

SAFE-STORAGE GUN LAWS: ACCIDENTAL  
DEATHS, SUICIDES, AND CRIME\*

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ABSTRACT

It is frequently assumed that safe-storage gun laws reduce accidental gun deaths and total suicides, while the possible impact on crime rates are ignored. We find no support that safe-storage laws reduce either juvenile accidental gun deaths or suicides. Instead, these storage requirements appear to impair people's ability to use guns defensively. Because accidental shooters also tend to be the ones most likely to violate the new law, safe-storage laws increase violent and property crimes against low-risk citizens with no observable offsetting benefit in terms of reduced accidents or suicides.

I. INTRODUCTION

The benefits of laws requiring that citizens safely store their guns seem undeniable, in terms of both fewer juvenile accidental gun deaths and suicide. Some have argued that these restrictions might also reduce crime rates to the extent it makes it more difficult for criminals to steal guns. This is an issue that most congressional Republicans and Democrats agree on. If new gun control laws are passed during the 1999–2000 legislative session, one component of the bill probably will involve mandating trigger locks to be included with any gun sales. Similar views are expressed by presidential candidates of both parties, and the Clinton administration made it a major issue.<sup>1</sup> During just the last couple of years, numerous states considered laws mandating safe storage of guns. Illinois passed a law mandating that guns be kept locked or otherwise securely placed when a child under 14 may have

\* The authors are from the American Enterprise Institute and Adelaide University, respectively. We would like to thank Gertrud Fremling, David Kopel, Bill Landes, and the seminar participants at Dartmouth College, University of Santa Clara, and the University of Washington for helpful discussions.

<sup>1</sup> David Ottway, A Boon to Sales, or a Threat? Washington Post, Thursday, May 20, 1999, at A1; John McCain Profile, Nat'l J., November 6, 1999.

access to it, and New Jersey and California passed new laws requiring guns be sold with locks.<sup>2</sup>

Concerns over accidental gun deaths and suicides are important in this debate. In 1998, 53 children under age 10 died from accidental gun deaths. In cases where the weapon involved could be identified, six of these deaths involved handguns. Only one suicide with a gun is reported in this age group. When all children under age 15 are examined, the total number of accidental gun deaths totals 121, of which 26 were identified as involving handguns. The number of gun suicides is much higher than for younger ages, 154.<sup>3</sup>

A study by the General Accounting Office claims that mechanical locks—such those that fit over a trigger or in a barrel of a gun—provide “reliable” protections only for children under age 7,<sup>4</sup> so it is unclear what percentage of older children’s deaths would have been prevented by the use of these locks. Nor would the locks even have been relevant in accidental gun deaths for cases where the gun cannot be realistically be locked up, such as hunting.

But gun locks are costly, too. Not only is there the actual expense of the locks, but even more potentially important is the reduced effectiveness of using the gun defensively. Locked guns may not be as readily accessible for defensive gun uses. If criminals are deterred from attacking victims because of the fear that people might be able to defend themselves, gun locks may in turn reduce the cost of criminals committing crime and, thus, increase crime. This problem is exacerbated because many mechanical locks (such as barrel or trigger locks) also require that the gun be stored unloaded.<sup>5</sup> Loading a gun then requires yet more time to respond to a criminal.<sup>6</sup> The costs of locks and the fear of accidental gun deaths, which is highly publicized when these laws pass, should also reduce gun ownership and may thus also further encourage crime.<sup>7</sup>

<sup>2</sup> Mark Schauerte, *Gov. Ryan Signs Bill That Requires Firearm Owners to Store Guns*, St. Louis Post-Dispatch, June 8, 1999, at A1; Editorial, *Trigger Locks*, The Record (Bergen County, NJ), Thursday, October 14, 1999, at L10; and Rene Sanchez, *The Battle for California*, Wash. Post, Saturday, October 23, 1999, at A1.

<sup>3</sup> There is an issue of whether deaths are properly classified as accidental, but the bias frequently appears to be to err on the side of classifying deaths as accidental.

<sup>4</sup> The study argued that the mechanical locks could be frequently pried off with a screwdriver or smashed with a hammer. U.S. General Accounting Office, *Accidental Shootings: Many Deaths and Injuries Caused by Firearms Could Be Prevented* (March 1991).

<sup>5</sup> Putting a lock on a loaded gun actually makes an accidental discharge possible (for example, by dropping the gun) that would not be possible if a loaded gun were not locked.

<sup>6</sup> One almost humorous example of the problems associated with removing gun locks was provided by Maryland Governor Parris Glendening who set up a press conference to demonstrate how easy it was to use a gun lock, but the lock did not easily disengage and it took him “numerous” tries before he was able to remove the lock (Gerald Mizejewski, *Glendening Shows Off Trigger Lock*, Washington Times, March 23, 2000, at C1).

<sup>7</sup> Data that we have from the National Opinion Research Center’s General Social Survey does indicate a drop in state gun ownership rates coinciding with the passage with safe-storage laws.

There is evidence that restrictions on people's ability to defend themselves encourages criminals to attack. The potential defensive nature of guns is indicated by the different rates of so-called hot burglaries, where residents are at home when the criminals strike.<sup>8</sup> A total of 59 percent of the burglaries in Britain, which has tough gun control laws, are "hot burglaries." By contrast, the United States, with laxer restrictions, has a "hot burglary" rate of only 13 percent. Consistent with this, surveys of convicted felons in America reveal that they are much more worried about armed victims than they are about running into the police. This fear of potentially armed victims causes American burglars to spend more time than their foreign counterparts "casing" a house to ensure that nobody is home. Felons frequently comment in these interviews that they avoid late-night burglaries because "that's the way to get shot."<sup>9</sup>

After Tasmania's horrible multiple victim public shooting in 1996, Australia outlawed defensive gun ownership, instituted strict locking requirements for guns, and banned many types of guns. But neither total crime nor total crime with guns declined in Australia. In the 4 years after the law, armed robberies rose by 51 percent, unarmed robberies by 37 percent, assaults by 24 percent, and kidnappings by 43 percent.<sup>10</sup> And although murders did decline by 3 percent, manslaughter rose by 16 percent.<sup>11</sup>

On the other hand, those supporting safe-storage laws point to how locking up guns can reduce crime by discouraging or preventing burglars from ob-

<sup>8</sup> For example, Gary Kleck, *Targeting Guns: Firearms and Their Control* (1997); David B. Kopel, *The Samurai, the Mountie, and the Cowboy* (1992); and David B. Kopel, *Lawyers, Guns, and Burglars: Lawsuits against Gun Companies and the Problem of Positive Externalities*, presented at the American Criminology Meetings (1999), provide international evidence on hot burglary rates.

<sup>9</sup> James D. Wright & Peter H. Rossi, *Armed and Considered Dangerous: A Survey of Felons and Their Firearms* 151 (1986), interviewed felony prisoners in 10 state correctional systems and found that 56 percent said that criminals would not attack a potential victim that was known to be armed. They also found evidence that criminals in those states with the highest levels of civilian gun ownership worried the most about armed victims. Examples of stories where people successfully defend themselves from burglaries with guns are quite common (see John R. Lott, *More Guns, Less Crime: Understanding Crime and Gun Control Laws* (1998), and Robert Waters, *The Best Defense: True Stories of Intended Victims Who Defended Themselves with a Firearm* (1998)). For example, see *Burglar Puts 92-Year-Old in the Gun Closet and Is Shot*, *New York Times*, 7 September 1995, at A16. George F. Will, *Are We "A Nation of Cowards"?* *Newsweek*, November 15, 1993, discusses more generally the benefits produced from an armed citizenry.

<sup>10</sup> The Australia Bureau of Statistics can be found at <http://www.abs.gov.au>.

<sup>11</sup> England also recently banned handguns and centerfire rifles and shotguns, yet it now leads the United States by a wide margin in robberies and aggravated assaults, and although murder and rape is still higher in the United States, that difference has been shrinking (Nicholas Rufford, *Official: More Muggings in England than US*, *Sunday Times* (London), October 11, 1998.)

taining guns through theft.<sup>12</sup> The effects in both directions seem plausible, but the question is the relative sizes of the effects, and that is an empirical question.

Guns are not the first item with safe-storage laws that economists have studied. Safety caps for medicines have been required for many years now and has been studied extensively. Surprisingly, Kip Viscusi found that safe-storage rules in this area actually lead to more poisonings because of a “lulling effect.”<sup>13</sup> Because of the safety caps, he argues, families no longer store medicines as far out of children’s reach as previously. A similar result could occur for guns if the General Accounting Office is correct that gun mechanical gun locks are not that reliable.<sup>14</sup>

Despite the active policy debate on guns, there has been surprisingly little similar research on the safe storage of guns. Similar results to those for medicine safety caps or automobile safety regulations could be quite important for this debate. While a medical journal provides some preliminary evidence on safe-storage laws and accidental gun deaths,<sup>15</sup> no evidence exists on any of the other possible effects of these laws. No one has investigated the impact of these laws on suicides or on the possible costs of these laws, in particular, whether the laws make it difficult for people to quickly access a gun for self-defense.

## II. THE EXISTING LITERATURE

David Klein and coauthors argued that accidental gun deaths and gun suicides are strongly linked to owning a gun for self-defense.<sup>16</sup> Studying all the fatal gun accidents involving persons under age 16 in Michigan from 1970 to 1975, they concluded that guns used in fatal accidents were nearly always kept for self-protection. While they did not have direct evidence to

<sup>12</sup> While we know of no empirical evidence that has been provided to back up this claim, it has been an issue that has been raised in legislative debates over safe-storage laws. Legislative hearings on safe-storage laws have raised this issue in both Hawaii (February 15, 2000) and Maryland (February 16, 2000).

