

AMERICAN ACADEMY OF PEDIATRICS

Committee on Injury and Poison Prevention

Firearm-Related Injuries Affecting the Pediatric Population

ABSTRACT. This statement reaffirms the 1992 position of the American Academy of Pediatrics that the absence of guns from children's homes and communities is the most reliable and effective measure to prevent firearm-related injuries in children and adolescents. A number of specific measures are supported to reduce the destructive effects of guns in the lives of children and adolescents, including the regulation of the manufacture, sale, purchase, ownership, and use of firearms; a ban on handguns and semiautomatic assault weapons; and expanded regulations of handguns for civilian use. In addition, this statement reviews recent data, trends, prevention, and intervention strategies of the past 5 years.

ABBREVIATION. AAP, American Academy of Pediatrics.

SCOPE OF THE PROBLEM

In 1997, 32 436 firearm-related deaths (12.12/100 000) occurred in the United States, of which 4223 of the victims were children and adolescents younger than 20 years of age.¹ Handguns continue to account for the majority of deaths and injuries from firearms in the United States.²⁻⁶ Compared with the period from 1980 through 1985, death rates from firearms for children and adolescents increased by 31.8% during 1986 through 1992, primarily as a result of increases in the number of homicides.⁷ The data from 1993 through 1997 indicate a decline each year in the overall number of deaths and death rates from firearms. For all ages, the rate of firearm-related deaths fell in 1997 to 12.12 after peaking in 1993 at 15.36 per 100 000. In 1997, firearm-related deaths for adolescents 15 through 19 years of age decreased from 28.00 in 1994 to 18.84 in 1997 (Fig 1). This decrease establishes a downward trend after nearly 10 years of increase.

Nonetheless, by the year 2003, firearm-related deaths may become the leading cause of injury-related death.⁸ In fact, in 1996, in 5 states (Alaska, Louisiana, Maryland, Nevada, and Virginia) and the District of Columbia, firearm-related deaths already outnumbered the deaths related to motor vehicle crashes (A. Crosby, written communication, February 1999).

In 1997, firearm-related deaths accounted for 22.5% of all injury deaths in children and adolescents 1 through 19 years of age.¹ Among adolescents 15 through 19 years of age, 32.2% of all injury deaths are

firearm related (Table 1). Among black males 10 through 34 years of age, injuries from firearms are the leading cause of death.⁹ Most firearm-related deaths of children occur before their arrival at the hospital.^{10,11}

PATTERNS OF INJURY IN SUBPOPULATIONS OF CHILDREN AND ADOLESCENTS

Although national data cannot fully document urban and rural differences in the patterns of injuries from firearms that involve children, local data indicate that children in rural areas, as well as in urban areas, are at risk for firearm-related mortality.¹²⁻¹⁵ For rural and urban areas, handguns account for the greatest proportion of firearm-related injuries.^{15,16}

National firearm-related death and injury statistics are presented overall, by age and sex and specifically for whites and blacks only.¹ However, knowledge of the specific rates and an understanding of the patterns of injury in other ethnic groups and communities are important to direct community-specific interventions. Figure 2 illustrates firearm-related death rates for persons 15 through 24 years old of different racial and ethnic groups from 1970 through 1996.

INTERNATIONAL COMPARISONS

The United States has the highest rates of firearm-related deaths (including homicide, suicide, and unintentional deaths) among industrialized countries.¹⁷ The overall rate of firearm-related deaths for US children younger than 15 years of age is nearly 12 times greater than that found for 25 other industrialized countries, and the rate of firearm-related homicide is nearly 16 times higher than that in all the other countries combined.¹⁸ This difference in these rates seems to be related to a large extent to the ease of availability of guns in the United States compared with other industrialized countries. The lower rates of crime, assaults, and homicides in Vancouver, British Columbia, compared with Seattle, Washington, has been attributed to different handgun regulations.^{19,20} The available National Pediatric Trauma Registry morbidity data from Toronto, Ontario, for the years 1986 to 1992 are also in sharp contrast to the US experience; <.5% of trauma admissions were attributable to gunshot wounds in Toronto compared with 5% in the United States.¹³

