

Fatal and Nonfatal Firearm Injuries in North Carolina

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This commentary discusses fatal and nonfatal injuries due to firearms in North Carolina and reviews epidemiologic trends in firearm-related homicide, suicide, and unintentional injuries. This commentary also provides an overview of strategies for reducing the risk of firearm-related injury and suggests future research to prevent these injuries.

Firearm-related injuries (hereafter, "firearm injuries") occur among all North Carolina demographic groups but are a leading cause of morbidity and mortality among young people aged 15-34 years and older adults aged 35-64 years. Although the most common manner of death due to firearms (hereafter, "firearm deaths") among these groups differs, with young people more likely to die of homicides and older adults of suicides, the community effects are devastating.

In 2008, there were 1,881 violent deaths in North Carolina, including 1,148 from suicide, 628 from homicide, 28 from legal intervention, and approximately 10 from unintentional firearm discharge; 67 had an undetermined intent [1]. A total of 60% of violent deaths were due to firearm use. Firearms were used in 57% of suicides and 68% of homicides [1], and the proportion of homicides and suicides that involved firearms during 2004-2008 remained relatively constant. Most firearm deaths in 2008 were, as in other years, caused by handguns, including 67% of suicides and 79% of homicides [1].

North Carolina rates of firearm death were relatively stable during 2004-2008 (range, 12.1-12.7 cases per 100,000 population), with rates of firearm-related suicide exceeding rates of firearm-related homicide each year [1]. Firearm death rates have consistently been higher among males than among females across age groups. Males aged 20-24 years had the highest rate of firearm deaths (43.13 cases per 100,000 population), followed by males aged 75-79 years and those aged 80-84 years (36.26 cases per 100,000 population in both groups) [1].

Nonfatal and Fatal Firearm Injuries

The Centers for Disease Control and Prevention [1] and the Children's Defense Fund [2] estimated that firearms yield 4-6 nonfatal injuries per fatal injury. Generally, the number of firearm injuries requiring hospitalization is less than the number requiring an emergency department (ED) visit, because many victims are treated solely through the ED or are pronounced dead there and do not require hospitalization.

A total of 6,811 ED visits for treatment of nonfatal and fatal firearm injuries were reported during 2006-2008 (mean, 25.1 visits per 100,000 population) [3]. The greatest rates of firearm injury were among individuals aged 15-44 years. Table 1 reflects the distribution of fatal and nonfatal firearm injuries among ED visitors, showing an almost equal number of assault-related injuries (which includes homicides) and unintentional injuries (which may include some cases later determined as suicides). Thus, unintentional firearm injuries are a significant cause of morbidity, although the number of deaths is relatively low.

The emotional and financial costs of these injuries can be quite high. In North Carolina, from 2004 through 2007 there were 4,014 reported hospitalizations for treatment of nonfatal or fatal firearm injuries, resulting in 28,421 days of hospital stay [4]. The median hospitalization duration was 4 days (mean, 7.1 days) and resulted in charges of \$161,608,218.00 [4]. Thus, among the 4,014 hospitalizations related to firearm injuries, the median charge was \$23,211.30 (mean, \$40,261.14) [4]. Many patients who sustain firearm injuries do not make it to the ED or hospital or seek medical care, and hospital costs do not include societal and other costs, such as those related to disability, the psychological consequences of witnessing violence, subsequent related medical care, or lost wages.

Manner of Firearm Deaths

Homicides. North Carolina rates of firearm-related homicide during 2004-2008 ranged from 4.5 to 5.0 cases per

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Table 1.
Nonfatal and Fatal Firearm Injuries Reported in North Carolina Emergency Departments, by Intent, 2006-2008

Sex	Intent					Total
	Assault	Other	Self-inflicted	Undetermined	Unintentional	
Female	360	0	47	71	343	829
Male	2,631	58	243	477	2,570	5,979
Total	2,991	58	290	548	2,913	6,808

Note. A total of 6,811 injuries were reported, but 3 cases are excluded because the sex was unknown. Data are from [3].

100,000 population. In 2008, the highest rate of firearm-related homicide was among people aged 20-29 years (163 deaths per 100,000 population), followed by those aged 30-39 years and 40-49 years (88 and 68 deaths per 100,000 population, respectively) [1].

