

# Gun Deaths in Rural and Urban Settings: Recommendations for Prevention

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**Background:** Family physicians can play a vital role in preventing gun violence, and better data on which to base their interventions might result in more effective prevention efforts. Using Washington State data, two assumptions on which interventions can be based were tested: compared with urban areas, rural areas have (1) a higher percentage of gun deaths from shotguns and rifles, and (2) a higher percentage of gun deaths from suicides and accidents

**Methods:** From 1990 to 1996, 4,271 gun deaths on Washington death certificates were classified as rural or urban. The data were retrospectively sorted and analyzed by gun type (handguns, rifles, shotguns, or other) and by intent (suicide, homicide, or accidental death).

**Results:** Compared with urban settings, rural areas had a higher percentage of gun deaths from shotguns and rifles and a higher percentage from suicides and accidents ( $P < .01$ ). Two similarities, however, stand out as more important than the confirmed hypothesized differences: handguns accounted for more than 50% of gun deaths, and suicides accounted for nearly 70% of gun deaths in both urban and rural areas.

**Conclusions:** Family physicians might want to focus their firearm safety efforts on preventing handgun deaths and suicides, which accounted for most gun deaths in rural and urban areas. Also, data from this study suggest that deaths from shotguns and rifles as well as accidental and suicide gun deaths deserve special attention in rural areas. (J Am Board Fam Pract 2001;14:107–15.)

Gun violence in the United States is a public health epidemic. In a study of firearm deaths from 1968 to 1991, the number of firearm-related deaths in 1991 exceeded the number of motor-vehicle-related deaths in 7 states and Washington, DC.<sup>1</sup> For male teenagers, firearm-related deaths exceed the number of deaths from all natural causes combined.<sup>2</sup> Recent school shootings in Littleton, Colo, and Conyers, Ga, have intensified US public awareness of tragedies associated with gun violence in general and have focused attention on issues specific to rural and urban areas.

According to a 1996 study, “few patients report that their physician has ever discussed firearm safety with them, and only 30% of physicians surveyed report ever counseling patients about firearm safety.”<sup>3</sup> In another study, 80% of physicians be-

lieved they should counsel on firearm safety, but only 38% did so. Of those who did counsel, only 20% counseled more than 10% of the families they saw.<sup>4</sup> Parents “indicate that they would acknowledge gun ownership if their pediatrician asked about guns in the home.”<sup>5</sup> This finding suggests that family physicians can play a bigger role in combating the epidemic of gun violence.

Better data on which to base interventions could result in more effective efforts. “Our knowledge about firearm injury in rural areas is limited compared with urban settings. Yet rural areas have high levels of firearm access and mortality.”<sup>6</sup> Nationally, rates of firearm violence have been declining since 1993. The so-called Boston miracle has received much attention: “a combination of gang-based interventions, identification and prosecution of firearms traffickers, and other measures has been associated in a preliminary evaluation with a more than 60% decrease in juvenile and youth homicide and a reduction in weapon carrying.”<sup>7</sup> Some legislation has been effective. For example, background checks under the Brady Handgun Violence Prevention Act and related statutes prevent the sale of firearms to 70,000 to 80,000 felons per year.<sup>7</sup> Still, more work needs to be done. “The homicide rate for persons

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aged 15 through 24 years remains high; the rate in 1995 was 71% higher than a decade earlier.<sup>8</sup> More information comparing and contrasting rural and urban gun deaths might make it possible to develop more effective interventions.