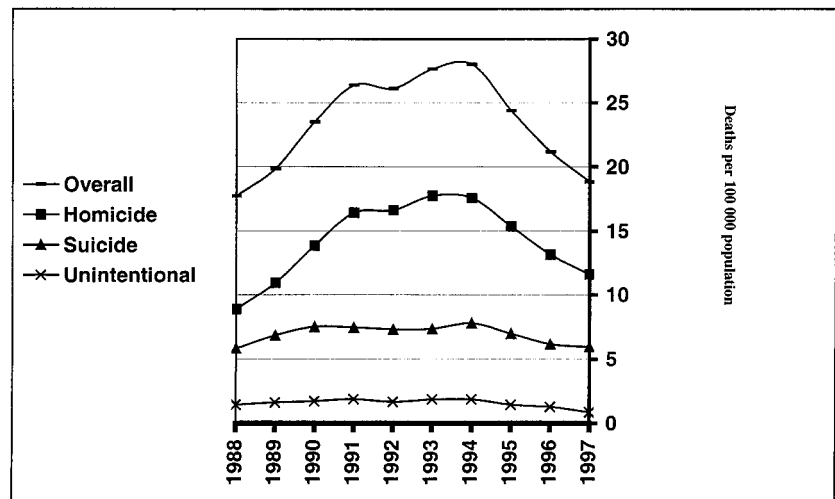
ECONOMIC COSTS OF FIREARM-RELATED INJURY

Miller and Cohen²¹ calculated that the financial cost to society resulting from gunshot-related injuries totaled \$112 billion in 1992. Half of the cost derives from assaults and murders; suicides and sui-

The recommendations in this statement do not indicate an exclusive course of treatment or serve as a standard of medical care. Variations, taking into account individual circumstances, may be appropriate.

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Fig 1. Firearm-related death rates per 100 000 persons 15 through 19 years of age in the United States, 1988–1997. Adapted from the Centers for Disease Control and Prevention, Atlanta, GA.



cide attempts are responsible for most of the remaining cost. Medical direct costs for the average hospitalized person with gunshot wounds is \$25 000.²¹ The method for calculating these costs, as described by Miller and Cohen,²¹ includes costs of life support; hospital room; intensive care unit; surgical theater; outpatient department use; and related supplies and services; professional fees; rehabilitation; nursing care; and for fatalities, autopsy, and burial. The most severe cases include a lifetime of care costs. A more recent publication cites the mean medical cost per gunshot injury of approximately \$17 000, with the 134 445 gunshot injuries in the United States in 1994 producing \$2.3 billion in lifetime medical costs, of which \$1.1 billion (49%) was paid by US taxpayers. Gunshot injuries attributable to assaults represented 74% of the total costs.³ It is estimated that 20 000 people per year are left paralyzed by a bullet from a handgun; the approximate number of people paralyzed and the lifetime medical costs are analogous to those of the polio epidemic of the 1950s.²²

HOMICIDE

In 1997, 85.2% of all homicides for persons 15 through 19 years of age were firearm-related (Table 1). Of the 4223 firearm-related deaths (E-Codes: E922, E955.0-4, E965.0-4, E970, E985.0-4) among children younger than 20 years of age in 1997, 2562 (61%) were attributable to homicide (Fig 3). Firearm-related homicides outnumbered firearm-related deaths attributable to other causes for all age groups 0 through 19 years of age.¹ In 1996 in the United States, 77.9% of all firearm-related homicides were committed with a handgun.²³ In 1996, of the teenage homicides attributable to firearms, 83% involved handguns, 10% long guns, and 7% other firearms (data from the *FBI Supplemental Homicide Report, 1996*, B. Brewer, May 1997). Deaths of males outnumber deaths of females. For adolescents 15 through 19 years old, firearm-related homicide rates increased 102% (data from 8.95 to 18.05 per 100 000) from 1988 through 1993. After young adults 20 through 24 years of age, African American males 15 through 19 years of age have the highest rates of firearm-related homicide (Fig 4), and these rates almost doubled

between 1988 and 1993 but have fallen in 1994 through 1997 (Fig 2). No single study has examined the reasons for the decline in firearm-related homicide rates. Postulated reasons include improved socioeconomic conditions, violence prevention programs, decline in crack/cocaine market, changes in legislation, and community policing. Nevertheless, the rates remain high.

