and annual per capita state hunting licenses, there were corresponding increases in adolescent firearm suicide of 23.1% (3.47% to 43.0%) and 31.1% (25.0% to 37.2%), respectively. Interaction tests using these alternate measures of firearm ownership each showed the association between firearm ownership and firearm suicide to be significantly stronger among adolescents relative to adults (Table 2). Sensitivity tests examining the association of firearm ownership and suicide during the early, middle, and late study periods showed that whereas firearm ownership was consistently positively associated with firearm suicide, the association between firearm ownership and all cause suicide rates differed, such that firearms were positively

associated with all cause suicide in the early study period, unrelated during the middle study period, and negatively associated in the late study period (see Table S2, available online).

Figure 1 here

Table 2 here

As illustrated in Figure 1, suicide rates increased linearly between the ages of 14 and 18, and this trend was amplified by the availability of firearms. High school aged adolescents living in states in the top quartile of firearm ownership had significantly higher absolute rates of all cause suicide relative to peers in lower firearm ownership states. This difference was driven by firearm suicide and the magnitude of these differences is considerable, such that 14-year-old adolescents living in high firearm owning states displayed a risk for suicide on par with 18-year-olds in low firearm owning states. For example, 14-year-olds living in high firearm owning states have a firearm suicide rate (3.5 per 100,000) that is 4.4 times higher than 14-year-olds in the lowest firearm owning states (0.8 per 100,000) and that more closely approximated the firearm suicide rate of 18-year-olds in the lowest firearm ownership states (3.3 per 100,000). Point estimates for Figure 1 can be found in the online supplement (see Table S3, available online). No significant differences were observed for non-firearm suicide rates across state firearm ownership quartiles.

Figure 2 here

As shown in Figure 2, provisions regarding safety locks and safe storage represented the only category of CAP laws associated with lower firearm suicide rates, such that each additional law from this category was associated with a 13.1% (2.7% to

22.3%) reduction. Among the specific provisions within this category, estimates show that the enactment of laws requiring a lock for all handguns sold through licensed dealers was linked to a non-significant 18.8% (-1.5% to 35.1%, *p*=.07) lower rate of adolescent firearm suicide. Provisions expanding these requirements to mandate locks be provided by all dealers, not only federal firearm licensees, were linked to a significant 34.6% (5.4% to 54.7%) decrease in adolescent firearm suicide. Provisions requiring that safety locks meet state-specified standards were marginally associated with lower firearm suicide rates (32.0%, 95% CI=0.0% to 53.8%, *p*=.05). In contrast, only one provision imposing criminal liability for child access, and none imposing liability based upon the age of the child, were measurably associated with adolescent firearm suicide rates. There was no indication of a substitution effect, whereby decreased firearm suicide was accompanied by increased suicide rates by other means. In fact, several child access provisions were also associated with reductions in non-firearm suicide, raising the possibility of unmeasured influences on model estimates that cannot be attributed to CAP provisions. It should be recognized that where reductions in firearm suicide were linked to lower rates of all cause suicide, these findings occurred in the context of unexplained reductions in non-firearm suicide.

While the reductions in firearm suicide associated with CAP laws were not specific to adolescent suicide, as a similar pattern of results was found for adults, the point estimates tended to show larger reductions for adolescents. Interaction tests of CAP laws by adolescent (versus adult) status reveal a clear pattern whereby CAP provisions were more strongly associated with reductions in adolescent firearm suicide relative to adult rates. Point estimates corresponding to Figure 2, interaction tests of CAP laws by

adolescent status, and models showing that the effects of CAP laws remain significant after adjusting for multiple testing can be found in Tables S4 through S6, available online.

## DISCUSSION

Consistent with prior research, this study found that high school aged adolescents living in high firearm ownership states had significantly higher rates of all cause suicide relative to their peers in lower firearm ownership states. Although the association between firearm ownership and suicide is certainly not unique to adolescents,[11,26] our findings show that the suicide risk associated with household firearm ownership is approximately two times greater for high school aged adolescents relative to adults. The age group examined in our study (14 to 18) is also an improvement on prior research as it better captures high school age adolescence (rather than 0 to 14, 0 to 19, or 10 to 19 groupings).[10,15,27,28]

Our study also supports prior research in showing that CAP laws work as intended to reduce adolescent suicide.[14] However, our analyses of these laws extends this literature by testing the unique effects of specific CAP provisions to show that those laws aimed at enforcing safe storage—namely through provisions requiring that safety locks be provided for all handgun sales and that these locks meet quality standards—were associated with decreases in adolescent firearm suicide.