<sup>13</sup> Kip W. Viscusi, *The Lulling Effect: The Impact of Child-Resistant Packaging on Aspirin and Analgesic Ingestions*, 74 *Am. Econ. Rev.* 324 (1984).

<sup>14</sup> This is part of a more general phenomenon. As Sam Peltzman, *The Effects of Automobile Safety Regulation*, 83 *J. Pol. Econ.* 677 (1975), has pointed out in the context of automobile safety regulations, increasing safety restrictions can result in drivers offsetting these gains by taking more risks in how they drive. Indeed, recent studies indicate that drivers in cars equipped with air bags drove more recklessly and got into accidents at such sufficiently higher rates that it offset the life-saving effect of air bags for the driver and actually increased the total risk of death posed to others (Steven Peterson, George Hoffer, & Edward Millner, *Are Drivers of Air-Bag-Equipped Cars More Aggressive? A Test of the Offsetting Behavior Hypothesis*, 38 *J. Law & Econ.* 251 (1995)).

<sup>15</sup> P. Cummings *et al.*, *State Gun Safe Storage Laws and Child Mortality Due to Firearms*, 278 *J. AMA* 1084 (1997).

<sup>16</sup> David Klein *et al.*, *Some Social Characteristics of Young Gunshot Fatalities*, 9 *Accident Analysis & Prevention* 177, 181 (1977).

prove this point, Klein and coauthors claimed that “guns used for self-protection are more likely to be involved in accidental shootings because hunting or target guns are much less likely to be stored loaded or to be kept where they are readily accessible.” In a later paper, Klein found that predominately low-income urban families with child gunshot victims had “kept loaded guns within ready reach because they had no confidence that the police offered them protection against neighborhood crime.”<sup>17</sup>

If Klein and his coauthors are correct in that it is guns primarily stored for self-defense that result in accidents and if gun owners are correct that guns help mitigate harm when an attack occurs, safe-storage laws could reduce fatal gun accidents while simultaneously decreasing the ability for self-protection. This would thus lower the cost to criminals and increase crime. The empirical question is then whether the reduction in accidental gun deaths or suicides outweighs any costs from increased crime. The test carried out in this paper will provide some qualitatively different evidence on the ability of guns to deter criminals.<sup>18</sup>

Half of all fatal gun accidents are self-inflicted. In cases where the fatal injury is inflicted on somebody else, the person firing the gun is on average 6.6 years older than the victim. Shooters tend to be between the ages of 15–24 and from low-income families. Data from 1980 indicate that the race of the victim and shooter were the same in 96.5 percent of the cases, while the sex was the same in 75 percent of the cases. Shooters also tend to demonstrate “poor aggression control, impulsiveness, alcoholism, willingness to take risks, and sensation seeking.”<sup>19</sup> Others have found that accidental shooters were much more likely to have been arrested for violent acts and/or for alcohol-related offenses, and a disproportionate number had been involved in automobile crashes and traffic citations.<sup>20</sup> They were also much more likely to have had their driver’s licenses suspended or revoked.

<sup>17</sup> David Klein, *Societal Influences on Childhood Accidents, Accident Analysis & Prevention* 275, 277 (1980).

<sup>18</sup> There is a large literature on the ability of guns to deter criminals including: Ian Ayres & John Donohue, *Nondiscretionary Concealed Weapons Laws: A Case Study of Statistics, Standards of Proof, and Public Policy*, 1 *Am. Law & Econ. Rev.* 436 (2000); William Bartley & Mark Cohen, *The Effect of Concealed Weapons Laws: An Extreme Bound Analysis*, 36 *Econ. Inquiry* 258, 259 (1998); Daniel Black & Daniel Nagin, *Do Right-to-Carry Laws Deter Violent Crime*, 27 *J. Legal Stud.* 209 (1998); Stephen Bronars & John R. Lott, *Criminal Deterrence, Geographic Spillovers, and Right-to-Carry Laws*, 88 *Am. Econ. Rev.* 475 (1998); Kleck, *supra* note 8; Lott, *supra* note 9; John R. Lott, *The Concealed Handgun Debate*, 27 *J. Legal Stud.* 221 (1998); John R. Lott & David Mustard, *Crime, Deterrence, and Right-to-Carry Concealed Handgun Laws*, 26 *J. Legal Stud.* 1 (1997); Florenz Plassman & Nic Tideman, *Geographical and Temporal Variations in the Effects of Right-to-Carry Laws on Crime* (working paper, Virginia Polytechnic Inst. & State Univ. 1999); Lawrence Southwick, *Self-Defense with Guns: The Consequences* (working paper, SUNY at Buffalo 1997); and Wright & Rossi, *supra* note 9.

<sup>19</sup> Kleck, *supra* note 8.

<sup>20</sup> Julian Waller & Elbert Whorton, *Unintentional Shootings, Highway Crashes, and Acts of Violence*, 5 *Accident Analysis & Prevention* 351 (1973).

Passing safe-storage laws that are largely unenforceable might result in only those who are the most “law-abiding citizens” to change their behavior. But, as just discussed, these are not likely to be the high-risk groups for accidental shootings. Because accidental shooters tend to be more likely to violate the laws anyway, it is possible that safe-storage laws will raise the cost of deterring criminals where the benefit of reducing accidents is smallest.

q4 The issue of suicide raises two questions: (1) whether safe-storage or other gun control laws prevent suicides using guns and (2) whether these laws reduce total suicides or merely change the method of suicide. However, the second question becomes relevant only if safe-storage laws indeed have much of an effect on gun suicides. The few existing studies that test for the impact of gun control laws (but not safe-storage laws) on total suicide rates use cross-sectional level data and find no significant relationship.<sup>21</sup> Some other studies use proxies for gun ownership rates (for example, the number of federally licensed firearms dealers or subscriptions to gun magazines) and analyze whether they are correlated with suicides.<sup>22</sup> Still other studies use surveys on individual suicide attempts, so as to describe various individual characteristics (such as impulsiveness) and examine whether suicides are more likely when guns are available.<sup>23</sup>

The normal assumption is that more guns will almost by definition increase both accidental gun deaths and gun suicides, although as this discussion suggests that it is possible that the risks vary with the type of household buying guns. Indeed, an appendix, which is available from the authors, provides evidence that the link between gun ownership and either of these types

<sup>21</sup> Martin Geisel, Richard Roll, & R. Stanton Wettick, *The Effectiveness of State and Local Regulations of Handguns*, 4 *Duke Univ. Law J.* 647 (1969); Douglas Murray, *Handguns, Gun Control Laws, and Firearm Violence*, 23 *Soc. Probs.* 81 (1975); Matthew DeZee, *Gun Control Legislation: Impact and Ideology*, 5 *Law & Pol’y Q.* 367 (1983); and Myron Boor & Jeffrey Bair, *Suicide and Implications for Suicide Prevention*, 66 *Psychol. Rep.* 923 (1990). Kleck, *supra* note 8, at 287, summarizes his take on this research by claiming that “[o]n the whole, previous studies failed to make a solid case for the ability of gun controls to reduce the total suicide rate.” Geisel et al. (*supra*, at 676) find evidence of a reduction in suicide with respect to an index that they create on gun control, but they could find no significant or even meaningful results when they used dummy variables for the different laws.

<sup>22</sup> There is a debate within criminology and the medical literature over whether the accessibility of guns leads to higher suicide rates, but this literature does not address the impact of safe-storage laws, and the evidence is fairly primitive. For example, a recent medical journal study compared the rate of gun suicides during the first week after people buy a gun with the suicide rate during any given week for people who do not own guns. It concluded that the rate for people who just bought the gun was 57 times higher, Garen Wintemute *et al.*, *Mortality among Recent Purchasers of Handguns*, 341 *New England J. Med.* 1583 (1999). The authors took this as strong evidence that suicides could be prevented if guns had not been purchased. However, the research in criminology is more mixed. (For an extensive survey, see Kleck, *supra* note 8, at 265–88.) It often has to rely on rather imprecise variables, such as the number of federally licensed firearms dealers in a county to proxy for gun ownership (Lin Huff-Corzine, Greg Weaver, & Jay Corzine, *Suicide and the Availability of Firearms Via the Retail Market: A National Analysis* (working paper, Univ. Central Florida 1999)).

<sup>23</sup> Kleck, *supra* note 8, at 269–75.

of death is actually fairly difficult to establish. Survey data on gun ownership rates is never statistically related to accidental gun deaths or gun suicides, and using gun magazine sales as a proxy for gun ownership implies only a small relationship in a small percentage of specification (the relationship is even smaller than if nongun magazines are used).

### III. THE RAW DATA

Fifteen states adopted safe-storage laws between October 1, 1989, and January 1, 1996, with the average law being adopted in the middle of September 1992.<sup>24</sup> For the implementation dates of safe-storage laws, we relied primarily on an article published in the *Journal of the American Medical Association*,<sup>25</sup> although this contained laws passed only through the end of 1993. The Web site for Handgun Control provided information on the three states passing laws after this date and confirmed the information found in the medical journal for the earlier dates.<sup>26</sup> The laws share certain common features, such as making it a crime to store firearms in a way that a reasonable person would know that a child could gain use of a weapon. The primary differences involve exactly what penalties are imposed and the age at which a child's access becomes allowed. While Connecticut, California, and Florida classify such violations as felonies, other states classify them as misdemeanors. The age at which children's access is permitted also varies across states, ranging from 12 in Virginia to 18 in North Carolina, Texas, and Delaware.<sup>27</sup> Most state rules protect owners from liability only if firearms are stored in a locked box, secured with a trigger lock, or obtained through unlawful entry.