Nationally, studies to date generally support the hypothesis that the greater number of rural gun deaths are from rifles or shotguns, whereas the greater number of urban gun deaths are from handguns. Among 122 gunshot wounds in a rural Wisconsin trauma center between 1981 and 1991, 39% were inflicted by rifles, 21% by shotguns, and 20% by handguns (16% were not specified, and 4% were inflicted by other).<sup>9</sup> In contrast, among guns used for homicides and suicides in Milwaukee between 1990 and 1994, 85% were handguns, 7% were shotguns, and 6% were rifles.<sup>10</sup> In Tennessee between 1978 and 1988, 59% of deaths in urban areas and 33% in rural areas involved handguns.<sup>11</sup> During a 5-year period in Philadelphia, a handgun was used in more than 90% of homicides.<sup>12</sup> An exception to the above pattern is a rural North Carolina county, where between 1990 and 1991, 51% of gun deaths were inflicted by handguns, 26% by rifles, and 23% by shotguns.<sup>6</sup>

This study also categorized gun deaths by suicide, homicide, and accidental shootings. According to statistics from the Centers for Disease Control and Prevention (CDC), suicides, homicides, and unintentional shootings accounted for 49%, 45%, and 1% of gun deaths, respectively, in the United States in 1994.<sup>13</sup> That year, firearms were responsible for 70% of all homicides and 60% of all suicides.<sup>14</sup> Washington State had the 19th highest suicide rate in the United States in 1990.<sup>15</sup>

In general, homicide gun deaths in the United States are more of an urban than a rural problem. "Half of all homicides occurred in 63 cities with 16% of the nation's population; within those cities, homicides were largely clustered in certain neighborhoods."<sup>7</sup> For example, in Milwaukee, two inner-city zip codes, 53204 and 53215, have homicide rates of 89.1 per 100,000 and 38.8 per 100,000, respectively, compared with a homicide rate of 10.5 per 100,000 for the state in general.<sup>16</sup>

Just as regionally comparative studies suggest that firearm homicides are more of an urban problem, they generally show that firearm-related suicides and accidents are a bigger problem in rural areas. In rural Kentucky, between 1988 and 1993 the relative risk and confidence intervals (CIs) for

pediatric gun deaths by suicide and unintentional injuries were 3.07 (1.85–4.29) and 1.66 (1.04–2.27), respectively.<sup>17</sup> In Oklahoma, between 1982 and 1983 the pediatric unintentional gun death rate was four times higher in rural counties.<sup>18</sup> In Texas, between 1984 and 1988 the pediatric death rate for unintentional shootings was 2.9 times greater in rural counties, whereas the pediatric death rate for homicides was 2.4 times greater in metropolitan areas.<sup>19</sup> In a rural North Carolina county, between 1990 and 1991, 59% of gun deaths were suicides, and none was unintentional.<sup>6</sup>

This study has two hypotheses: (1) compared with urban Washington, rural Washington has a higher percentage of gun deaths from shotguns and rifles; and (2) compared with urban Washington, rural Washington has a higher percentage of gun deaths from suicides and accidents. The former focuses on gun type, whereas the latter focuses on intent. This study does not investigate why certain types of gun deaths are more common.

## Methods

Gun death statistics were gathered from death certificates of the Washington State Department of Health, Center for Health Statistics, and from the Forecasting Division of the Washington State Office of Financial Management. Counties were classified as urban or rural based on codes developed by the Economic Research Service of the United States Department of Agriculture.<sup>20</sup> Deaths were analyzed by place of residence rather than place of occurrence, because place of residence was more reliably reported on death certificates. Data were compiled from 1990 to 1996, but the total gun death rates by gun type are from 1995 to 1996 only because Washington started an improved system for reporting gun type in 1995.

The chi-square test was then used to assess whether the overall distribution of gun deaths by gun type and by intention was significantly different in rural and urban Washington.  $P < 0.05$  was considered statistically significant.

A MEDLINE search was performed using the key words "rural health," "urban health," "firearms," "violence," "homicide," "suicide," "gun ownership" and "legislation." Other resources included Physicians for Social Responsibility, the HELP Network of Concerned Professionals, and the CDC.