The American Academy of Pediatrics encourages the use of trigger locks, lock boxes, gun safes, and safe storage legislation[31] and the results from this study and others suggest limiting access to firearms via CAP laws may be an important policy strategy for reducing youth suicides. As Webster and colleagues suggest, CAP laws might also

benefit others in the household when they raise awareness and shift social norms in favor of safer storage practices.[14] A recent simulation study found that a hypothetical safe-storage intervention provided to firearm owners living with children could reduce firearm deaths among youth by 6% to 32%.[28] And while studies of voluntary removal by parents have not been encouraging,[32,33] interventions aimed at increasing voluntary safe storage practices by parents of high-risk youth who are engaged in clinical settings show promising results.[34–36]

The results from the present study suggest that state-level measures of firearm access are a stronger risk factor for suicide among adolescents than adults. This finding can be understood in the context of research which suggests that youth are two to ten times more likely to die by suicide if there is a firearm in the home,[37,38] that a sizable majority of youth firearm suicides are carried out with firearms owned by adolescents' parents or relatives,[37,39] and that young adults living in areas with higher firearm ownership rates have higher rates of suicide than areas with lower firearm ownership.[40] Notably, during a period when firearm ownership in the U.S. declined, there was a corresponding reduction in youth firearm suicides at about twice the rate of reduction observed for adult firearm suicides during the same period,[27] again suggesting that decreases in overall firearm access may be particularly effective at reducing youth suicide.

For psychiatrists, these findings have important clinical implications at the population level, within local communities, and for individual clinical cases. At the population level, psychiatrists should advocate for legislated policy solutions promoting safe storage, including the mandatory provision of gun locks with all handgun sales. Such

efforts will require sustained effort and organization in order to inject clinicians', researchers', and professional organizations' expertise into the legislative process. At the level of local communities, collaborations between clinicians and firearm owners, dealers, shooting ranges, public health workers, emergency medical personnel, and individuals throughout the suicide prevention field provide diverse points of entry for developing resources to refine and enhance adherence to safe storage practices. Statewide community coalitions of stakeholders to prevent firearm suicides have also emerged in Colorado,[41] New Hampshire,[42] Tennessee,[43] and South Dakota,[44] and may provide useful models for educating providers and families. At the individual level, these findings suggest that clinicians should recommend safe storage practices when working with adolescent patients and their families. For example, interventions combining firearm safety counseling and family access to safe storage options appear promising. In two studies of pediatric patients and their families, brief counseling combined with free cable-style gun locks given to families by providers led to increased patient-reported use of cable locks and other safer storage practices compared to controls and indicate that motivational interviewing techniques might further enhance compliance.[45,46] Similarly, young adults with firearm "familiarity" also at-risk for suicide were more likely to indicate intent to follow gun safety guidelines after receiving a safety planning intervention that emphasized the temporariness of suicidal thinking, compared to more confrontational fear-based interventions.[47]

It is important to note that the effect of CAP laws in the present study come from a minority of states that have lower rates of firearm ownership and thus the generalizability of the present findings to states with more firearms and fewer firearm

laws warrants consideration. Because firearms account for a relatively smaller proportion of all suicides in these adopting states, it is possible that states where firearms represent a higher proportion of all suicides might see larger aggregate decreases in all cause suicide if similar reductions in firearm suicide accompany the enactment of some of the CAP provisions. Future research should consider the potentially moderating role of firearm density on the association between CAP laws and suicide if similar legislation is implemented in relatively higher firearm ownership states. Further, while these findings support a robust association between firearm ownership and high school age adolescent suicide, prior findings indicating that this association might be more pronounced among male adolescents warrants further investigation.[48] Additionally, sensitivity analyses suggesting that increased firearm ownership was associated with decreased rates of all cause suicide during the late study period, while remaining positively associated with suicide by firearm, highlights the complex and evolving role of firearms in youth suicide prevention.

The use of a proxy measure of firearm ownership that incorporates the ratio of firearm suicides to total suicides is a limitation when used as a measure of the association between firearm ownership and suicide. While the present study found generally consistent results across three estimates of state-level firearm ownership, the absence of more independent estimates of annual firearm ownership presents a challenge to understanding the role of firearms in youth suicide. Additionally, there exists little data regarding states' implementation of these laws, several of which appear quite difficult to enforce. Given the potential variability across states in the legal enforcement of CAP provisions as well as firearm owners' voluntary adoption of safer storage practices when

provided with tools such as gun locks, it is possible that these unmeasured factors might have influenced these findings.

Suicide is the second leading cause of death among high school aged adolescents in the U.S., and the present findings show that the relative risk of suicide for adolescents conferred by firearms is approximately twice that observed among adults. This illustrates the importance of evaluating youth access to firearms, especially within the context of assessing and managing suicide risk. This study suggests that states which enacted legislated policy solutions encouraging safe storage practices reduced rates of firearm suicide that were particularly impactful among high school aged adolescents.