An understanding of the characteristics of firearm-related homicides is important when interventions are being planned. Most homicides occur on impulse during interpersonal conflict.^{24–28} Firearms are involved in the majority of cases of fatal interpersonal violence.^{15,16,29} Recognized risk factors for violence involving children and adolescents include exposure to family violence, history of antisocial behavior, depression, suicidal ideation, drug/alcohol use, poor school performance, bullying, and withdrawal, demonstrating isolation from peer groups.³⁰ A number of authors have noted that adult drug traffickers use children and adolescents to hold and transport drugs, and the number of adolescent firearm-related homicides has risen, often with children caught in the cross-fire of drug trafficking.^{31,32} The occurrence of several highly publicized shootings in suburban or middle size town schools deserves continued serious study and prompt local and national responses.

SUICIDE

Of the 4223 firearm-related deaths of children in 1997, 1262 (29.9%) were the result of suicide. In 1997, 63% of all suicides in adolescents 15 through 19 years of age were committed with a firearm (Table 1). In 1996, handguns were involved in 70% of teenage suicides in which a firearm was used (*FBI Supplemental Homicide Report, 1995*, R. Peters, written communication, October 1997). Suicide rates for white males exceed those for black males. However, in 1994, the firearm-related suicide rate for black males 15 through 19 years of age doubled compared with the 1988 rate, but then decreased in 1995 through 1997. For black females, the rates also increased until 1994, although the numbers remain small. Since 1988, the

Fig 2. Death rates for firearm-related injuries for persons 15 through 24 years of age by race and Hispanic origin in the United States, 1970–1996.

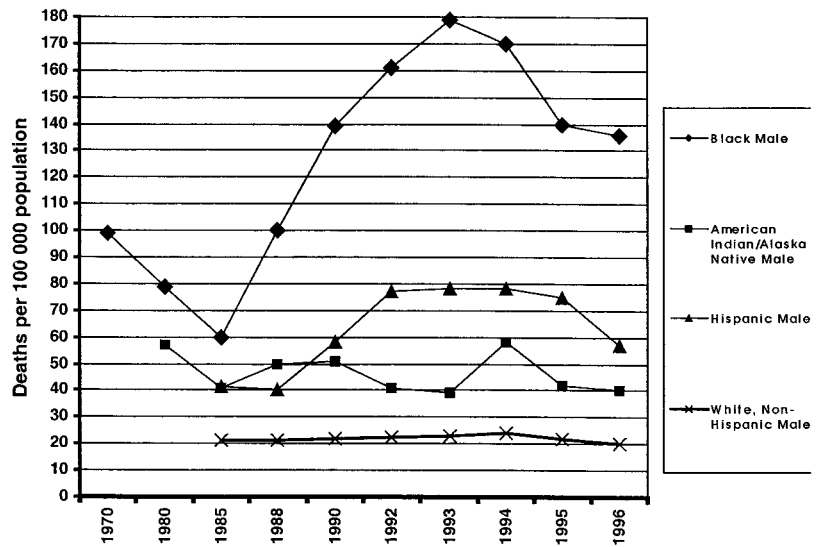


TABLE 1. Firearm-Related Deaths as a Percentage of All Deaths by Death Type and Demographic Group: United States, 1996

Death category	Age or Age/Gender Group				
	0–4 y	5–9 y	10–14 y	15–19 y	Males 15–19 y
All causes	2.4	6.3	18.0	32.2	37.8
All homicides	9.0	44.3	73.4	85.2	88.9
All suicides	Not applicable	25.0	41.5	63.0	65.4