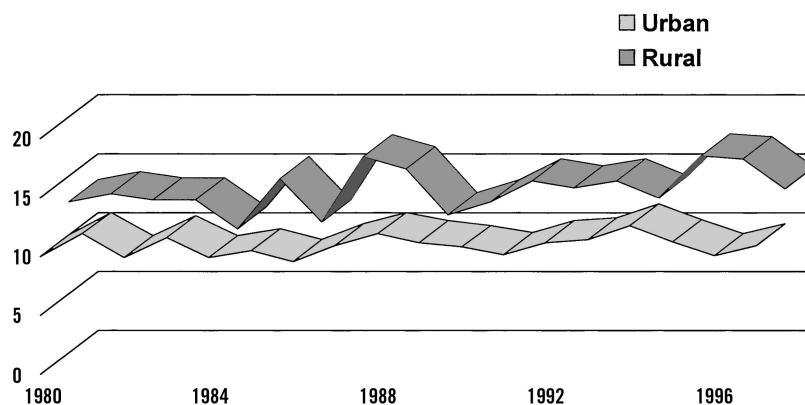


Figure 1. Rural vs urban Washington gun deaths per 100,000 (1980–1996).

### Results

Figure 1 shows that the total gun death rate was higher for rural than urban Washington. Figure 2 and Figure 3 show the overall distribution of gun deaths by type and intention, respectively.

The difference in overall distribution of gun deaths by gun type was statistically significant ( $\chi^2 = 50.275$ , 8 *df*,  $P < .01$ ) (Figure 2). Compared with urban Washington, rural Washington had a larger percentage of gun deaths by shotguns and rifles and a smaller percentage by handguns. Within rural Washington, however, the percentage of deaths by handguns still overshadowed the percentage of deaths by shotguns and rifles.

The difference in overall distribution of gun deaths by intent was also statistically significant with a chi-square  $P$  value of  $< .01$  (Figure 3). Rural Washington had a greater percentage of gun deaths

by suicide and accidental shootings and a smaller percentage by homicide when compared with urban Washington. As Figure 3 shows, most gun deaths in rural and urban Washington were suicides—nearly 70% of deaths in both areas. The percentage of rural gun deaths caused by accidental shootings was only 3%.

### Discussion

While the hypothesized differences between rural and urban gun deaths are supported by study data, the unforeseen similarities are more impressive. Handguns accounted for more than 50% of rural and urban gun deaths (Figure 2), and suicides accounted for about 70% of gun deaths in both areas (Figure 3). Consequently, efforts to prevent handgun and suicide gun deaths have the potential to

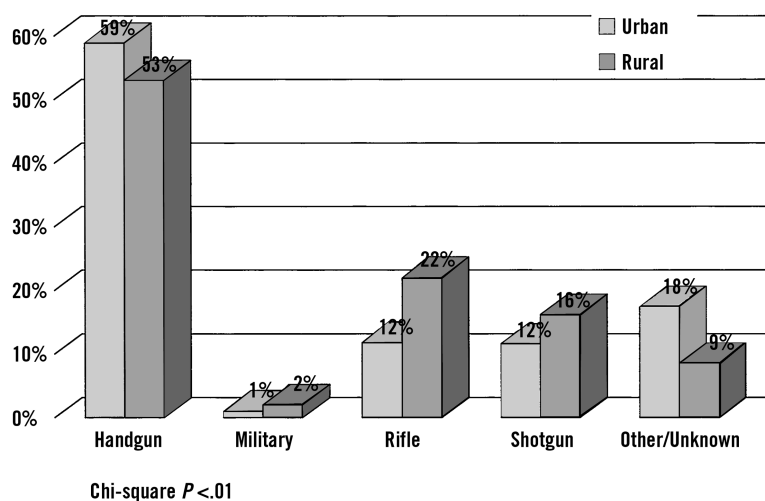
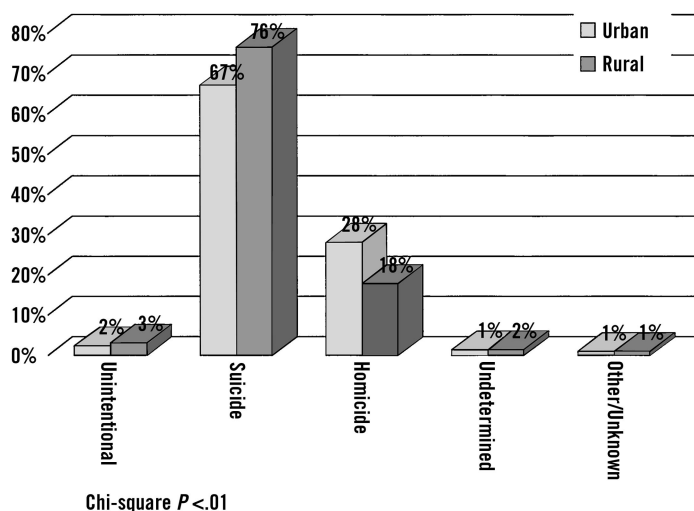


Figure 2. Rural vs urban Washington gun deaths by gun type (1995–1996).



