Motor-Vehicle Safety: A 20th Century Public Health Achievement

THE REDUCTION OF THE RATE OF DEATH attributable to motor-vehicle crashes in the United States represents the successful public health response to a great technologic advance of the 20th century—the motorization of America. Six times as many people drive today as in 1925, and the number of motor vehicles in the country has increased 11-fold since then to approximately 215 million.1 The number of miles traveled in motor vehicles is 10 times higher than in the mid-1920s. Despite this steep increase in motor-vehicle travel, the annual death rate has declined from 18 per 100 million vehicle miles traveled (VMT) in 1925 to 1.7 per 100 million VMT in 1997—a 90% decrease (Figure 1).1

Systematic motor-vehicle safety efforts began during the 1960s. In 1960, unintentional injuries caused 93,803 deaths1; 41% were associated with motor-vehicle crashes. In 1966, after 5 years of continuously increasing motor-vehicle-related fatality rates, the Highway Safety Act and the National Traffic and Motor Vehicle Safety Act authorized the federal government to set and regulate standards for motor vehicles and highways, a mechanism necessary for effective prevention.2-3 Many changes in both vehicle and highway design followed this mandate. Vehicles (agent of injury) were built with new safety features, including head rests, energy-absorbing steering wheels, shatter-resistant windshields, and safety belts.3-4 Roads (environment) were improved by better delineation of curves (edge and center line stripes and reflectors), use of breakaway sign and utility poles, improved illumination, addition of barriers separating oncoming traffic lanes, and guardrails.4-5 The results were rapid. By 1970, motor-vehicle-related death rates were decreasing by both the public health measure (deaths per 100,000 population) and the traffic safety indicator (deaths per VMT) (Figure 2).1

Changes in driver and passenger (host) behavior also have reduced motor-vehicle crashes and injuries. Enforcement of traffic safety laws, reinforced by public education, have led to safer behavior choices. Examples include enforcement of laws against driving while intoxicated (DWI) and underage drinking, and enforcement of safety-belt, child-safety seat, and motorcycle helmet use laws.5-6

Government and community recognition of the need for motor-vehicle safety prompted initiation of programs by federal and state governments, academic institutions, community-based organizations, and industry. NHTSA and the Federal Highway Administration within the U.S. Department of Transportation have provided national leadership for traffic and highway safety efforts since the 1960s.2 The National Center for Injury Prevention and Control, established at CDC in 1992, has contributed public health direction.7,8

Figure 1. Motor-Vehicle–Related Deaths Per Million Vehicle Miles Traveled (VMT) and Annual VMT, by Year—United States, 1925-1997

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State and local governments have enacted and enforced laws that affect motor-vehicle and highway safety, driver licensing and testing, vehicle inspections, and traffic regulations. Preventing motor-vehicle-related injuries has required collaboration among many professional disciplines (e.g., biomechanics has been essential to vehicle design and highway safety features). Citizen and community-based advocacy groups have played important prevention roles in areas such as drinking and driving and child-occupant protection. Consistent with the public/private partnerships that characterize motor-vehicle safety efforts, NHTSA sponsors “Buckle Up America” week (this year during May 24-31), which focuses on the need to always properly secure children in child-safety seats (additional information is available by telephone, [202] 366-5399, or on the World-Wide Web at http://www.nhtsa.dot.gov).

**SPECIFIC PUBLIC HEALTH CONCERNS**

**High-Risk Populations**

Alcohol-impaired drivers. Annual motor-vehicle crash-related fatalities involving alcohol has decreased 39% since 1982, to approximately 16,000; these deaths account for 38.6% of all traffic deaths. Factors that may have contributed to this decline include increased public awareness of the dangers of drinking and driving; new and tougher state laws; stricter law enforcement; an increase in the minimum legal drinking age; prevention programs that offer alternatives such as safe rides (e.g., taxicabs and public transportation), designated drivers, and responsible alcohol-serving practices; and a decrease in per capita alcohol consumption.

Young drivers and passengers. Since 1975, motor-vehicle-related fatality rates have decreased 27% for young motor-vehicle occupants (ages 16-20 years). However, in 1997 the death rate was 28.3 per 100,000 population—more than twice that of the U.S. population (13.3 per 100,000 population). Teenaged drivers are more likely than older drivers to speed, run red lights, make illegal turns, ride with an intoxicated driver, and drive after drinking alcohol or using drugs. Strategies that have contributed to improved motor-vehicle safety among young drivers include laws restricting purchase of alcohol among underaged youths and some aspects of graduated licensing systems (e.g., nighttime driving restrictions).

Pedestrians. From 1975 to 1997, pedestrian fatality rates decreased 41%, from 4 per 100,000 population in 1975 to 2.3 in 1997 but still account for 13% of motor-vehicle-related deaths. Factors that may have reduced pedestrian fatalities include more and better sidewalks, pedestrian paths, playgrounds, and restricted on-street parking.

**Occupant-Protection Systems**

Safety belts. In response to legislation, highly visible law enforcement, and public education, rates of safety belt use nationwide have increased from approximately 11% in 1981 to 68% in 1997. Safety belt use began to increase following enactment of the first state mandatory-use laws in 1984. All states except New Hampshire now have safety-belt use laws. Primary laws (which allow police to stop vehicles simply because occupants are not wearing safety belts) are more effective than secondary laws (which require that a vehicle be stopped for some other traffic violation). The prevalence of safety belt use after enactment of primary laws increases 1.5-4.3 times, and motor-vehicle-related fatality rates decrease 13%-46%.