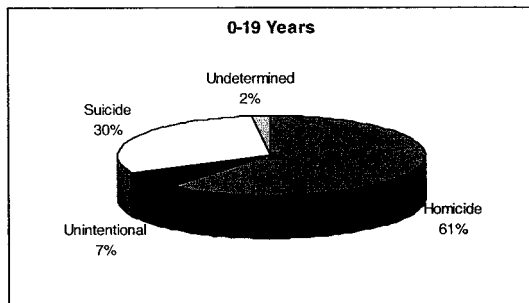
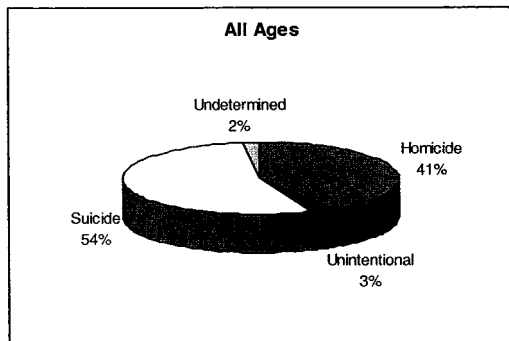


Fig 3. US 1997 firearm-related deaths, for all ages ($n = 32\,436$) and in children from birth through 19 years of age ($n = 4223$).

firearm-related suicide rate for white adolescents has shown only a slight decline.

Recognized risk factors for suicide are age; depression; use of cigarettes, alcohol, or illicit drugs; impulsiveness; gender; overall life stressors; sexual identity issues; abuse; family dysfunction; and suicidal

ideation.^{33–35} Suicide attempts involving a firearm more often are fatal (91%) compared with those involving drug overdoses (23%).^{6,14} The current prioritization of suicide as a national public health issue is underscored by the recent Surgeon General’s Report.³⁶