The data examined in this study ranges 1977–96 for the crime rates and 1979–96 for the accidental death and suicide rates. Most of the analysis is conducted at the state level because the county-level data are not disaggregated by age and only a tiny fraction of 1 percent of the counties will

<sup>24</sup> The states in order of adoption are Florida (October 1, 1989), Iowa (April 5, 1990), Connecticut (October 1, 1990), Nevada (October 1, 1991), California (January 1, 1992), New Jersey (January 17, 1992), Wisconsin (April 16, 1992), Hawaii (June 29, 1992), Virginia (July 1, 1992), Maryland (October 1, 1992), Minnesota (August 1, 1993), North Carolina (December 1, 1993), Delaware (October 1, 1994), Rhode Island (September 15, 1995), and Texas (January 1, 1996).

<sup>25</sup> Cummings *et al.*, *supra* note 15.

<sup>26</sup> See <http://www.handguncontrol.org>.

<sup>27</sup> The ages for different states are California (14), Connecticut (16), Delaware (18), Florida (16), Hawaii (16), Iowa (14), Maryland (16), Minnesota (14), Nevada (14), New Jersey (16), North Carolina (18), Rhode Island (16), Texas (18), Virginia (12), and Wisconsin (14).

experience an accidental gun death or gun suicide by children under age 15 in any given year (data available from author).<sup>2829</sup>

Three of the 15 states adopting the safe-storage laws had the laws in effect for only 1 full year, 10 states for 4 full years, six states for 5 full years, and three states for 6 or more years. Because the different states have such different crime, accidental death, and suicide rates, the before-and-after rates need to be made comparable. Therefore, the simple graphs presented here will primarily compare the before-and-after rates for only the 10 states that had their law in effect for at least 4 full years, although the other groupings of states produce similar results. We will also indicate how the raw data changed during the sample for the 36 states that did not adopt safe-storage laws.

Not all states experience accidental gun deaths in any given year. In 1996, for example, 12 states experienced at least one death for children under 5, 16 states for children between 5 and 9, and 32 states for children between 10 and 14. Suicides were more spread out across the states for 10–14-year-olds, with 40 states experiencing at least one suicide.

As a rough method to detect any affect from the passage of the law, Figure 1 illustrates how accidental gun death rates changed over time for states with safe-storage laws for children under age 15 relative to those without such laws. The diagram provides information on per capita accidental death rates from guns and per capita accidental death rates from handguns. Handguns are examined separately because much of the public debate has focused on the possible risks of having handguns in the home.<sup>30</sup> Unfortunately, most gun deaths (about 56 percent) are listed as “unclassified” as to the type of weapon, but this does not pose a major problem for the comparisons presented here as the share of unclassified cases remains fairly constant over the period.

To calculate the ratio of accidental deaths in states with safe-storage laws relative to those without the law, the yearly accidental death rate in each individual state that adopted a safe-storage law is divided by that same year’s average accidental death rate in states that do not adopt the law. The figure reports the average of these ratios for the safe-storage states. The comparison

<sup>28</sup> More precisely, the data exclude accidental gun deaths for children under age 1, although it is our understanding that the number of accidental gun deaths in that category are exceedingly rare relative to even the small number of accidental gun deaths in the 1–4-year-old range.

<sup>29</sup> We have examined the county-level data for 1977–94 used in Lott, *supra* note 9, but could not find a relationship between safe-storage laws and total accidental gun deaths or suicides. Because of obvious objections to using these aggregate numbers, since only a small share of accidental deaths or suicides involve juveniles, we will focus on the state-level data. The safe-storage laws are also statewide laws, although county-level data could be useful in differentiating the impact of these laws on different population groups.

<sup>30</sup> Indeed, the first agreement that President Clinton made with gun makers to voluntarily include locks was made with respect to handguns. See also for example, Amanda Ripley, Ready. Aim. Enter Your Pin, *New York Times Magazine*, November 21, 1999, at 82–83, which discusses the need for handgun locks.



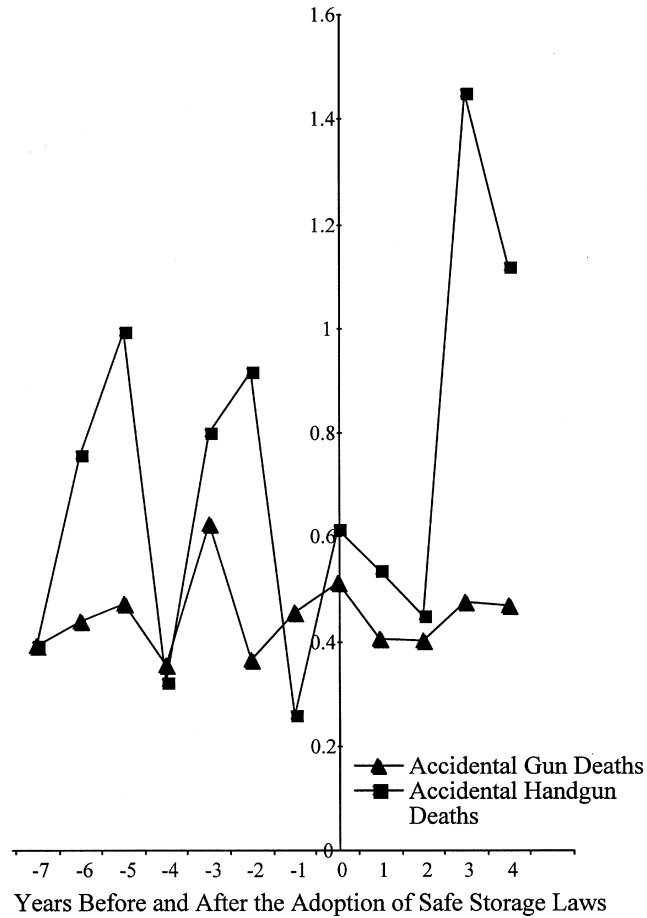


FIG. 1.—How accidental gun death rates for children under age 15 changed in states with and without safe-storage laws. Vertical axis: Ratio of accidental gun and handgun death rates for the 10 states that passed safe-storage laws and ended up having them in effect for at least 4 years relative to those rates in states that never had safe-storage laws in effect.

is made in this way because different states adopted safe-storage laws in different years, and we want to examine how the accidental deaths changed in the years before and after the law while making sure that we account for national trends.

Year 0 in Figure 1 constitutes the year that the law was passed, and year 1 is the first full year that the law is in effect.<sup>31</sup> While the states adopting

<sup>31</sup> The average law went into effect in early July, so that the law was in effect, on average, for half a year during the year that it is adopted.

safe-storage laws tended to have lower accidental gun death rates than states without the law, the figure indicates little systematic impact of safe-storage laws on accidental deaths. Following adoption, the relative rate of accidental gun deaths in states passing the laws first falls and then rises. The rate of accidental total gun deaths in the two sets of states ends up being virtually the same at the end of the period as when the law passed. The same holds for the subcategory of handgun deaths. Despite these laws potentially being most likely to stop accidental handgun deaths, there is no obvious decline.

q5 In fact, while relative accidental handguns fall at first, the relative accidental handgun death rate in states passing the laws almost doubles 4 years afterward.<sup>3233</sup>

The relative changes in suicide are shown in Figure 2, and they are calculated in the same way as for Figure 1. For suicides, no clear impact can be observed. The relative gun suicide rate ends up at almost the exact same level 4 years after adoption as the year that the law is adopted. Suicides from all methods (the middle curve) actually rose slightly between year 0 and year 4, but it was due to an increase suicides by nongun methods. If a relationship between safe-storage laws and suicides exists, it will have to be ferreted out by more sophisticated regression estimates, such as the ones presented in Section V.

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Figure 3 examines the relative violent crime rates, and it provides the first indication that crime rates may have changed around the time that safe-storage laws were enacted. For the 10 states that had their safe-storage laws

<sup>32</sup> The Cummings *et al.*, *supra* note 15, research provides evidence of a 23 percent drop in juvenile accidental gun deaths after the passage of safe-storage laws. As shown in Figure 1, juvenile accidental gun deaths did decline after the passage of the law, but what Cummings *et al.* miss is that these accidental deaths declined even faster in the states without these laws. While the Cummings *et al.* piece examined national data, they did not use fixed year effects which would have allowed them to test whether the safe-storage states were experiencing a drop relative to the rest of the country. The simple dummy variable that they use is only picking up whether the average juvenile accidental death rate is lower after the passage of safe-storage laws. One potential problem with this approach is that any secular decline in accidental gun deaths would produce a lower average rate after the law even if the rate of decline was not affected by the law. The smaller drop that they observe than we do for the states that pass the law is due to the shorter period of time that they examine. Finally, because they did not breakdown the results by type of gun or, as we shall do later, by a more detailed age breakdown, they never observed some of the anomalies that we will show for some categories of accidental gun deaths (for example, for handguns) actually rising after the passage of safe-storage laws. In a recent interview with USA Today, Cummings stated “that, unlike Lott, he didn’t explore the possibility that gun-storage laws actually cause crime. ‘I guess I wouldn’t have, because it seems like a very implausible connection,’ Cummings says. ‘But I guess anything’s conceivable.’ ” (Martin Kasindorf, Study: Gun-Lockup Laws Can Be Harmful, USA Today, Thursday, May 11, 2000, at 8A.)

<sup>33</sup> If the base years had been made using year -1 in Figure 1 (the last full year before the safe-storage law was enacted) and 1990 in Figure 2, the differences in accidental handgun deaths for those under age 15 is truly dramatic. At the same time that accidental handgun deaths are exploding in safe-storage states (increasing fourfold by year 3 and still being 2.25 times higher in year 4), the accidental handgun death rate is plummeting in states without the law (declining by 56 percent in 1994 and 81 percent in 1996).