**Figure 3. Rural vs urban Washington gun deaths by intention (1990–1996).**

prevent most gun deaths. Nevertheless, the differences between rural and urban gun deaths were statistically significant and are worth noting as violence prevention strategies relevant to the clinical setting are developed.

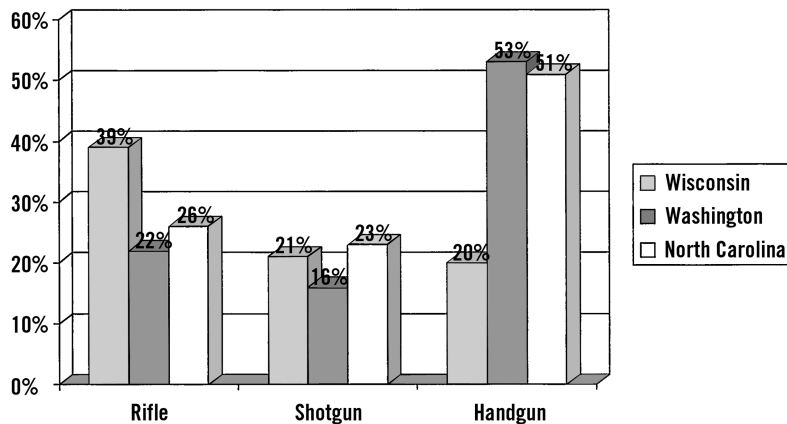
To avoid wasting time and effort on ineffective or even harmful interventions, interventions should be evidence-based when possible. Unfortunately, in gun death prevention, well-designed outcome studies in many areas are still lacking. Such studies are hard to design given the myriad of biopsychosocial factors that play a role in gun deaths. This problem is not unique to gun death prevention: “for many decisions, there is simply no evidence available.”<sup>21</sup> Lack of evidence, however, does not mandate inaction. Ideally, if an intervention lacking evidence is considered, physicians should implement the in-

tervention in the context of a well-designed outcome study so that others can learn from the experience.

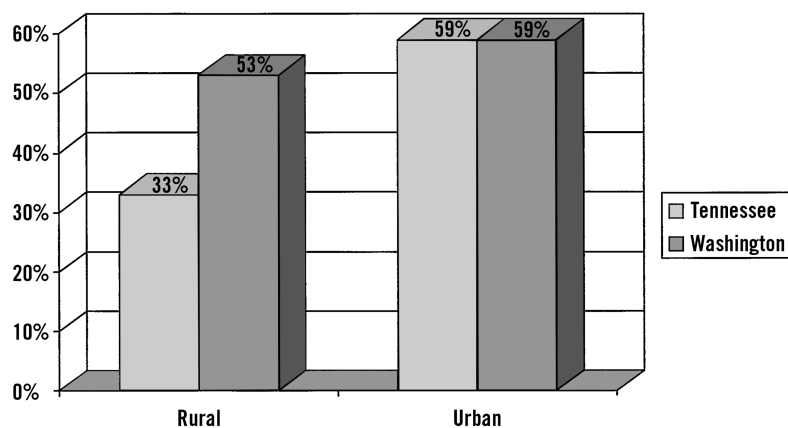
Family physicians can play an important role in promoting violence prevention through work in their communities and through legislation. The following discussion, however, will focus on gun death prevention strategies that can be applied in a clinical setting.