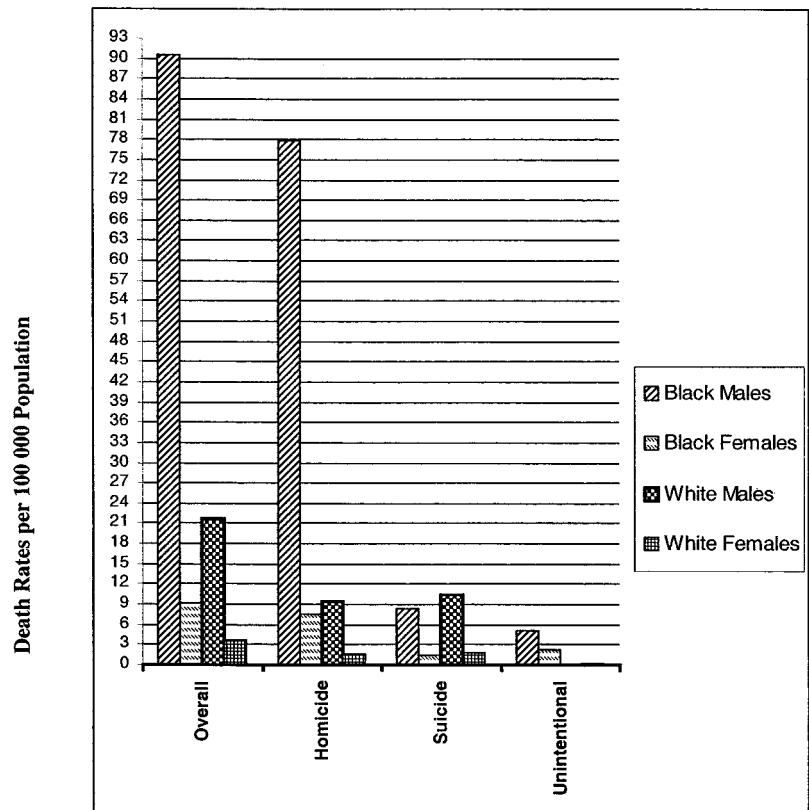
UNINTENTIONAL FIREARM-RELATED DEATHS

In 1997, 306 (7.2%) children and adolescents younger than 20 years killed by firearms died as a result of unintentional firearm-related injuries. Only 6.5% (20/306) of these deaths involved children younger than 5 years of age. However, deaths from unintentional firearm-related injuries account for a large proportion of firearm-related deaths of younger children. Twenty-four percent of firearm-related deaths in children younger than 5 years of age are attributable to unintentional shootings; 26% for children 5 through 9 years of age; 21% for children 10 through 14 years of age; and 5% for adolescents 15 through 19 years of age. The rates for males are higher than those for females, and the rates for blacks are higher than those for whites.¹ Most unintentional shootings occur among children left unsupervised at home.^{37–39} Unintentional shootings in rural areas are more likely to occur outdoors with shotguns or rifles, in contrast to urban areas, where they are more likely to be indoors with handguns.⁴⁰ However, handguns account for ~70% of all unintentional firearm-related injuries and deaths.^{17,40,41}

NONFATAL FIREARM-RELATED INJURIES

Based on data from emergency departments in the 91 hospitals in the National Electronic Injury Surveil-

Fig 4. Firearm-related death rates per 100 000 persons for blacks and whites 15 through 19 years of age in the United States, 1997. Adapted from the Centers for Disease Control and Prevention, Atlanta, GA.



lance System, an estimated 99 025 persons were treated for nonfatal firearm-related injuries in US hospital emergency departments from June 1, 1992 through May 31, 1993. The ratio of nonfatal to fatal injuries was 2.6:1.¹⁴ Of these injuries, 47% occurred in persons younger than 25 years of age, for whom the nonfatal:fatal ratio is 4.1:1. Most of the nonfatal injuries were attributable to assault (nonfatal:fatal ratio, 3.3:1). Suicide attempts and unintentional injuries showed different patterns, with nonfatal:fatal ratios of .3:1 and 12.8:1, respectively.

Other data systems in some states (eg, data from medical examiners, police, emergency medical services, hospital discharges, emergency departments, trauma registries, newspaper clippings, and behavioral risk factor surveys) provide additional information about the injury: the circumstances, place, demographics, relationships to illegal drugs, emotional and mental health factors, and hospitalization information, including health outcomes such as disability, including those related to spinal cord injury.⁶

The National Pediatric Trauma Registry collects information on injured children admitted to its 76 participating trauma centers around the United States.^{42,43} The National Pediatric Trauma Registry data indicate that the proportion of trauma admissions attributable to gunshots in general and children's hospitals increased during the period from 1986 through 1993 from 3% to 5%. A higher proportion of pediatric trauma cases were gunshot wound victims in general hospitals (8%) compared with children's hospitals (4%). The case fatality rate for those admitted for treatment of gunshot injuries during

this period was 10%, 10 times higher than the rate for stabbings.⁴²

CRIME AND FIREARM ACCESS

From 1980 to 1994, the proportion of homicides committed by juveniles increased from 8% to 16% of all homicides. After more than a decade of increases, the number of homicides committed by juveniles dropped in 1995, but only in firearm-related homicides. Nevertheless, in 1995, firearms were involved in 79% of the homicides committed by juveniles. Ten percent of the victims were family members, 54% were acquaintances, and 36% were strangers.⁴⁴

In 1996, a demonstration project aimed at reducing youth firearm-related violence by identifying major gun-related crime patterns was begun.³ Annual requests to trace guns in the 17 participating cities more than tripled, from 10 000 requests in 1996 to >37 000 in 1997. Guns used in crimes committed by juveniles (17 years of age and younger) and youth (18 through 24 years of age) combined make up 45% of the total guns recovered. Eighty percent of guns associated with crimes committed by juveniles and youth are handguns, compared with 70% of gun-related crimes by adults. Semiautomatic guns were most commonly used by youth (61% for youth vs 47% for adults). Many recovered firearms had been rapidly diverted from first retail sales at federally licensed gun dealers to a black market that supplies juveniles and youth.