Although firearm-related homicides affect all races, blacks and American Indians are disproportionately affected. During 2004-2007, firearm-related homicide rates ranged from 3.7 to 4.4 cases per 100,000 population for whites, 2.7 to 5.4 per 100,000 population for Asians, 16.4 to 17.7 per 100,000 population for blacks, and 16.0 to 21.1 per 100,000 population for American Indians, who experienced the largest absolute increase in rates during this time [5]. Among youths, most victims were boys. However, these racial and sex disparities were not present among adults older than 75 years. Although rates of firearm-related homicide were low overall in this older age group, at 4 cases per 100,000 population, the firearm-related homicide rate was 3.0 per 100,000 population among whites and 1.0 per 100,000 population among blacks; approximately 50% of homicides were among women [1].

Suicides. Rates of firearm-related suicide during 2004-2008 ranged from 7.8 to 8.6 cases per 100,000 population. In 2008, the greatest rate of firearm-related suicide was detected among people aged 40-49 years (124 cases per 100,000 population), followed by people aged 50-59 years (110 per 100,000 population). Individuals older than 75 years and those aged 30-39 years had similar rates (105 and 107 cases per 100,000 population, respectively) [1]. Notably, adolescents experienced lower rates than any of these group (23 cases per 100,000 population) [1].

Whites consistently had higher suicide rates across all races and ages. Data from 2004-2007 show relatively stable suicide rates for whites (range, 15.8-17.3 cases per 100,000 population) and blacks (range, 5.0-6.2 per 100,000 population), whereas rates among Asians decreased (from 6.0 to 3.2 per 100,000 population) and those among American Indians increased (from 7.5 to 15.2 per 100,000 population) during this period [5].

Most firearm deaths are due to suicide, but homicides often receive more media attention. There are interesting patterns among suicides. For example, a study in Kentucky,

North Carolina, and South Carolina revealed that, during 1990-1998, white males working in agriculture were 2 times more likely to commit suicide than were males at large in the community [2, 6].

Unintentional firearm deaths. During 2004-2008, there were 73 unintentional firearm deaths; the annual number of deaths ranged from 9 to 22. Because of low numbers, a rate could be calculated reliably only for 2005 (0.3 deaths per 100,000 population). On average, these deaths comprised approximately 1% of firearm deaths annually (North Carolina Violent Death Reporting System, unpublished data, 2010) [1]. Although numbers were small and must be interpreted with caution, across all ages, most deaths occurred among white males.

Nationally, 49% of unintentional firearm deaths were inflicted by others, most often by family members (47% of cases), particularly brothers, and by friends (43%). Fatalities occurred while playing, hunting, target shooting, and showing off a gun [7]. Studies have also demonstrated that the majority of firearms used in youth suicides and unintentional deaths were acquired from either the youth's home or the home of a friend or relative [8].

Firearm Presence in North Carolina Homes

According to the 2004 North Carolina Behavioral Risk Factor Surveillance Survey, homes of 40.9% of respondents had a firearm; this is higher than the national average of approximately 30% [9]. Firearm ownership also varied by region, with 36.7% of respondents from eastern counties, 32.3% from piedmont counties, and 52.9% from western counties reporting "yes" to the presence of firearms in their place of residence.

Preliminary North Carolina data suggest that firearm ownership may be correlated with suicide rates in the state. The average suicide rate during 2004-2008 was 12.1 cases per 100,000 population. Counties with the greatest reported prevalence of household firearms appeared to have the highest suicide rates. This pattern of higher suicide rates in states with higher prevalence of firearm ownership has also been reported in national data [10].

Firearm ownership also varies by the presence of children residing in the home: 29% of North Carolina households

contain children younger than 18 years, and 37% of these households contain at least 1 firearm (mean, 2 firearms) [11]. This is slightly higher than the national rate of approximately 33%.

Firearm Storage Practices in North Carolina Homes With Youths

Many youths are able to access household firearms because guns are often stored unsafely. In homes with firearms and children younger than 18 years, 43% of parents reported having at least 1 firearm stored unsafely—either unlocked, loaded, or both [11]. White non-Hispanic parents were almost 4 times more likely to own firearms than were parents in other racial groups and were more likely to report keeping a firearm unlocked and/or loaded. Storage practices of household firearms become less safe as children grow older, with more firearms reported to be stored unlocked and/or loaded in households with adolescents, compared with households with children. This is consistent with findings from another study [12] and particularly disturbing because adolescents are more likely than children to have access to and use firearms.