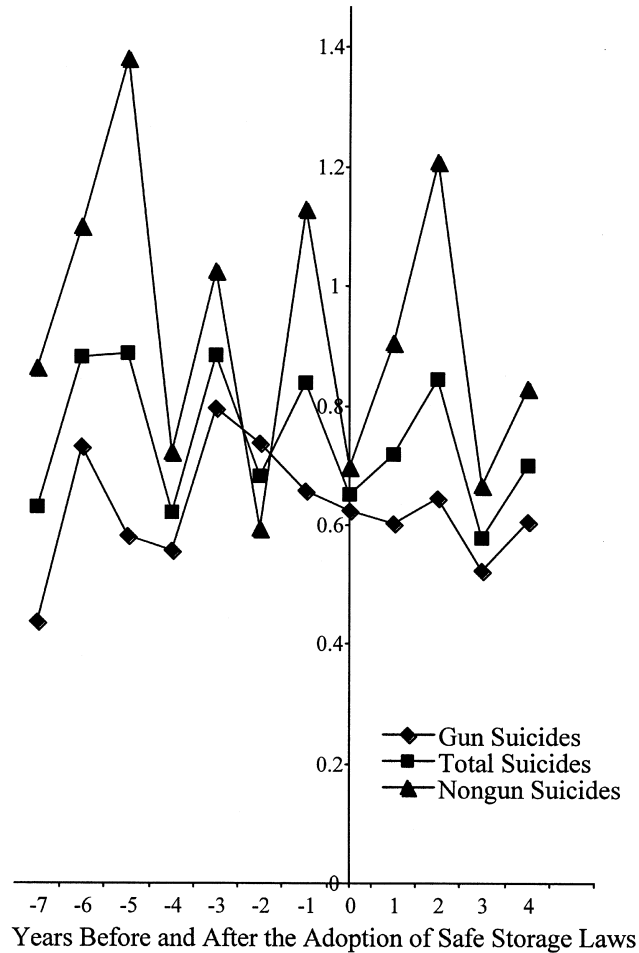


FIG. 2.—How gun suicide rates for children under age 15 changed in states with and without safe-storage laws. Vertical axis: Ratio of suicide rates for the 10 states that passed safe-storage laws and ended up having them in effect for at least 4 years relative to those rates in states that never had safe-storage laws in effect.

in effect for at least 4 years, the relative violent crime stopped falling when these laws were adopted and then ended up even higher at the end of the period.

#### IV. OTHER FACTORS

While very large changes can sometimes be seen in the raw data, patterns often only emerge once other factors are taken into account. As with the

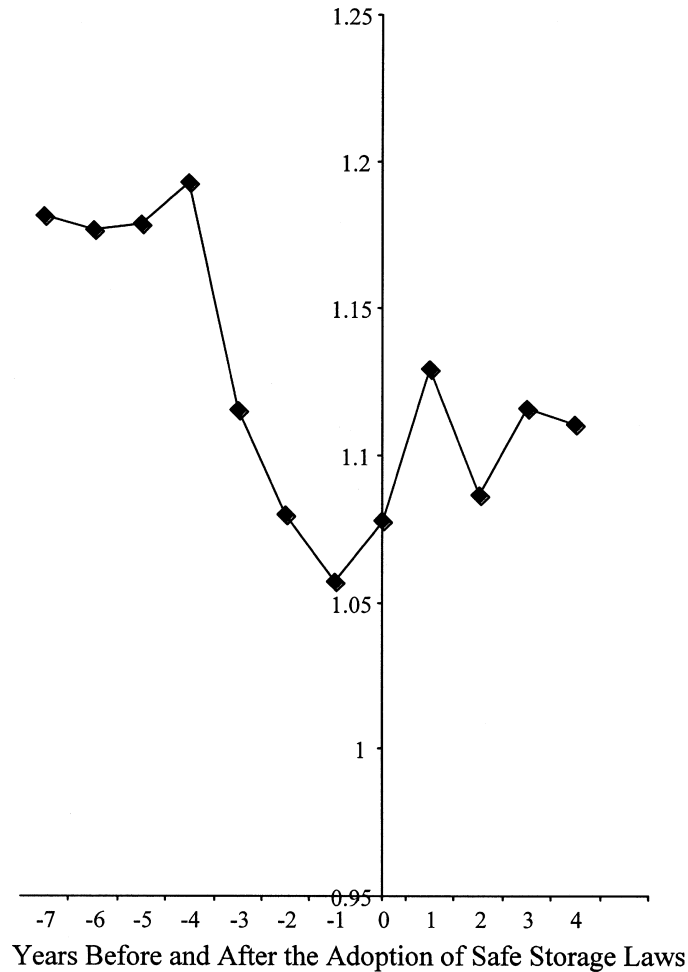


FIG. 3.—How violent crime rates changed in states with and without safe-storage laws. Vertical axis: Ratio of the violent crime rate for the 10 states that passed safe-storage laws and ended up having them in effect for at least 4 years relative to those rates in states that never had safe-storage laws in effect.

preceding diagrams, probably the most obvious variables to account for in explaining accidental gun deaths for children are the rates at which other nongun accidental deaths occur, as well as the rate at which other age groups in the population die from accidental gunshots. Since none of the safe-storage restrictions apply to people older than 17, we will use the per capita accidental gun death rate for people over age 19. Accidental gun deaths for those outside the age group impacted by the safe-storage law may also proxy for not only

the availability of guns in the home since some of these deaths will involve parents or other adults, but also for other risk factors that might vary by state. We have also run estimates where the accidental gun death information for those over age 19 is broken down into narrower age groupings under the assumption that those closest in age to the age group being studied would explain more of the variation. While there is some evidence for that hypothesis, these narrower age groupings for people over age 19 help explain more of the variation in juvenile accidental gun deaths, none of the results for the safe-storage laws were affected.

The data allow the accidental death data to be disaggregated by age (1–5, 5–9, 10–14, and 15–19 years of age; see the Appendix for the descriptive statistics of these variables). If the desire to access guns were the same for all age groups, one would expect that if safe-storage laws prevent access to guns, they would have their biggest impact for the youngest children. As noted earlier, the General Accounting Office reported in 1991 that mechanical safety locks are unreliable in preventing children over 6 years of age from using a gun,<sup>34</sup> and there is probably little that can prevent an older teenager from doing what he wants. Yet, even if the benefits are smaller for older children, it is possible that children who are even older than the ages for which the restrictions apply could experience a drop in accidental gun deaths.

The general specification that we will use is

$$\begin{aligned} & \text{Accidental Gun Death Rate}_{ijk} \\ = & \beta_1 \text{Safe Storage Law Dummy}_{jk} + \beta_2 \text{Accidental Nongun Death Rate}_{ijk} \\ & + \beta_3 \text{Accidental Gun Death Rate for Adults}_{jk} + \beta_4 \text{Control Variables}_{jk} \\ & + \beta_5 \text{State Fixed Effects} + \beta_6 \text{Year Fixed Effects} + \alpha + \varepsilon_{ijk}, \end{aligned}$$

where the “Accidental Gun Death Rate” is that rate for age group  $i$  in state  $j$  and year  $k$ . Besides the law dummy, the accidental nongun death rate for the same age group, and the accidental gun death rate for adults, we account for vectors of control variables and state and year fixed effects.

A similar approach will be used to explain how suicides by youngsters vary. We will include information on suicides for people in that age group committed by means other than guns along with suicide rates for people older than 19 years of age. Whatever might cause youngsters to attempt to commit suicide by means other than guns might also help explain the rate at which they try to commit suicides with guns. In addition, factors that determine the general suicide rate for those over age 19 might also be relevant for explaining the gun suicide rate for those under that age.

It is simply not possible to use the same level of disaggregation by age for suicides as was used for accidental deaths. For example, there was only

<sup>34</sup> U.S. General Accounting Office, *supra* note 4.

one suicide using a gun for children under age 10 in 1996. State and year fixed effects would easily explain all the variation even using state-level data. The categories thus have a somewhat broader age range: one category with children under age 15 and one with adolescents ages 15–19.

To try to account for differences other than safe-storage laws, in addition to the normal fixed state and year effects, we incorporate an extensive data set on state-level variables. This includes 36 demographic variables, by the percentage of the population that belongs to a certain sex and race (black, white, and other) by 10-year age groupings (10–19 and 20–29 years of age). It also includes real per capita income, poverty rates, median education, unemployment, percent of families with only one parent present, state population and state population squared (to account for population density), as well as information on per capita unemployment insurance payments, income maintenance payments, and government retirement payments to those over age 64.

Unfortunately, one variable that we do not have is the rate at which people are arrested for violating these laws across different states, although we do examine whether the violation is a felony or a misdemeanor. This inability to obtain data on enforcement is one reason why we examine how the accidental gun deaths, suicides, or crime rates vary across each of the 15 states that passed safe-storage laws. The consistency of these results provides some assurance the results do not arise simply because some states enforce the law while others do not. Even in the couple of cases where a significant effect is found for an individual state, that impact is not consistent across accidental gun deaths, suicides, and crime rates.