#### ***Handgun Death Prevention in Rural and Urban Areas***

Handguns were the weapons most often involved in both rural and urban Washington gun deaths (Figure 2). Figure 4 and Figure 5 show that the high percentage of rural Washington deaths by handguns contrasts with findings in Tennessee and Wis-



**Figure 4. Wisconsin vs Washington rural gun deaths.**



**Figure 5. Tennessee vs Washington handgun deaths.**

consin but is consistent with the North Carolina data. This study did not address why the Washington rural handgun death rate was higher than expected. Regardless of the reason for the high rural handgun death rate in this study, the finding indicates a need to stress handgun safety not only in urban but also in rural areas. Strategies can range from discouraging gun ownership and usage to promoting gun safety for patients who own or plan to own guns. Many strategies to prevent handgun deaths are relevant to preventing gun deaths in general.

In clinical work, family physicians have the opportunity to educate patients on the dangers of owning a handgun. Well-designed studies have shown that, contrary to popular belief, it is not safer to have a gun in the house. A gun in the home is 43 times more likely to kill a family member or friend than it is to kill in self-defense.<sup>22</sup> Kellerman found “the presence of one or more guns in the home was. . . associated with an increased risk of suicide (adjusted odds ratio (OR) 4.8; 95% CI 2.7–8.5).”<sup>23</sup> Kellermann and other researchers have similarly found an increased risk of gun death by homicide when a gun is in the home.<sup>22,24</sup> In contrast, guns are rarely used for self-protection<sup>22,25,26</sup> even though 75% of persons who own a handgun give protection as their reason for owning the gun.<sup>27</sup> Perhaps many would rethink gun ownership if a physician presented them with these statistics. Outcomes research can evaluate the impact of physician counseling regarding the relative risks of having a gun in the home.

Several approaches to office-based intervention are effective in preventing handgun and other gun deaths. The HELP Network for Concerned Pro-

fessionals developed the acronym GUNS as a guide for questions to ask as part of every medical history (Figure 6).<sup>28</sup> Responses to these routine questions give the physician information on risk factors for gun violence and misconceptions of gun safety. Counseling can be individualized, based on the answers to these questions. The GUNS mnemonic can serve as a good teaching device if medical education is part of the practice. Future research could examine whether simply using the GUNS acronym at each visit results in decreased handgun or other gun deaths.

Another mnemonic used to remember recent recommendations from the American Academy of Pediatrics (AAP) for clinical violence prevention and management is EnLiST: *early nurturing, limit-setting, screening for risk and assurance of safety, and treatment of the physical and psychologic consequences of violence.*<sup>29</sup>

The AAP recommendations are “a historic step because it makes pediatrics the first medical specialty to fully embrace the idea that violence is a health issue and that the responsibility for violence prevention does not rest solely in the hands of the criminal justice system.”<sup>30</sup> Family physicians now also have a historic opportunity to evaluate the effectiveness of the AAP recommendations.

Because most family physicians provide primary care for children, we need to look at what clinical interventions are most effective in preventing pediatric gun deaths. Patterson and Smith<sup>31</sup> noted that “play involving toy guns is thought to contribute to the behavior patterns seen in gun-related deaths in children.” In one study of accidental shootings, “the most common activity associated with the fatalities was playing with a gun.”<sup>11</sup> Per-



**Is there a **G**un in your home?**

**Are you around **U**users of alcohol or other drugs?**

**Do you feel a **N**eed to protect yourself?**

**Do any of these **S**ituations apply to you?**

**Have you **S**een or been involved in acts of violence?**

**Have you or someone you know experienced **S**adness,  
depression or mental illness?**

**Do you have **S**chool-age children or adolescents in  
your home?**

**Figure 6. GUNS acronym. Developed by the HELP Network of Concerned Professionals.<sup>28</sup> Reprinted with permission.**

haps counseling parents on ways to discourage their children from playing with guns can have an impact. Future outcomes research can look at which prevention strategies are most effective with children.