ADOLESCENT CHARACTERISTICS AND ACCESS TO GUNS

Among adolescents in grades 9 through 12, 7.6% reported that they had carried guns during the past month.^{45,46} Males (12.3%) were significantly more likely to carry guns than were females (2.5%). The carrying of guns at school was found to be strongly associated with the use of violence and illicit drugs at school. Students who had been victims of violence and feared attending school were at greater risk of using alcohol and carrying a gun at school.³³

Many adolescents who carry guns report that they do so because they are afraid.^{29,41} Others seem to carry guns as a result of peer pressure.⁴⁷ Shootings are often impulsive.^{33,47,48} Adolescence is marked by a search for identity, independence, and autonomy. Accompanying characteristics may be curiosity, the strong influence of the peer group, rites of passage, belief in invincibility, impulsiveness, immaturity, mood swings, and substance abuse.^{33,48-50} The perception of danger by adolescents may be influenced by many factors, including the media, as well as the reality of their own lives. The world seen as a dangerous place during this particularly vulnerable developmental period may lead to conflict, injury, and death, especially when access to guns is easy.

GUNS AND GUN OWNERSHIP

It is estimated that 44 million Americans owned 192 million firearms in 1994: 65 million handguns, 70 million rifles, 49 million shotguns, and 8 million other long guns.⁵¹ Of the handguns, 48% were revolvers, 40% semiautomatic pistols, and 12% other types. The magazine capacity was 10 or more rounds in one fifth of the pistols, most often for guns purchased after 1993 (37.8% vs 14.1% for earlier purchases). The majority of handgun owners (55%) reported leaving their guns loaded, and many left guns loaded and unlocked. These data have been supported by other surveys of gun owners.⁵²⁻⁵⁵ Although for all firearms the leading motivation for ownership is recreational, nearly three quarters of handgun owners said self-protection was the primary reason for owning a gun.⁵⁶ Research in several US urban areas indicates that a gun stored in the home is associated with a three-fold increase in the risk of homicide and a fivefold increase in the risk of suicide.⁵⁶⁻⁵⁸ The widely publicized estimates of the number of defensive gun uses in the millions each year are not credible.⁵¹ In fact, guns kept in the home are 43 times more likely to be used to kill someone known to the family than to be used to kill in self-defense.⁵³

THE SECOND AMENDMENT ISSUES

Several legal reviews emphasize that the Second Amendment does not protect an *individual's* gun ownership. Two cases, *Presser v Illinois* and *United States v Miller*, have established the meaning of the Second Amendment.^{59,60} These and later federal court rulings have indicated that the "right" to bear

arms is linked to the preservation of state militias and is not intended to provide for an individual's right to own a firearm. The federal government could ban whole categories of firearms, such as handguns and assault weapons.^{60,61}

IMPLICATIONS OF DATA FOR PREVENTION STRATEGIES

The following summary of data suggests a number of intervention strategies:

- Firearm-related injuries are often fatal; since most deaths of children occur before their arrival at the hospital, primary prevention is essential;
- Suicide completion rises if guns are used; therefore, access to guns must be restricted;
- Access to guns increases the number of conflict-related deaths and injuries;
- Access to guns creates a risk for serious unintentional injury and death;
- Most firearm-related injuries and deaths of children and adolescents involve a handgun;
- For developmental reasons, educational interventions are unlikely to be effective for many children and adolescents.⁶²

A number of design options have been proposed to decrease the likelihood of unintentional injury by a firearm, as well as limiting access to unauthorized users. These include trigger locks, lock boxes, personalized safety mechanisms, and trigger pressures that are too high for young children.⁶³ Further study is needed to evaluate the effectiveness of these measures in reducing injuries and deaths. In addition, until existing guns are no longer present in the environments of children, educational efforts should continually inform parents of the hazards of guns and safety measures.