While much of the focus of other gun laws is on the crime rate, gun laws also control the accessibility and availability of guns and, hence, might affect accidental gun deaths and suicides. Therefore, we will also account for right-to-carry laws, one-gun-a-month purchase rules, states that border one-gun-a-month states, waiting periods, and mandatory prison penalties for using guns in the commission of a crime. While one of the authors has previously examined the impact of right-to-carry laws on county-level accident and suicide rates and found no evidence of any significant impact, it is still possible that some specific age groups might be placed at greater risk. For instance, waiting periods might impact an adult's ability to obtain a gun to commit suicide, while it is less plausible that this would apply to suicides by younger people under 18.<sup>35</sup>

## V. THE RESULTS

<sup>35</sup> Recent editorials in medical journals have called for research on whether waiting periods impact suicides, M. Rosenberg, J. Mercy, & L. Potter, *Firearms and Suicides*, 341 *New England J. Med.* 1609 (1999).

*A. Accidental Gun Deaths*

The first set of estimates use a simple dummy variable that is set equal to the portion of the first year that the safe-storage law is in effect and then equal to one for all subsequent years. Specifications 1, 5, and 9 in Table 1 account for only state and year fixed effects. The other specifications also account for all the other variables discussed in the preceding section, with the exception of the other gun control laws. The estimates are broken down in two ways, by age category (1–5, 5–9, 10–14, and 15–19 years of age, although for space considerations this last category is not shown here) and by whether the rate of nongun accidental deaths for people in that age group or whether the accidental gun death rate for people over 19 years of age are accounted for.

Despite these different combinations, it is difficult to observe any evidence of reduced accidental gun deaths from the safe-storage law. Half the 16 coefficients are negative and half are positive, with the only statistically significant estimate implying that safe-storage laws increase accidental gun deaths. Some of the point estimates do imply a large percentage impact for the two youngest age groups, but the net effect on all four age groups added together is actually very small—resulting in four more accidental deaths (ignoring the even smaller estimates provided by the regressions with only the fixed effects: six lives saved for those ages 1–5 years, 12 more lives lost for those ages 5–9, 12 lives saved for those ages 10–14, and 10 more lives lost for those ages 15–19). The differential pattern for different age groups also seems inconsistent with what would be predicted from safe-storage laws.<sup>36</sup>

While increases in the accidental death rate from nongun methods for people in an age group is almost always positive, it is never statistically significant. The coefficients also indicate that increasing by one the per capita number of nongun accidental deaths increases the number of accidental deaths by guns by at most .01. Perhaps not surprisingly, the accidental gun death rate for people over age 19 does a much better job of explaining the accidental gun death rate for juveniles that are relatively closer in age—increasing accidental gun deaths over age 19 by one per 1,000 people increases the per capita number of accidental gun deaths for 15–19-year-olds by .64 per 1,000 people. The results for the other control variables are presented for some of these specifications in an appendix that is available from the authors, but most variables are not statistically significant.

These results were robust to including other gun laws, accounting for the age at which the law applies or whether the penalty was a felony or misdemeanor, using separate dummy variables or before-and-after trend for each

<sup>36</sup> Consistent with the raw data, rerunning the results for accidental handgun deaths implies that these deaths actually rose after the passage of the safe-storage laws.

TABLE 1  
 IMPACT OF SAFE-STORAGE LAWS ON ACCIDENTAL GUN DEATHS, BY AGE GROUP

	UNDER AGE 5				AGES 5-9			
	Only Fixed Effects	All Other Control Variables Used			Only Fixed Effects	All Other Control Variables Used		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Safe-storage law dummy <sup>a</sup>	-8.77E-7 (1.228)	-1.05E-6 (.982)	-1.05E-6 (.988)	-1.03E-6 (.971)	1.59E-6 (2.106)*	1.90E-6 (1.69) <sup>+</sup>	1.78E-6 (1.583)	1.77E-6 (1.581)
Accidental death rate for people in age group from means other than guns			.00107 (.175)	.000937 (.154)			.0105 (1.109)	.0102 (1.062)
Accidental gun death rate for people over 19 years of age				-.169 (2.40)*				.0275 (.403)
$\chi^2$	343.94	419.51	425.49	453.47	389.91	454.87	722.46	722.46



	AGES 10-14				AGES 15-19			
	Only Fixed Effects	All Other Control Variables Used			Only Fixed Effects	All Other Control Variables Used		
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Safe-storage law dummy <sup>a</sup>	-3.95E-7 (.433)	-1.46E-6 (1.11)	-1.46E-6 (1.11)	-1.48E-6 (1.12)	9.13E-7 (.779)	7.87E-7 (.485)	8.30E-7 (.511)	6.43E-7 (.405)
Accidental death rate for people in age group from means other than guns			.00018 (.018)	-.000283 (.027)			.00584 (1.021)	.00425 (.757)
Accidental gun death rate for people over 19 years of age				.0655 (.789)				.6405 (6.34) <sup>+</sup>
$\chi^2$	669.31	949.30	950.33	986.64	807.23	949.30	950.33	986.64

NOTE.—All regressions are weighted tobits, where the weighting is each state's population, and use state and year fixed effects. Specifications 1, 5, and 9 account for only fixed year and state effects. Not reported for the other specifications are the 36 demographic variables, state population and population squared, unemployment, poverty rate, income variables, or the fixed effects.  $N = 918$ .

<sup>a</sup> Equals fraction of year that the law is first in effect and 1 thereafter.

<sup>+</sup> The two-tailed test is significant at the 10% level.

\* The two-tailed test is significant at the 5% level.

state that passed the safe-storage law, year fixed effects by region, lagged values of the endogenous variable, and interacting the safe-storage law dummy with the violent crime rate to see if the law produced fewer accidental gun deaths in low-crime areas. We also tried using Poisson estimates to reestimate these regressions. (These results are available from the authors on request.) The few gun law coefficients that were statistically significant actually implied increases in accidental gun deaths.

Taken together, these estimates provide no consistent evidence that safe-storage laws reduce accidental gun deaths. The adverse consequences of safety caps for medicine or car safety regulations do not appear to be present here, but neither are there any benefits. Not only are the coefficients almost never statistically significant, but when they are significant, they are more likely to indicate increased accidents after the law. In any case, the effect (if it does indeed exist) is extremely small and implies only a few more deaths a year. As noted earlier, in the description of the previous research, one possible reason for these laws not having an effect is that accidental deaths primarily occur among the not-so-law-abiding segments of society, and these groups do not appear to care very much whether a law exists regarding the storage of guns.<sup>37</sup>

### *B. Suicides with Guns*

Our examination of suicide laws follows the set of specifications used to examine accidental gun deaths, but with two exceptions: (1) the age categories for children under 5, ages 5–9, and ages 10–14 have been combined into one group, children under age 15, and (2) the variables on accidental deaths from other sources and for people over age 19 have been replaced by the analogous variables for suicides.

The estimates in Table 2 correspond to the earlier results presented for accidental gun deaths in Table 1. These results also fail to indicate any significant change in gun-related deaths. While the coefficients for both sets of results are negative, they are statistically insignificant and relatively small. The estimates for children under age 15 using the control variables imply that anywhere from a 2 to 4.8 percent drop in gun suicides from the safe-storage law, while the similar estimates for 15–19-year-olds are somewhat larger, at up to 5 percent. As with the case of accidental gun deaths, the

<sup>37</sup> Because people might be the least likely to store their guns safely when they feel the most threatened, and the survey data provided in Section VD confirms this, we also reestimated the earlier regressions for accidental gun deaths and suicides by interacting the violent crime rate with the safe-storage law dummy variable. If people are more likely to feel threatened in high-crime-rate areas, higher crime rates should be associated with smaller reductions in accidental gun deaths and suicides. The coefficients are slightly more negative than reported earlier, but the results are qualitatively unchanged. Our interpretation of these results is that accidental gun deaths and gun suicides are simply not a problem in the law-abiding households who are most likely to alter their behavior.

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TABLE 2  
IMPACT OF SAFE-STORAGE LAWS ON SUICIDES

	UNDER AGE 15				AGES 15-19			
	Only Fixed Effects	All Other Control Variables Used			Only Fixed Effects	All Other Control Variables Used		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Safe-storage law dummy <sup>a</sup>	-4.65E-7 (1.601)	-1.74E-7 (.403)	-1.84E-7 (.389)	-7.69E-8 (.178)	-4.22E-6 (1.330)	-3.67E-6 (1.195)	-3.83E-6 (1.248)	-3.68E-6 (1.194)
Suicide rate by people in age group committed by means other than guns			.0285 (.706)	.0195 (.477)			.3598 (.863)	.0337 (.804)
Suicide rate by people over 19 years of age				.0191 (2.627)*				.0276 (.534)
$\chi^2$	425.34	563.71	512.23	570.86	1,225.57	1,434.68	1,435.43	1,435.71

NOTE.— $N = 918$ . All regressions are weighted tobits, where the weighting is each state's population, and use state and year fixed effects. Specifications 1 and 5, account for only fixed year and state effects. Not reported for the other specifications are the 36 demographic variables, state population and population squared, unemployment, poverty rate, income variables, or the fixed effects.  $N = 918$ .

<sup>a</sup> Equals fraction of year that the law is first in effect and 1 thereafter.

\* The two-tailed test is significant at the 5% level.

SAFE-STORAGE GUN LAWS

CHECKED 19

effectiveness of the law was expected to decrease with age, not only because not all 15–19-year-olds are covered by the law, but also because of the presumed inability to actually prevent older juvenile access. Yet again, however, these differences are not statistically significantly different from zero, and they are not statistically significantly different from each other. The estimates that come closest to being statistically significant at the 10 percent level for a two-tailed  $t$ -test are those that account only for fixed effects. Adding only the variables for the rate at which people in the age group commit suicides by other means and the suicide rate for people over 19 years of age reduces the  $t$ -statistic below 1 for both regressions.

