



Crossing Lines — A Change in the Leading Cause of Death among U.S. Children

Lois K. Lee, M.D., M.P.H., Katherine Douglas, M.D., and David Hemerway, Ph.D.

Injuries are the most common cause of death among children, adolescents, and young adults between 1 and 24 years of age in the United States; indeed, injuries are responsible for more

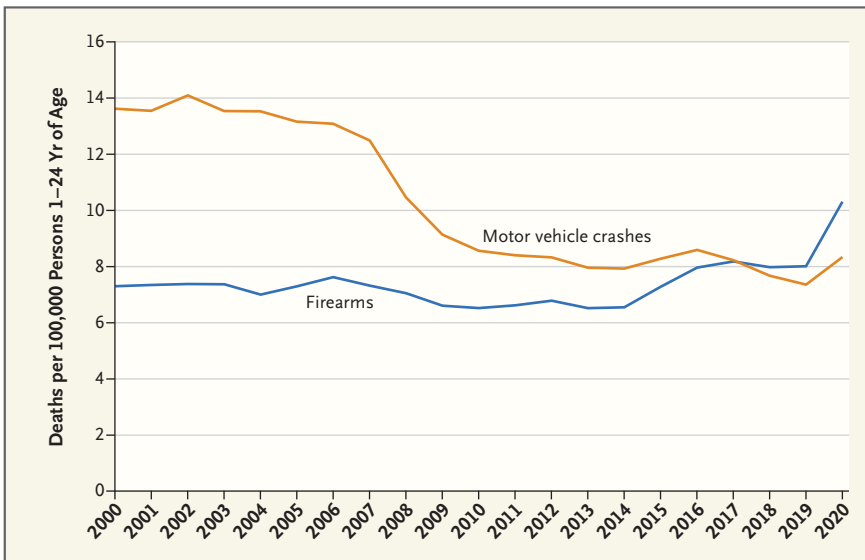
deaths among children and adolescents than all other causes combined.¹ For more than 60 years, motor vehicle crashes were the leading cause of injury-related death among young people. Beginning in 2017, however, firearm-related injuries took their place to become the most common cause of death from injury (see graph).¹ This change occurred because of both the rising number of firearm-related deaths in this age group and the nearly continuous reduction in deaths from motor vehicle crashes. The crossing of these trend lines demonstrates how a concerted approach to injury prevention can reduce injuries and deaths — and, conversely, how a public health problem can be exacerbated in the absence of such attention. Be-

tween 2000 and 2020, the number of firearm-related deaths among children, adolescents, and young adults increased from 6998 (7.30 per 100,000 persons) to 10,186 (10.28 per 100,000 persons), according to the Centers for Disease Control and Prevention (CDC).¹

Research has shown that most injuries can be prevented by means of the manufacture and appropriate use of safe products and the implementation of policies reducing product-related danger and the occurrence of hazardous situations — the principles of harm reduction. Since the 1960s, continuous efforts have been directed toward preventing deaths from motor vehicle crashes. As a result, there has been a substantial reduction not just in fatality

rates, but in rates of serious non-fatal injuries associated with motor vehicle crashes, among people of all ages. In 2000, motor vehicle-related injuries resulted in 13,049 deaths among young people (13.62 per 100,000 persons). Twenty years later, there has been a nearly 40% decrease, with 8234 motor vehicle traffic deaths (8.31 per 100,000 persons) recorded in 2020.¹

Two decades ago, the CDC proclaimed the reduction in deaths attributable to motor vehicle crashes to be one of the most substantial public health achievements of the 20th century.² Most important, the United States established an infrastructure permitting continuous improvements in motor vehicle safety. At the forefront of this effort has been the National Highway Traffic Safety Administration (NHTSA), a federal agency whose mission is to save lives and prevent injuries caused by road-traffic crashes. Firearms, however, are one of the



Mortality from Motor Vehicle Crashes and Firearms among Children, Adolescents, and Young Adults, United States, 2000–2020.

The rates are age-adjusted and are from the Web-based Injury Statistics Query and Reporting System, Centers for Disease Control and Prevention.¹

few products whose safety isn't regulated by a designated federal agency.

Dr. William Haddon, the first NHTSA director, is credited with articulating the comprehensive scientific (i.e., public health) approach now used to reduce unintentional and intentional injuries. The first step is to create comprehensive data systems. The NHTSA maintains a public database that includes entries for all motor vehicle-related deaths occurring on U.S. public roads (<https://www.nhtsa.gov/research-data/fatality-analysis-reporting-system-fars>) and collects data on a large, nationally representative sample of police-reported crashes. By contrast, it has taken 20 years to build a database of firearm-related deaths that includes data from all 50 states, known as the National Violent Death Reporting System. This database is already quite useful, and it should improve over time because of enhanced data quality and variable coding. Work on creating a reli-

able database for nonfatal firearm-related injuries is ongoing.

Injury and fatality data are of little use without research to uncover important trends, disparities, and associations. Such research is critical to developing, implementing, and evaluating injury-prevention initiatives. Although substantial federal funding has been devoted to research on motor vehicle crashes, the firearm industry and gun-rights organizations, led by the National Rifle Association (NRA), have been effective at keeping federal dollars from financing firearm-related research. Between 1996 and 2019, little federal research funding was appropriated for firearm-injury prevention, owing in large part to the Dickey Amendment.³ Unsurprisingly, researchers and policymakers know much more about the circumstances surrounding deaths from motor vehicle crashes and effective interventions for preventing traffic-related injuries and deaths than they do about firearm-related

harm. Only in the past couple of years has there been a substantial increase in federal funding for firearm-related research — though not to levels commensurate with the size of the problem. The work of federally funded groups, such as the Firearm Safety Among Children and Teens consortium, will be important in advancing the science of firearm-injury prevention.