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**Figure 1. Suicide Among High School Aged Adolescents by Age and State Household Firearm Ownership Quartile**

**Figure 2. Within-State Estimates of the Association between Child Access Prevention Laws and Firearm Suicide among High School Aged Adolescents and Adults 1991-2017**

Note: Models include state fixed effects and control for within-state secular trends with the inclusion of a state-by-time interaction term. Models also control for the percent of the population age 14 to 18 who are Black and Native American, the percent of the population completing high school, unemployed, in poverty, per capita spirit alcohol consumption, overall firearm legislative strength, and household firearm ownership rate. Tests of each category of laws are based on a count of laws within that category in a given state-year. Tests of individual laws are based on state-year indicators.

Table 1. Eleven Types of Child Access Prevention Provisions

| *Safe storage regulations and standards* | *Number of states with provision, 1991-2017* |
|---|---|
| Safety lock is required for handguns sold through licensed dealers. | 10 |
| Safety lock is required for handguns sold through all dealers. | 4 |
| Safety locks must meet state-specified standards or be otherwise approved by the state. | 3 |
| All firearms in a household must be stored securely (locked away) at all times. | 1 |
| *Criminal liability for child access or use* | |
| Owner of gun is criminally liable if a gun is not stored properly, regardless of whether a child actually gains access to the gun. | 4 |
| Owner of gun is criminally liable if a gun is not stored properly and a child gains access to the gun. | 7 |
| Owner of gun is criminally liable if a gun is not stored properly and the child uses or carries the gun. | 17 |
| Owner of gun is criminally liable regardless of whether gun is loaded or unloaded. | 3 |
| *Criminal liability based on the age of the child* | |
| Owner of gun is criminally liable if child under age 14 gains access to the gun. | 17[a] |
| Owner of gun is criminally liable if child under age 16 gains access to the gun. | 13 |
| Owner of gun is criminally liable if child under age 18 gains access to the gun. | 5 |

Note: [a] Includes Nevada's provision which was repealed during the study period.

Table 2. Estimates of the Association Between Multiple Measures of Firearm Ownership and Suicide Among High School Aged Adolescents and Adults

| | New Proxy | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Adolescent Suicide | | | Adult Suicide | | | Gun Ownership-by-Adolescent Status Interaction | | |
| Firearm Ownership | IRR | 95% CI | p | IRR | 95% CI | *p* | IRR | 95% CI | *p* |
| All Cause Suicide | 1.007 | 1.002, 1.011 | .002 | 1.001 | 1.000, 1.003 | .06 | 1.022 | 1.017, 1.026 | <.001 |
| Firearm Suicide | 1.039 | 1.035, 1.043 | <.001 | 1.018 | 1.016, 1.020 | <.001 | 1.035 | 1.031, 1.039 | <.001 |
| Nonfirearm Suicide | 0.963 | 0.959, 0.968 | <.001 | 0.978 | 0.976, 0.980 | <.001 | 0.998 | 0.993, 1.002 | .30 |

| | BRFSS Gun Ownership Rate | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Adolescent Suicide | | | Adult Suicide | | | Gun Ownership-by-Adolescent Status Interaction | | |
| Firearm Ownership | IRR | 95% CI | *p* | IRR | 95% CI | *p* | IRR | 95% CI | *p* |
| All Cause Suicide | 0.989 | 0.973, 1.006 | .20 | 0.996 | 0.987, 1.006 | .46 | 1.009 | 0.990, 1.029 | 0.35 |
| Firearm Suicide | 1.023 | 1.003, 1.043 | 0.02 | 1.000 | 0.989, 1.010 | 0.99 | 1.039 | 1.018, 1.059 | <.001 |
| Nonfirearm Suicide | 0.956 | 0.934, 0.978 | <.001 | 0.982 | 0.968, 0,997 | 0.02 | 1.018 | 0.993, 1.045 | .16 |

| | State Hunting Licenses Per Capita | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Adolescent Suicide | | | Adult Suicide | | | Gun Ownership-by-Adolescent Status Interaction | | |
| Firearm Ownership | IRR | 95% CI | *p* | IRR | 95% CI | *p* | IRR | 95% CI | *p* |
| All Cause Suicide | 1.002 | 0.996, 1.009 | .49 | 0.998 | 0.996, 1.001 | .19 | 1.019 | 1.012, 1.026 | <.001 |
| Firearm Suicide | 1.031 | 1.025, 1.037 | <.001 | 1.002 | 0.999, 1.005 | 0.27 | 1.043 | 1.037, 1.049 | <.001 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Nonfirearm Suicide | 0.943 | 0.933, 0.952 | <.001 | 0.988 | 0.984, 0.992 | <.001 | 0.967 | 0.958, 0.977 | <.001 |

Note: Models control for geographic region, percent of the population age 14 to 18 Black, Native American, percent population completing high school, unemployed, in poverty, and per capita alcohol consumption. Adults are coded 0 and adolescents are coded 1 in all interactions. IRRs greater than 1.00 indicate a relatively stronger association between firearms and suicide for adolescents relative to adults. Behavioral Risk Factor Surveillance Survey (BRFSS) estimates of state-level household firearm ownership were available for 2001, 2002, and 2004.