The other reported coefficients for nongun suicides for people in these age groups and the suicide rate for those over 19 are all positive. However, only the suicide rate for those over 19 is statistically significant in explaining the suicide rate for children under age 15. (The estimated values for the other coefficients are available from the authors.)

We then checked whether these results were robust to including other gun laws, accounting for the age at which the law applies or whether the penalty was a felony or misdemeanor, using separate dummy variables or before-and-after trend for each state that passed the safe-storage law, year fixed effects by region, lagged values of the endogenous variable, interacting the safe-storage law dummy with the violent crime rate to see if the law produced fewer accidental gun deaths in low-crime areas, and using Poisson estimates to reestimate these regressions. (These results are available from the authors on request.) Unlike the estimates for accidental gun deaths, we did find a couple of coefficients that indicated that gun suicides declined after the passage of the safe-storage law. However, even in these cases, the evidence clearly rejects the hypothesis that the total number of suicides, committed by all methods, would be reduced.

### C. *Crime Rates*

Jessica Lynne Carpenter is 14 years old. She knows how to shoot . . . Under the new “safe storage” laws being enacted in California and elsewhere, parents can be held criminally liable unless they lock up their guns when their children are home alone. . . -so that’s just what law-abiding parents John and Tephania Carpenter had done . . . [The killer], who was armed with a pitchfork. . . -had apparently cut the phone lines. So when he forced his way into the house and began stabbing the younger children in their beds, Jessica’s attempts to dial 9-1-1 didn’t do much good. Next, the sensible girl ran for where the family guns were stored. But they were locked up tight . . . the children’s great-uncle, the Rev. John Hilton, told reporters: “If only (Jessica) had a gun available to her, she could have stopped the whole thing. If she had been properly armed, she could have stopped him in his tracks.” “Maybe John William and Ashley would still be alive,” Jessica’s uncle said.<sup>38</sup>

The lack of benefits in the preceding sections are consistent with two possible explanations: either the safe-storage laws have no impact on people's behavior in storing or owning guns, or the laws alter the behavior of people for whom the risks of accidental gun deaths or suicides were already very low. This second explanation is consistent with what we know about the types of people involved in accidental gun deaths, but additional information on changes in crime rates can help distinguish between these two hypotheses.

The specifications reported here are similar to those discussed in the preceding tables, although the crime-specific arrest rates and the execution rate for murder are now included. Table 3 finds that safe-storage laws are significantly related to higher rape, robbery, and burglary rates and that these effects are quite large, at least for the first two categories—with rape and robbery rates rising by 9 percent and 10 percent, respectively.<sup>39, 40</sup> Specifications using only the safe-storage law dummy and fixed state and year effects or excluding the other gun control laws imply a similar pattern of results. These are surely very large changes in crime rates that occur when the safe-storage laws are adopted. However, as the survey data in the next section shows, the percentage changes in the rate at which people lock up their guns or no longer own guns after these laws are passed are even much larger.

The coefficients from Table 3 predict that the 15 states that had the safe-storage law in effect in 1996 experienced 3,738 more rapes, 26,724 more

<sup>38</sup> Vin Suprynowicz, *Las Vegas Rev.-J.*, September 24, 2000, at 2K. There are many related stories that indicate that crimes would have been successful if the gun had been locked up or not accessible to children. Take a case in Grand Junction, Colorado (Ellen Miller, *Man Faces Suspects Accused of Attacking Him after Getting Ride*, *Denver Rocky Mountain News*, Tuesday, March 20, 2001): A building contractor, on his way home from work, a contractor picked up three young hitchhikers. He fixed them a steak dinner at his house and was preparing to offer them jobs. But two of the men grabbed his kitchen knives and started stabbing him in the back, head and hands. The attackers only stopped when he told them that he could give them money. But instead of money, the contractor grabbed a pistol and shot one of the attackers. The contractor said, "If I'd had a trigger lock, I'd be dead. If my pistol had been in a gun safe, I'd be dead. If the bullets were stored separate, I'd be dead. They were going to kill me." A typical example of a young person using a gun defensively is from Clearwater, Florida (Alleged Intruder Shot, in Critical Condition, *Gainesville Sun*, Sunday, March 11, 2001): At 1:05 A.M., a man started banging on a patio door, briefly left to beat on the family's truck, but returned and tore open the patio door. At that point, after numerous shouts not to break into the home, a 16-year-old boy fired a single rifle shot, wounding the attacker.

<sup>39</sup> Including lagged values of the crime rates as an explanatory variable does not alter these findings. The coefficients for rape, robbery, and burglary still remain positive and statistically significant and the signs of the other coefficients remain unaltered. The results for the later regressions on which the figures are based actually become more significant and the pernicious impact of the safe-storage law more pronounced.

<sup>40</sup> Poisson estimates were also employed for the murder and rape regressions and this actually implied an even stronger relationship between safe-storage laws and crime rates. The incidence rate ratio estimates were murder 1.0496 ( $z$ -statistic = 4.082) and rape 1.1048 ( $z$ -statistic = 18.213). The other crime variables could not be estimated using Poisson simply because so few observations had zero values.

TABLE 3  
IMPACT OF SAFE-STORAGE LAWS ON CRIME RATES

	Violent Crime	Murder	Rape	Robbery	Aggravated Assault	Property Crime	Burglary	Larceny	Auto Theft
Safe-storage law dummy <sup>a</sup>	-.0104 (.372)	.039 (1.141)	.092 (3.357)**	.1056 (2.823)**	-.041 (1.493)	.02 (.059)	.061 (2.678)**	.0094 (.498)	.0052 (.165)
Right-to-carry laws <sup>b</sup>	-.02 (8.88)**	-.034 (17.62)**	-.01 (3.34)*	-.039 (19.52)**	-.03 (15.35)**	-.009 (3.87)*	-.02 (14.35)**	-.007 (2.99)*	-.003 (.20)
One-gun-a-month purchase rule <sup>a</sup>	.059 (.713)	.132 (1.808)*	.054 (.679)	.11 (.999)	.136 (1.430)	.037 (.656)	.0057 (.085)	-.084 (1.503)	.004 (.043)
Neighbor's adoption of one-gun-a-month purchase rule <sup>a</sup>	.233 (3.855)**	.153 (2.093)*	.089 (1.508)	.00232 (.029)	.25 (3.639)**	.117 (2.818)**	.081 (1.662)	.146 (3.600)	.024 (.355)
Waiting period dummy	.124 (1.459)	-.026 (.249)	.046 (.561)	-.019 (.333)	.155 (1.587)	.086 (1.456)	.159 (2.288)*	.033 (.578)	.1384 (1.428)
Length of waiting period in days	-.020 (1.865) <sup>+</sup>	-.0244 (.925)	-.019 (1.419)	-.023 (.807)	-.027 (1.110)	-.0155 (1.716) <sup>+</sup>	-.026 (2.489)*	-.0109 (.750)	-.0628 (2.564)
Length of waiting period in days squared	.002 (1.802) <sup>+</sup>	.0019 (1.322)	.0016 (1.401)	.002 (1.273)	.00078 (.568)	.0016 (1.939) <sup>+</sup>	.0026 (2.694)**	.00067 (.831)	.0049 (3.611)
Adjusted R <sup>2</sup>	.9491	.9262	.9068	.9599	.9356	.9095	.9238	.9078	.9341
F-test	13.02	6.49	13.92	12.80	16.20	11.61	21.55	11.66	17.06
N	994	999	994	1,001	1,001	1,001	1,001	1,001	1,001

NOTE.—The table reports the natural log of the crime rate. The table uses state-level, violent, and property-crime data from the Uniform Crime Report. All regressions are weighted least squares, where the weighting is each state's population, and use state and year fixed effects. Not reported are the 36 demographic variables, state population and population squared, unemployment, poverty rate, income variables, or the fixed effects. All crime rates are in natural logs.

<sup>a</sup> Equals fraction of year that the law is first in effect and 1 thereafter.

<sup>b</sup> Change in the crime rate from the difference in the annual change in crime rates in the years before and after the change in the law (annual rate of change after the law — annual rate of change before the law). F-test values are in parentheses.

<sup>+</sup> The two-tailed test is significant at the 10% level.

\* The two-tailed test is significant at the 5% level.

\*\* The two-tailed test is significant at the 1% level.

q8 robberies, and 69,741 more burglaries.<sup>41</sup> It is possible to put a rough dollar value on the losses that result from these safe-storage laws. The National Institute of Justice has estimated the costs to victims of various types of crime, as a result of lost productivity, out-of-pocket expenses, medical bills, property losses, as well as losses from fear, pain, suffering, and lost quality of life.<sup>42</sup> Using our smallest estimated increase in these three crime categories, the total annual loss to victims from safe-storage laws is about \$652 million in 1998 dollars. If the rest of the country were to adopt similar safe-storage laws, the most conservative estimates here imply that there would be 5,070 more rapes, 23,525 more robberies, and 24,058 more burglaries.

As expected, higher arrest rates and higher execution rates for murder deter violent crime and the longer a right-to-carry law is in effect the greater the drop in crime.<sup>43</sup> One-gun-a-month rules raise violent crime, although the effect on crimes other than murder are not statistically significant. It is also interesting to see that one-gun-a-month rules are frequently consistent with increased crime in neighboring states. At the very least, concerns about crime arising from straw purchasers exporting guns to neighboring states appears to be misplaced.

We then examined whether the accounting for the age at which the law applies or whether the penalty was a felony or misdemeanor. Breaking down the effect by the age for which the law applies produces larger increases in rape, robbery, property crimes, burglary, and larceny. Treating violations as a felony rather than a misdemeanor creates a bigger increase in all the crime categories except for auto theft, although the differences are statistically significant only at better than the 1 percent level for aggravated assault, property crime, and burglary.<sup>44</sup> Including the other gun control laws and regional year fixed effects produces similar results.