To support automotive safety, the NHTSA and the nonprofit Insurance Institute for Highway Safety provide vehicle safety ratings using crash-test results and fatality data. Motor vehicle companies, which for decades resisted competing on the basis of safety, reversed course and now often advertise their vehicles' safety features. An important contributor to the nearly continuous reduction in traffic fatalities among both children and adults during the 21st century has been the implementation of vehicular safety improvements, such as automatic emergency braking, electronic stability controls, lane-departure warnings, blind-spot detection, side airbags, and rear-facing cameras. In recent years, on the other hand, the firearms available to civilians have become more lethal, in part because manufacturers are increasingly selling weapons designed for military use. There also appears to have been little effort by the gun industry to develop or market personalized "smart" guns. Such weapons can be fired by the authorized user only and should therefore reduce the risk of children unintentionally shooting themselves or others and of adolescents using guns for homicide or suicide.

Another important component of traffic-safety infrastructure has been universal state-level require-

ments for the licensing of drivers and the registration of vehicles. Licensing and registration policies also make it easier for states to establish and enforce safety mandates. Some safety measures have focused specifically on young people. In the 2000s, states began implementing booster-seat laws, child car seats became sturdier and more protective, and anticipatory guidance for parents on child-passenger safety was emphasized, which reduced deaths from motor vehicle crashes among children. Following the example of states that created graduated-licensing programs for new drivers in the late 1990s — which reduced fatal crashes among teenagers — the remaining states have adopted graduated licensing, which includes standardized driver education, mandatory supervised-driving hours, and other policies.⁴

By contrast, many states have made it easier for children and young adults, as well as adults with criminal records, to gain access to firearms. Some states don't require background checks when firearms are purchased from private sellers, such as at gun shows. In recent years, many of the same states have passed legislation allowing people to carry a concealed weapon without a permit. At the federal level, the government has given the firearm industry partial protection against certain tort-liability suits (i.e., against negligence claims contending that they could have foreseen their product being diverted for criminal use), which has reduced the industry's incentive to help prevent firearm-related deaths.

One takeaway from ongoing success in improving motor vehicle safety may be the impor-

tance of a system that tracks firearm-related injuries and promotes the type of continuous reduction in injury rates that has been seen for motor vehicle crashes, including among children. At the federal level, such an

As the progress made in reducing deaths from motor vehicle crashes shows, we don't have to accept the high rate of firearm-related deaths among U.S. children and adolescents.

approach could involve establishing an agency whose mission is to prevent harm caused by firearms. Eliminating tort protections that have been carved out for the firearm industry could encourage manufacturers to reduce harm. Successful negligence claims against insured manufacturers might give the insurance industry more incentive to help reduce gun violence — and perhaps to create a gun-focused organization analogous to the Insurance Institute for Highway Safety to advocate for beneficial regulations and policies. Federal and state laws, such as strong child-access prevention laws, which hold firearm owners liable if a child gains or could gain access to a firearm, could reduce related injuries and deaths among children.⁵ All cost-effective programs and policies that reduce injuries among children deserve support from researchers and policymakers, but we may want to prioritize those that could generate increasing benefits over time.

As the progress made in reducing deaths from motor vehicle crashes shows, we don't have to accept the high rate of firearm-related deaths among U.S.

children and adolescents. Preventable deaths among young people not only are associated with tremendous medical costs, but take a great personal toll on families and communities. To reverse the trend of increasing fire-

arm-related deaths among U.S. children, experts and policymakers should be intentional in their efforts to develop and implement a multipronged scientific strategy centered on continuous improvement.

Disclosure forms provided by the authors are available at NEJM.org.

From the Department of Pediatrics, Boston Children's Hospital (L.K.L., K.D.), the Departments of Pediatrics and Emergency Medicine, Harvard Medical School (L.K.L.), and the Department of Health Policy and Management, Harvard T.H. Chan School of Public Health (D.H.) — all in Boston.

This article was published on April 16, 2022, at NEJM.org.

- Centers for Disease Control and Prevention. WISQARS injury data (<https://www.cdc.gov/injury/wisqars/index.html>).
- Centers for Disease Control and Prevention (CDC). Motor-vehicle safety: a 20th century public health achievement. *MMWR Morb Mortal Wkly Rep* 1999;48:369-74.
- Rostron A. The Dickey Amendment on federal funding for research on gun violence: a legal dissection. *Am J Public Health* 2018;108:865-7.
- Williams AF, McCartt AT, Sims LB. History and current status of state graduated driver licensing (GDL) laws in the United States. *J Safety Res* 2016;56:9-15.
- Azad HA, Monuteaux MC, Rees CA, et al. Child access prevention firearm laws and firearm fatalities among children aged 0 to 14 years, 1991–2016. *JAMA Pediatr* 2020;174:463-9.

DOI: 10.1056/NEJMp2200169

Copyright © 2022 Massachusetts Medical Society.

 An audio interview with Dr. Lee is available at NEJM.org