Child-safety and booster seats. All states have passed child passenger protection laws, but these vary widely in age and size requirements and the penalties imposed for noncompliance. Child-restraint use in 1996 was 85% for children aged <1 year and 60% for children aged 1-4 years. Since 1975, deaths among children aged <5 years have decreased 30% to 3.1 per 100,000 population, but rates for age groups 5-15 years have declined by only 11%-13%. Child seats are misused by as many as 80% of users. In addition, parents fail to recognize the need for booster seats for children who are too large for child seats but not large enough to be safely restrained in an adult lap-shoulder belt.

**21ST CENTURY CHALLENGES**

Despite the great success in reducing motor-vehicle-related death rates, motor-vehicle crashes remain the leading cause of death for individuals ages 1-24 years. The issues to be addressed are complex and interrelated, and solutions require national, state, and local public health strategies that go beyond the individual. The key components to enhancing motor-vehicle safety are education, enforcement, and engineering changes.
cause of injury-related deaths in the United States, accounting for 31% of all such deaths in 1996 (CDC, unpublished data, 1999). Furthermore, motor-vehicle-related injuries led all causes for deaths among persons aged 1-24 years. In 1997, motor-vehicle crashes resulted in 41,967 deaths (16 per 100,000 population), 3.4 million nonfatal injuries (1270 per 100,000 population), and 23.9 million vehicles in crashes; cost estimates are $200 billion.1

The challenge for the 21st century is to sustain and improve motor-vehicle safety. Future success will require augmentation of the public health approach to (1) expand surveillance to better monitor nonfatal injuries, detect new problems, and set priorities; (2) direct research to emerging and priority problems; (3) implement the most effective programs and policies; and (4) strengthen interagency, multidisciplinary partnerships.

Key public health activities will be to
- continue efforts shown to reduce alcohol-impaired driving and related fatalities and injuries.
- promote strategies such as graduated licensing that discourage teenage drinking and other risky driving behaviors such as speeding and encourage safety belt use.
- enhance pedestrian safety, especially for children and the elderly, through engineering solutions that reduce exposure to traffic and permit crossing streets safely and by encouraging safer pedestrian behaviors, such as crossing streets at intersections, and increasing visibility to drivers and driver awareness of pedestrians.
- accommodate the mobility needs of persons aged >65 years—a population that will almost double to 65 million by 2030—through a combination of alternative modes of transportation (e.g., walking and better public transportation) and development of strategies to reduce driving hazards.6,10
- encourage the 30% of the population who do not wear safety belts to use them routinely.
- encourage proper use of age-appropriate child-safety seats and booster seats, especially for older children who have outgrown their child seats but are too small for adult lap-shoulder belts.
- conduct biomechanics research to better understand the causes of nonfatal disabling injuries, in particular brain and spinal cord injuries, as a foundation for prevention strategies.
- develop a comprehensive public health surveillance system at the federal, state, and local levels that track fatal and nonfatal motor-vehicle-related injuries and other injuries and diseases (i.e., outpatient and emergency department visits, hospitalizations, disabilities, and deaths) as a basis for setting prevention and research priorities.

Reported by: Div of Unintentional Injury Prevention, National Center for Injury Prevention and Control, CDC.

REFERENCES
19 available

International Course in Applied Epidemiology

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CDC AND EMORY UNIVERSITY’S ROLLINS School of Public Health will cosponsor a course, “International Course in Applied Epidemiology,” October 4-29, 1999, in Atlanta. This basic course is directed at public health professionals from countries other than the United States. Its content includes presentations and discussions of epidemiologic principles, basic statistical analysis, public health surveillance, field investigations, surveys and sampling, and discussions of epidemiologic aspects of major public health problems in international health.

Included are small group discussions of epidemiologic case exercises based on field investigations. Participants are encouraged to give a short presentation reviewing some epidemiologic data from their own country. Computer training using Epi-Info software is included. Prerequisites are familiarity with the vocabulary and principles of basic epidemiology or completion of CDC’s “Principles of Epidemiology” home-study course or equivalent. Preference will be given to applicants whose work involves priority public health problems in international health. There is a tuition charge.

Additional information and applications are available from Emory University, The Rollins School of Public Health, International Health Dept. (PIA), 1518 Clifton Rd., N.E., Room 746, Atlanta, GA 30322; telephone (404) 727-3485; fax (404) 727-4590; e-mail pvaleri@sph.emory.edu, or on the World-Wide Web at http://www.sph.emory.edu/EPICOURSES.

National Dog Bite Prevention Week

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THE HUMANE SOCIETY OF THE UNITED States (HSUS) sponsored the fifth annual National Dog Bite Prevention Week during May 16-22, 1999. In recognition of the importance of a combined effort to prevent dog bites, HSUS and cosponsoring organizations conducted events throughout the week that were designed to educate the public about responsible dog ownership and dog bite safety. Co-sponsors included CDC, the American Medical Association, the American Academy of Pediatrics, the American Veterinary Medical Association, the American Society of Plastic and Reconstructive Surgeons, State Farm Insurance Companies, the National Animal Control Association, the Independent Insurance Agents of America, and the U. S. Postal Service.

Campaign kits and additional information about National Dog Bite Prevention Week are available on the World-Wide Web at http://www.nodogbites.org*; by mail from The Humane Society of the United States, 2100 L Street, N. W., Washington, DC 20037; and by telephone, (202) 452-1100.

*References to sites of nonfederal organizations on the World-Wide Web are provided solely as a service to MMWR readers and do not constitute or imply endorsement of these organizations or their programs by CDC or the U. S. Department of Health and Human Services. CDC is not responsible for the content of pages found at these sites.