A number of factors may be important in reducing exposure to violence and the results of that exposure in children and adolescents. Some curricula targeting younger children and those at low risk for violence have been evaluated and have shown positive results.⁶⁵ Resiliency-based violence prevention strategies in preschool children have shown improvement in teacher interactional skills supporting children's resiliency and improvement in children's pro-social behaviors.⁶⁶ Other studies have shown that both family support and early childhood education result in reductions in delinquency.⁶⁷ However, one study has shown that, for seventh grade children exposed to high levels of violence, as victims or witnesses, a conflict resolution class produced more anxiety, depression, and aggression.⁶² School curricula aimed at reducing violence should be specific to the population and include evaluation components to determine their effectiveness.

The recent American Academy of Pediatrics (AAP) statement on youth violence prevention⁶⁸ suggests many ways in which pediatricians and communities can respond to violence. In one project, a comprehensive community-based intervention, which included improvement of playgrounds and parks to make safe play areas for

children and a multitude of supervised educational programs, was effective in curbing the incidence of severe assault injuries, but the reduction of gun-related injuries was not statistically significant.^{69,70} This finding suggests that additional control measures, such as limiting the access of adolescents to guns and control of other crime-related behaviors, are needed to further reduce firearm-related morbidity and mortality.

SUMMARY AND RECOMMENDATIONS

Because firearm-related injury to children is associated with death and severe morbidity and is a significant public health problem, child health care professionals can and should provide effective leadership in efforts to stem this epidemic. The AAP recognizes the importance of a variety of countermeasures (educational, environmental, engineering, enactment, enforcement, economic incentives, and evaluation) to begin to curb dramatically the number of firearm-related injuries to children. The AAP makes the following recommendations, which reaffirm and expand on the 1992 policy statement⁷¹:

1. The AAP affirms that the most effective measure to prevent firearm-related injuries to children and adolescents is the absence of guns from homes and communities.

- a) Firearm regulation, to include bans of handguns and assault weapons, is the most effective way to reduce firearm-related injuries.

- b) Pediatricians and other child health care professionals are urged to inform parents about the dangers of guns in and outside the home. The AAP recommends that pediatricians incorporate questions about guns into their patient history taking and urge parents who possess guns to remove them, especially handguns, from the home. Loaded firearms and unlocked firearms and ammunition represent a serious danger to children and adolescents. At especially high risk are adolescents who have a history of aggressive and violent behaviors, suicide attempts, or depression.^{30,68,71}

2. The AAP urges that guns be subject to safety and design regulations, like other consumer products, as well as tracing.

- a) The AAP supports efforts to reduce the destructive power of handguns and handgun ammunition via regulation of the manufacture and importation of classes of guns. Engineering efforts (eg, personalized safety mechanisms and trigger locks) are of unproved benefit and need further study. (Trigger locks, lock boxes, and other safe storage legislation are encouraged by the AAP, until guns are fully removed from the environment of children.) Other such measures aimed at regulating access of guns should include legislative actions, such as mandatory waiting periods and/or background checks.

3. The AAP urges the development of quality, violence-free programming and constructive dialogue among child health and education advo-

cates, the Federal Communications Commission, and the television and motion picture industries, as well as toy, video game, and other software manufactures and designers, in an effort to reduce the romanticization of guns in the popular media.

4. The AAP supports the evaluation of firearm injury prevention and intervention strategies such as conflict resolution, alternatives to violence, storage techniques (eg, trigger locks, lock boxes, and gun safes), and educational programs for children and adolescents.⁷²

5. The AAP urges that a coordinated, comprehensive, national surveillance data system be maintained by the Centers for Disease Control and Prevention as well as the National Center for Health Statistics.

6. The AAP supports the education of physicians and other professionals interested in understanding the effects of firearms and how to reduce the morbidity and mortality associated with their use. Organizations such as the Handgun Epidemic Lowering Plan may work with the AAP and individual chapters to foster an advocacy network to protect children from injury and death from firearms.

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