The preceding discussions examine only how the adoption of safe-storage laws change the before-and-after average crime rates. Yet, as noted earlier, sometimes such simple averages can be quite misleading. Figure 4 graphs out the estimates based on the simple before-and-after law linear and squared

<sup>41</sup> Not including the other gun control variables for a set of regressions that correspond to those in Tables 3 and 4 produced a slightly different change in crimes: 3,819 more rapes, 21,000 more robberies, and 49,733 more burglaries.

<sup>42</sup> Ted R. Miller, Mark A. Cohen, & Brian Wiersema, *Victim Costs and Consequences: A New Look* (1996).

<sup>43</sup> Each 1 percentage point increase in execution rates is associated with a 4 percentage point drop in murder rates.

<sup>44</sup> Disaggregating the estimates down to the individual states reveals that, especially for rape and robberies, the vast majority of states with safe-storage laws experience more crime. For rapes, 14 of the 15 states adopting safe-storage laws faced higher rates, and the one state for which this was not true only had an extremely small drop (Texas experienced a .3 percent decline). The numbers are not quite as lopsided for robberies, but 11 of the 15 states experienced an increase. While the overall effect of safe-storage laws on aggravated assaults is not statistically significant, 10 of the 15 states did experience a decline in this type of crime.

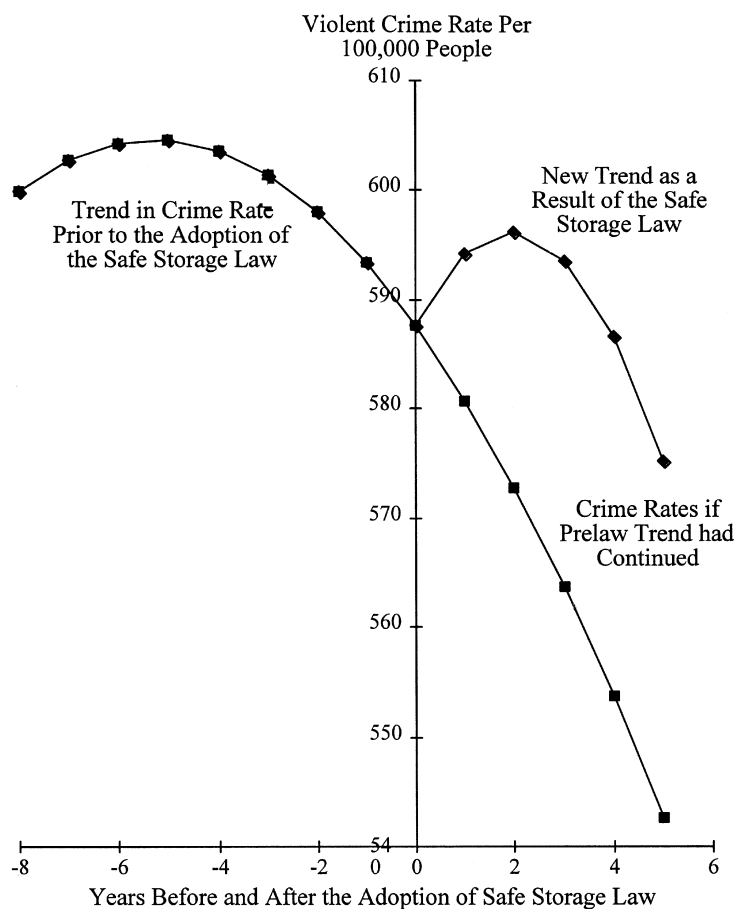


FIG. 4.—Comparison the change in average violent crime rates after the adoption of a safe-storage law with the preexisting trend.

trends. These results indicate that the dummy variable approach underestimates the crime increasing impact of safe-storage laws. The simple dummy variable in Table 3 actually found a very slight insignificant decline in violent crime. Looking at Figure 4, it is easy to see how the after law average violent crime rates are less than the prelaw average, yet it is also obvious that violent crime rates stopped declining and started rising at the time the safe-storage law was passed. After an upward displacement in violent crime, the violent crime starts declining again but remains above what its predicted rate would have been if the law had not been passed. In a country of 270 million people, this difference of 33 violent crimes per 100,000 people would amount to



TABLE 4  
COSTS OF SAFE-STORAGE LAWS IN TERMS OF HIGHER CRIME RATES

Year after Passage	Murder	Rape	Robbery	Aggravated Assault	Burglary	Larceny	Auto Theft
1	168	1,856	16,037	7,118	58,125	14,326	28,532
2	287	3,313	26,488	15,319	101,123	23,441	51,134
3	358	4,326	30,758	24,565	127,850	27,313	67,369
4	380	4,869	28,807	34,821	137,980	25,946	77,075
5	355	4,932	21,152	46,050	132,023	19,384	80,373
Average increase in victim costs <sup>a</sup>	1,070.6	399.2	235.6	688.4	176.4	9.4	26.4

NOTE.—The table uses the quadratic before-and-after trends and the control variables used in Table 3. The table reports the change in the number of crimes by year after the adoption of the safe-storage law. In millions of 1998 dollars, using the National Institute of Justice's Estimates.

over 89,000 violent crimes. The patterns for the individual crime categories were similar and the graphs are available from the authors on request.<sup>45</sup>

Table 4 provides more refined estimates of the victimization costs of safe-storage laws. The first part of the table calculates the difference in the number of crimes by year between the new trend as a result of the safe-storage law and what the crime rates would have been if the prelaw trend had continued. The 15 states with safe-storage laws would be expected to experience 168 more murders in the first full year that the law is in effect. The number of murders peaks in the fourth full year at 380 murders. The number of rapes and aggravated assaults is still rising 5 full years after the law is in effect, while robberies peak at almost 31,000 during the third year. Of the property crimes, burglaries show the biggest increase over the period.

The total victimization costs using the National Institute of Justice's estimates continues rising over the period, reaching \$3.4 billion during the fifth year. The average yearly cost to victims over the 5 years is \$2.6 billion, of which \$2.4 billion arises because of increased violent crimes.

There is one final prediction about the impact of safe-storage laws on crime and that is after the passage of safe-storage laws, crimes should be more attractive to criminals in residences than in other places. Unfortunately, the Federal Bureau of Investigation's Uniform Crime Reports do not disaggregate crimes in this manner. After contacting state law enforcement agencies, we obtained yearly data for 1987–99 for two states (California and Oregon) that show the percentage of homicides and robberies that took place in residences. While the data are very limited, Figure 5 suggests that California's safe-storage law increased the rate at which crimes occurred in the

<sup>45</sup> The graphs also make it clear why rape and robbery rates were the only violent crime categories using the simple dummy variable to show a statistically significant increase in crime after the passage of safe-storage laws. While all the violent crime categories increase when safe-storage laws go into effect, rape and robbery were the only categories where the crime rates rose above the previous before-law averages.

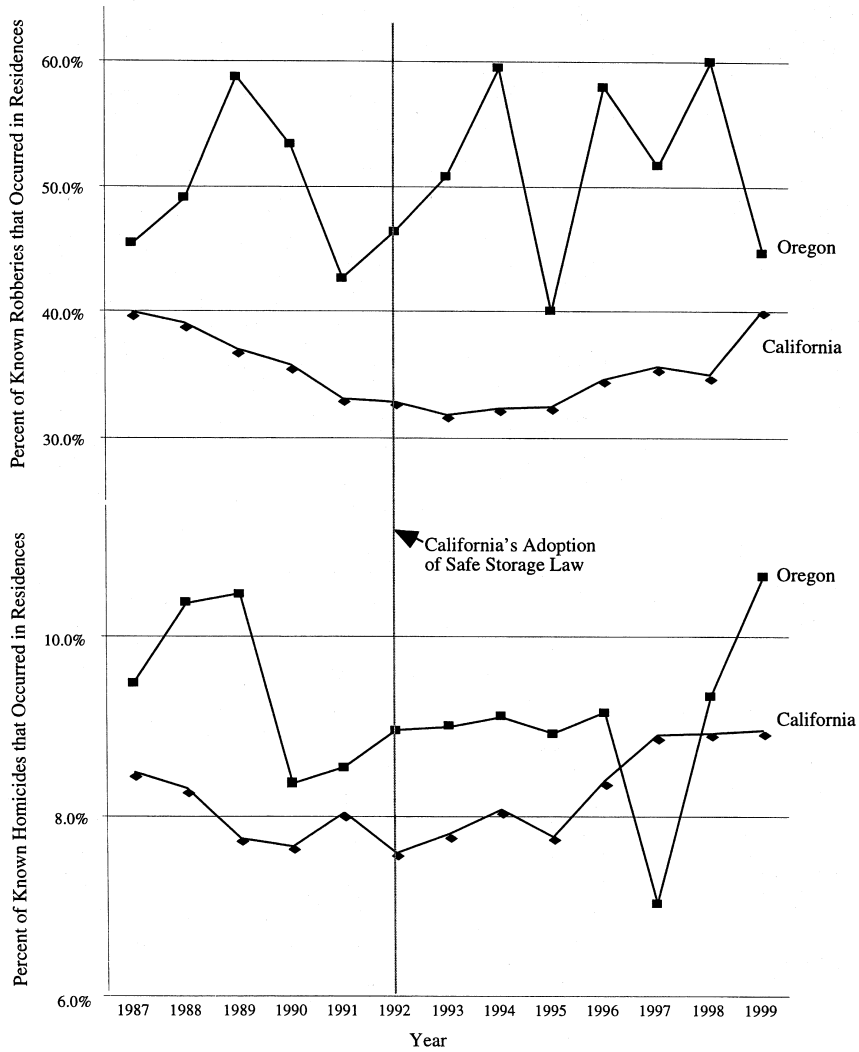


FIG. 5.—Percentage of homicides and robberies in residences in California and Oregon before and after the adoption of a safe-storage law.

home. While the percent of homicides and robberies exhibit no observable pattern in Oregon (a state with out the safe-storage law), the California data indicates that these percentages obtained their lowest values in 1993 for robberies and 1992 for homicides and there is a general upward trend after those dates (California enacted its safe-storage law in 1992).<sup>46</sup>

*D. Did Safe-Storage Laws Change the Rate at Which People Locked Up Guns?*

While we observe an economically and statistically significant increase in crime after the passage of safe-storage laws, a more direct tie between the passage of the laws and individuals locking up guns would be very helpful. Otherwise, it is possible that the passage of the law did not alter the rate at which individuals either locked up or owned guns. Fortunately, several types of survey data are available. One survey sponsored by the Police Foundation<sup>47</sup> asked 2,568 people about whether they owned a gun as well as how they stored them.