Promoting gun locks and safety storage mechanisms might help reduce gun deaths, whether by shotguns and rifles or handguns. Physicians can familiarize themselves with the latest in safety technology and pass this along to their patients. Safety devices include gun locks, lockable plastic boxes, metal lock boxes, security cabinets, and gun safes.<sup>32</sup> At a gun store in Milwaukee, one can buy a trigger lock for only \$9.99 or spend \$1,499.99 to purchase a fire-resistant, 800-pound storage cabinet. The effectiveness of different gun lock and storage mechanisms can be compared and contrasted in future outcome studies.

In clinical practice physicians can incorporate secondary prevention strategies such as education and intervention after an injury. These strategies might prevent gun deaths resulting from revictimization and revenge violence. Moments after a gunshot injury a patient might be more open to life-changing modifications that will reduce the chance of future gun death or injury. Prothrow-Stith<sup>33</sup> in Boston recommends that all patients inflicted with intentional injuries be assessed for (1) circumstances of the injury event, (2) victim's relationship to the assailant, (3) use of drugs or alcohol, (4) underlying emotional or psychosocial risk, (5) history of intentional injuries or violent behaviors, (6)

predisposing biologic risk factors, and (7) intent to seek revenge. Future research could examine whether simply asking and following up on these questions have an impact on gun deaths.

Times of crisis can provide an excellent intervention opportunity for preventing violence. In Milwaukee, for example, Project Ujima, out of the Children's Hospital of Wisconsin, uses trained counselors on call to intervene whenever a youth gun victim arrives in the emergency department. After the initial contact, a multidisciplinary team follows the youth into the community to provide medical, psychiatric, and social support to make major life modifications. Most health systems have secondary prevention protocols when someone arrives at the emergency department who is suicidal or who has chest pain. These protocols are designed to prevent the patient from committing suicide or having a heart attack after they leave the hospital. Physicians have the opportunity to intervene with victims of violence to reduce their risk of being revictimized or seeking revenge after recovering from their acute injury. Outcome studies could be designed for such secondary prevention programs.

***Suicide Prevention in Rural and Urban Areas***

Findings from this study strongly suggest that suicide is the major cause of gun deaths in rural and urban Washington (Figure 3). National data indicate that suicide is a greater cause of US gun deaths than homicide, which is especially true in Wash-

ington in both urban and rural areas. These findings counter popular assumptions that homicide is uniformly the leading cause of gun deaths in cities and that accidents are the major cause of gun deaths in rural areas. Given this information, family physicians might want to place extra emphasis on suicide prevention when trying to reduce gun deaths wherever they live and work. Unfortunately, well-designed outcome studies of office-based interventions to prevent suicide gun deaths are lacking.

The low percentage of rural gun deaths from accidents and high percentage of rural gun deaths from suicides contrast with the studies cited in the introduction. Unlike the Oklahoma, Kentucky, and Texas studies, this study showed the accidental gun death rate to be low and approximately equal in rural (0.4 per 100,000) and urban (0.3 per 100,000) Washington. Also, contrasting with these studies, the percentage of gun deaths from suicides was high and approximately equal in rural and urban Washington (Figure 3). A North Carolina study did not contrast urban and rural gun deaths, but reported a low accidental rural gun death rate, a finding similar to that of this study. As with handgun deaths, this study did not examine why suicide gun death rates are so high in rural and urban areas, but the results suggest a need to focus efforts on preventing gun deaths by suicide in rural and urban areas.

Suicide prevention most likely requires traditional interventions to screen for and treat mental illnesses, substance abuse, and domestic violence. One study found that 81.9% of adolescent suicides involved diagnosis of bipolar disorder, affective disorder with comorbidity, lack of previous mental health treatment, or availability of firearms in the house.<sup>34</sup> Usually patients see a physician within a few months before committing suicide.<sup>35</sup> Physicians need to have both primary and secondary prevention strategies in place for suicide prevention, whether in a rural or urban area. Outcomes research can be used to decide which clinical interventions are most effective in preventing gun deaths by suicide.