Strategies to Reduce Firearm Injuries

In recognizing the dangers posed by household firearms, many health professional organizations have recommended multiple strategies to reduce firearm injuries, including removal of firearms from homes and environments where children play and visit, as well as providing firearm-safety counseling for parents. For families that are unwilling to remove firearms from their homes, an alternative recommendation is to store the firearms unloaded and locked up, with the ammunition locked and stored separately. Several campaigns for safe storage of firearms have been developed to reinforce these messages, and some even provide tools, such as gun locks, to facilitate safer storage [13]. The long-term effectiveness of these programs has been mixed but is improved when the program is community based; engages or focuses on males, who are more likely to be gun owners; and gives the gun owners tools to lock their guns [13, 14].

CeaseFire is a Chicago-based initiative that seeks to reduce violent deaths in high-risk communities. CeaseFire has the following 5 components: community mobilization, youth outreach, public education, involvement of faith-based leaders, and participation by criminal justice agencies. Outreach staff are selected for their community experience and ability to empathize and communicate with community members. They respond to the needs of their clients, helping interested individuals find jobs, get back into school or a GED program, and disengage from gangs [15]. Individuals at increased risk for violence are also identified through CeaseFire's partnership with local EDs, where culturally sensitive hospital respondents are invited to meet with stabbing, shooting, and blunt-trauma victims to reflect on the consequences of violence and retaliation.

These comprehensive efforts ultimately resulted in a 17%-24% decrease in shootings and attempted shootings and a 16%-34% decrease in the number of people shot or killed, depending on the neighborhood [14]. CeaseFire's success and sustainable effects to reduce violence have made it a model program, with new CeaseFire projects underway in New York City, Philadelphia, and Baltimore [15].

Efforts to reduce firearm injuries have also included legislation. North Carolina is a state with relatively limited firearm control laws. While several states have legislation that limits handgun purchases to 1 handgun per person per month, there is no limit on the number of handguns that can be purchased by holders of a North Carolina firearm permit. In addition, although some states, including California, Massachusetts, New York, and Maryland, require the sale of approved external locks with handgun purchases, North Carolina does not.

One type of law that is specifically designed to protect children is the child access prevention (CAP) law. CAP laws dictate the legal repercussions for adults who give children access to guns or who are negligent about safe storage. In North Carolina, the current CAP law imposes criminal charges against adults only if they allow a child under their care to use or possess a firearm, not if the child independently gains access to a firearm. Furthermore, adults are exempt from prosecution if the minor obtains the firearm in an illegal manner, if the minor has taken a gun-safety course, or if the firearm was intended to be used for sport or agricultural purposes.

Studies have demonstrated that making violation of CAP laws a felony, rather than a misdemeanor, resulted in decreased unintentional firearm deaths, particularly among children, and worked best in states with strict enforcement [16]. Violation of the CAP law in North Carolina is considered a misdemeanor. Another study found that state CAP laws did have an important effect on reducing youth firearm-related suicides among youths, whereas federal firearm laws did not [17].

A criticism of studies investigating the effect of firearm laws on firearm injuries is the presence of insufficient or mixed evidence. A nationwide task force evaluating firearm laws and injury found insufficient evidence for evaluating the effect of firearms or ammunition bans, ownership restrictions, waiting periods, registration and licensing, and permits for concealed weapons. They noted that this did not mean that these interventions were ineffective but merely that more-substantial data are needed [18].

Future Research

Future research in North Carolina is needed to understand and intervene in new trends, such as the recent increase in firearm-related suicides and homicides among American Indians, and for the development and rigorous evaluation of primary prevention strategies to prevent firearm injuries, including suicide, which remains the largest source of firearm

deaths in North Carolina and the nation. Interventions that are most likely to be successful are multilevel, affecting individuals, relationships, communities, and society, and address known risk factors for firearm injury, as well as the agent of injury—the firearm—through measures such as reducing access and ownership, combining legislation with enforcement, and changing the types and lethality of ammunition. To develop these interventions, adequate funds will be required for research that has rigorous designs and frameworks for evaluation; continued data surveillance, including integration

of data held by different agencies; and innovative, multidisciplinary, and collaborative activities, including those that address employment, education, and mental health needs, that are similar to those of the CeaseFire project. **NCMJ**

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