A total of 2,562 people answered “yes” or “no” to the question of whether a gun in the home was stored loaded and unlocked, but missing information for other questions reduced the sample size in the regressions to 2,394. The survey included a great deal of information that allowed us to measure race, how safe the individual feels at home alone, whether they have ever used a gun for self-defense, whether they have had training in how to use a gun, the person’s age, place where you live, employment status, marital status, education, political views, veteran, number of children, number of children under age 3, how frequently one attends religious services, religious preferences, family income, whether they have ever been arrested, the respondents’ sex, state codes, and information on whether the surveyor thinks that the person being surveyed invented the defensive gun use. Dummy variables were used to identify these different characteristics.<sup>48</sup> A detailed appendix of the complete list of the characteristics and their average values for those that acknowledged that they owned guns as well as those who claim that they did not is available on request from the authors.

The variable for whether a gun is stored unlocked and loaded equals 1 when this is true and zero otherwise. Because we have a dummy variable as an endogenous variable, we will estimate logit regressions. A dummy is included for whether a safe-storage law was in effect at the time of the polling in 1994, as well as a variable for the number of years (including parts thereof) that the safe-storage law has been in effect. The results (available on request) indicate that states with safe-storage laws had higher rates at which households left gun loaded and unlocked (coefficient = .69, *t*-

<sup>46</sup> Simple regressions running the percentage of these crimes committed in residences on time trends for the years and including fixed state and year effects provides some additional support. An *F*-test for the difference in before-and-after trends equals 1.72 for homicide and 1.47 for robberies.

<sup>47</sup> Police Foundation, National Study of Private Ownership of Firearms in the U.S. 1994 (1997).

<sup>48</sup> The left-out characteristics picked up in the intercept are for an employed, married, veteran, Protestant, weekly church attending, white male with no education living in the open country who feels very safe at home and makes less than \$5,000 per year.

statistic = 2.3) but that the rate fell the longer that the law was in effect (the coefficient =  $-.1248$ ,  $t$ -statistic =  $-1.646$ ). Six years after adoption of the law, states with safe-storage laws have a lower percentage of their homes with loaded locked guns.

The other coefficient estimates are basically what one would expect. People have used a gun in self-defense or who feel the least safe are more likely to have a gun that is loaded and unlocked, but only the first effect is statistically significant. Men and those living on farms are also more likely to have a gun that is loaded and unlocked. Other characteristics of people in this category are interesting, though less obvious: Asians, Catholics, and those making between \$50,000 and \$75,000.

Because the decline in the rate that guns are stored loaded and unlocked in the previous regression could be due to either people with gun now storing them differently or because gun ownership is declining, we also reestimated this regression solely on those individuals that report that they own guns. Doing so produces very similar though more significant results, with the coefficient on the number of years that the safe-storage law is in effect now equalling  $-.0995$  ( $t$ -statistic = 1.995).

Other survey data are also available from the General Social Survey, conducted by the National Opinion Research Corporation. While this survey has the advantage of being given in many different years, it can investigate only what happens to the number of guns owned and not whether guns are being stored loaded and unlocked.<sup>49</sup> The results imply that gun ownership rates fell by 1 percentage point per year faster after the law than they did before hand (although the change was statistically significant only at the 17 percent level for a two-tailed test). If true, this represents a substantial change in gun ownership. After 5 years, the level of gun ownership in these states would be expected to fall from 28 to 23 percent.

There are several possible reasons for this decline in ownership, although the price of gun locks themselves do not seem particularly important. The most likely factors would be either the new possible criminal penalties for owning a gun or the increased perceptions of the riskiness of having a gun in the home given the news attention surrounding the law's passage. However, differentiating safe-storage law states on the basis of whether they make violations a felony or a misdemeanor does not appear to make a difference

<sup>49</sup> There are also a couple of other problems: not all states are surveyed and the survey was only conducted in 1977, 1980, 1982, 1984, 1985, 1987-91, 1993, 1994, and 1996. Fewer people were also included in any given year, with between 907 and 1970 people. Because the General Social Survey reports national weights, we reweighted the state level percentages to reflect the composition of people in that state using the 36 demographic groupings that we have used in the earlier regressions. We regressed the percent of the population with guns on the year trends for before and after the adoption of the safe-storage and concealed handgun laws as well as all the measures of income, state population, unemployment, poverty, and demographics used in earlier regressions.

in explaining the drop in gun ownership. It is not immediately obvious how to measure the impact of increased perceptions of risk on gun ownership.

## VI. CONCLUSION

Safe-storage laws have no impact on accidental gun deaths or total suicide rates. While there is some weak evidence that safe-storage laws reduce juvenile gun suicides, those intent on committing suicide appear to easily substitute into other methods, as the total number of juvenile suicides actually rises (if insignificantly) after passage of safe-storage laws. The pattern across ages and with regard to the type of gun is also difficult to reconcile the theory that safe-storage laws will reduce juvenile accidental gun deaths. The only consistent impact of safe-storage laws is to raise rape, robbery, and burglary rates, and the effects are very large. Our most conservative estimates show that safe-storage laws resulted in 3,738 more rapes, 21,000 more robberies, and 49,733 more burglaries annually in just the 15 states with these laws. More realistic estimates indicate across the board increases in violent and property crimes. During the 5 full years after the passage of the safe-storage laws, the 15 states face an annual average increase of 309 more murders, 3,860 more rapes, 24,650 more robberies, and over 25,000 more aggravated assaults.

The impact of safe-storage laws are consistent with existing research indicating that the guns that are most likely to be used in an accidental shooting are owned by the least law-abiding citizens and thus are least likely to be locked up after the passage of the law. The safe-storage laws thus manage to produce no significant change in accidental deaths or suicides and yet still raise crime rates because households with low accidental death risks are now the ones most likely to obey the law.

## APPENDIX

TABLE A1

DESCRIPTIVE STATISTICS FOR ENDOGENOUS VARIABLES

Variable	Mean	SD	Min	Max
Accidental gun death rate for ages ( $N = 918$ ):				
Under 5	2.62E-06	5.01E-06	0	.0000455
5-9	4.21E-06	7.31E-06	0	.0000604
10-14	.000011	.0000123	0	.0000875
15-19	.0000182	.0000211	0	.000208
Nongun accidental death rate for ages ( $N = 918$ ):				
Under 5	.0001995	.0000788	-1.10E-12	.0005212
5-9	.0001164	.0000483	0	.0003763
10-14	.0001229	.0000484	0	.0003382
15-19	.0004679	.0001598	.0000347	.0012447

Suicide rates for those under age 15 ( $N = 918$ ):				
Gun	3.38E-06	3.47E-06	0	.0000285
Other method	2.48E-06	2.83E-06	0	.0000242
Total	5.86E-06	4.75E-06	0	.0000449
Suicide rates for those between ages 15 and 19 ( $N = 918$ ):				
Gun	.0000763	.0000426	0	.0003402
Other method	.00004	.0000232	0	.0001844
Total	.0001162	.0000527	0	.000431
Natural log of crime rates ( $N = 1,017$ ):				
Violent <sup>a</sup>	5.9692	.7013274	2.68	7.979955
Murder	1.749346	.7675413	-2.3	4.39
Rape <sup>a</sup>	3.412765	.4988437	0	4.9
Robbery	4.658273	.9991612	1.17	7.4
Aggravated assault	5.450054	.6910092	2	7.350902
Property	8.346207	.3342765	6.4	10.02
Burglary	6.961164	.4242595	4.65	9.8
Larceny	7.922934	.3196749	6.08	8.81
Auto theft	5.846315	.6062313	3.28	7.517467

<sup>a</sup>  $N = 1,010$ .

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**QUERIES TO THE AUTHOR**

1 Au: "Clinton administration has made" changed to "Clinton administration made"; OK?

2 Au: Quotes deleted from "hot burglaries" with "so-called."

3 Au: "A total of" added before "59 percent" to avoid starting a sentence with a numeral.

4 Au: Italics deleted from "prevent suicides" and "reduce" as it is not JLE style to use italics for emphasis.

5 Au: "relative accidental handguns first fall" changed to "relative accidental handguns fall at first"; OK?

6 Au: Italics deleted from "all" per JLE style.

7 Au: "increasing the per capita number of nongun accidental deaths by one" changed to "increasing by one the per capita number of nongun accidental deaths"; OK?

8 Au: In footnote 41, "Tables 3 and 6" changed to "Tables 3 and 4" because there is no Table 6"; is this correct?

9 Au: Please provide the city of the meetings.

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