Suicide prevention in clinical practice can also involve some of the general gun safety measures discussed above. In one study, "the presence of a gun in the home, particularly if the gun was loaded, seemed to be most closely associated with suicide in the absence of a diagnosable psychiatric condition."<sup>36</sup> There are about 200 million guns in the

United States. An increase in the suicide rate in recent years can be attributed mostly to an increase in suicide by firearms.<sup>37,38</sup> Women attempt suicide more often than men, but men die from suicide more often because men are more likely to use a gun with a suicide attempt. Outcome studies can help evaluate how to incorporate most effectively general gun death prevention measures into suicide prevention measures.

### ***Special Issues Regarding Rural Gun Deaths***

This study supports the hypotheses that compared with urban Washington, rural Washington has a higher percentage of gun deaths from shotguns and rifles (Figure 2) and that rural Washington has a higher percentage of gun deaths from suicides and accidents (Figure 3). These results agree with those of national studies discussed in the introduction.

In reality, the occurrence of shotgun and rifle deaths in rural areas might be even greater for Washington state than this study indicates. The data in this study were from place of residence of the gun death victim because these data were more reliable. If data based on place of occurrence of gun deaths had been used, those who were killed by a shotgun or rifle when they traveled from an urban area to hunt in a rural area would have been included as a rural rather than urban gun death.

Good outcome data are again needed to show how to reduce shotgun and rifle gun deaths as well as suicide and accidental gun deaths in rural areas. Some of the measures to prevent handgun deaths might apply to preventing shotgun and rifle deaths. The interventions to reduce rural gun deaths from shotguns and rifles could be important in reducing rural gun deaths from suicides. Brent found that "long-guns in the home were associated with suicide only in rural areas."<sup>36</sup> Accidental deaths account for a minority of gun deaths in rural and urban areas, but each one is tragic. Trigger locks and other devices that do not require behavioral change could be especially effective in preventing these deaths.

### ***Future Research***

This study, as do many, poses at least as many questions as it answers. Future research can focus both on collecting better epidemiologic data on which to base interventions and on assessing the effectiveness of various interventions.

As mentioned, the data in this study were from place of residence of death victims, rather than place of death. A study comparing results using place of residence and place of occurrence data might provide useful insights.

This study was retrospective. A better research design would be a controlled prospective study. Although more than 13,000 gun deaths per year is alarmingly high, gun death rates in individual communities are low enough that getting a sufficient number of participants in intervention studies to give a study significant power could be difficult. A national gun death registry could help coordinate data collection and improve the potential power of studies that are undertaken.

Because of a new gun death reporting system in Washington State and the desire to collect relatively recent statistics, data were collected for a relatively short period. Future studies can compare rural and urban gun deaths within different periods and in different regions of the country and look for trends with time. The scope of the study could be expanded to compare rural and urban nonfatal firearm injuries. This study looked at gun deaths, but as many as two thirds of firearm injuries are not fatal.<sup>6</sup>

This study does not address why some of the Washington data differ from national data. Perhaps demographics in rural Washington are different from rural demographics in Wisconsin and Tennessee but are similar to those in North Carolina. Furthermore, why rural and urban gun death rates differ within a given state was not addressed. Future research could be designed to assess possible causes for differences in gun death rates. Demographics, such as age, sex, ethnicity, income level, and education, could be assessed. Future research could also assess the subset of gun deaths related to domestic violence and investigate potential legal, transportation, confidentiality, and financial barriers to domestic violence prevention in rural and urban areas.

Many interventions for gun death prevention lack outcome studies, though there are several areas of intervention where outcome data are needed. Given the magnitude of the gun death epidemic and the variety of interventions to consider, research is warranted to document which interventions are most effective. Such research can look at what family physicians are already doing in addition to testing new strategies. It is hoped that a

continued partnership between research and interventions will help control the current violence epidemic in the United States.

### Summary

As hypothesized, compared with urban Washington, rural Washington had a higher percentage of gun deaths from shotguns and rifles and a higher percentage of gun deaths from suicides and accidents. Similarities overshadow differences, however, between rural and urban gun deaths in this study. Handguns accounted for more than 50% of rural and urban gun deaths, and suicides accounted for about 70% of gun deaths in both areas. The differences and similarities have implications for violence prevention interventions and suggest many areas for further research.

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