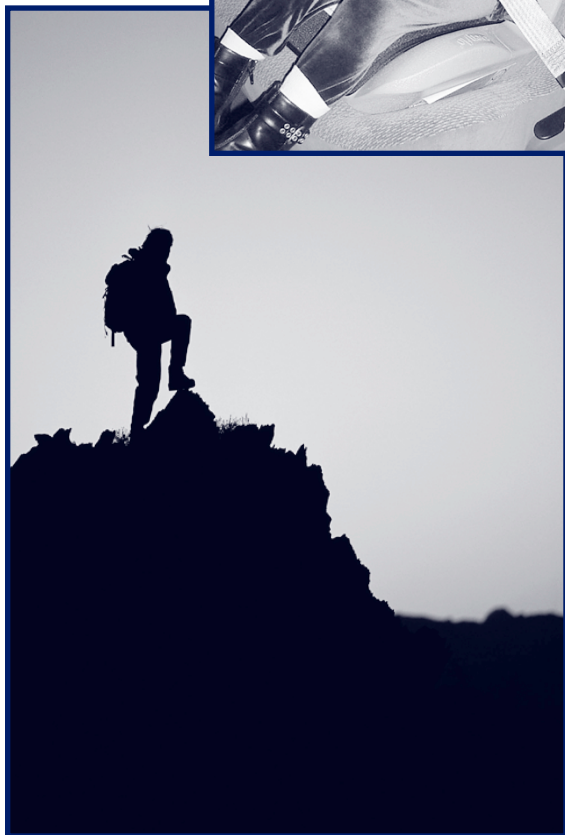

INJURY PREVENTION

STRATEGIC PLAN • 2003-2008



APRIL 2003

**State Emergency Medical and Trauma Services Advisory Council
and Injury Prevention Advisory Committee, in coordination with:**
Colorado Department of Public Health and Environment, Injury Prevention Program

INJURY PREVENTION

STRATEGIC PLAN • 2003–2008

APRIL 2003



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Colorado State Emergency Medical and Trauma Services Advisory Council

April 28, 2003

Dear Colleagues:

We are pleased to present you with the *Colorado Injury Prevention Strategic Plan: 2003–2008*, which was endorsed by the State Emergency Medical and Trauma Services Advisory Council in April 2003. The plan has been developed to serve as a guide for reducing the three leading causes of injury deaths and hospitalizations in our state: suicide, motor vehicle traffic and falls.

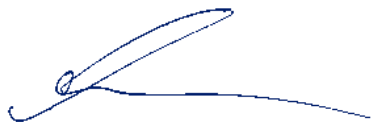
Preventing injuries in Colorado could save our citizens millions of dollars each year. Communities working together to raise awareness, educate, and effect changes in policy, organizational practices and the environment can make a significant impact on the injury toll in our state. Injury prevention makes good sense.

We would like to offer our sincere thanks and appreciation to the Injury Prevention Advisory Committee members, the State Emergency Medical and Trauma Services Advisory Council members, and the Colorado Department of Public Health and Environment's Injury Prevention, Injury Epidemiology and Office of Suicide Prevention program staff for their important contributions to the plan. Together, we can make a difference in the health and safety of our fellow citizens in Colorado.

Sincerely,



Jerry Rhodes, Chair
State Emergency Medical and Trauma
Services Advisory Council



Amy Martin, MD, Chair
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Colorado SEMTAC website: <http://www.cdphe.state.co.us/em/SEMTAC/semtachom.html>

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Chapter One: Introduction

“Injury is probably the most under recognized major public health problem facing the nation today, and the study of injury presents unparalleled opportunities for realizing significant savings in both financial and human terms—all in return for a relatively modest investment.”

—National Academy of Sciences, *Injury Control*¹

Overview

Each year 150,000 Americans die as a result of injuries, and an estimated 70 million suffer non-fatal injuries. Injury ranks third among causes of death overall, and constitutes our nation's second most costly health problem, after heart disease.² National Center for Health Statistics data show that injury causes more deaths among children and young adults than does disease.³ On any given day in the United States:

- 405 people will die of injuries
- 7,500 will be hospitalized because of nonfatal injuries
- 162,000 people will suffer injuries severe enough to restrict their usual activities and—in 92 percent of those cases—require that they seek medical attention.⁴

In Colorado, injuries are the third leading cause of death, with about 2,400 injury deaths occurring each year. More than 27,000 Coloradans are hospitalized for injuries, and thousands more are treated in emergency departments and physicians' offices. It is estimated that nearly one in 10 Coloradans seek medical treatment for injuries each year.⁵

Injuries are not unique to any specific population or age group. They affect everyone, regardless of age, gender, race or economic status. The outcome of an injury can vary from temporary discomfort and inconvenience, to chronic pain, disability, and major lifestyle changes. Injury affects the injured person, but also families, employers, communities and the society at-large.

Injury Costs

In addition to their human toll, injuries also have huge economic costs. They account for about 12 percent of all medical spending in the United States, a total of almost \$260 billion in 1995. Federal, state and local government funds pay for 28 percent of national medical expenditures for injuries, with private sources covering the remaining 72 percent.⁶

Hospital Charges

Figure 1: Total charges for hospitalizations due to injury: Colorado residents, 2001⁷

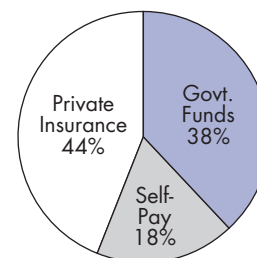
| Cause | Number of hospitalizations | Total hospital charges | Average charges of 90% interval* |
|--------------------------------------|----------------------------|------------------------|----------------------------------|
| Total Injury hospitalizations | 29,641 | \$556,361,422 | \$14,363 |
| Falls | 13,223 | \$234,540,815 | \$15,064 |
| Motor vehicle traffic | 5,128 | \$152,482,732 | \$22,220 |
| Suicide | 2,680 | \$28,190,293 | \$8,073 |

* The average hospital charge shown represents the average of the 90 per cent interval costs. In this calculation, the highest five percent and lowest five percent of charges are subtracted prior to calculating the average. This method is used to deal with “outliers,” admissions with extremely high or extremely low charges.

As shown in the preceding table, Colorado hospital charges for injuries were over \$556 million in 2001. For the three leading types of injuries, these charges included \$234 million for falls, \$152 million for motor vehicle traffic injuries, and \$28 million for suicide attempts.⁷ Since these figures are for hospital charges only, and therefore do not include physician payments, rehabilitation and emergency medical services costs, the total med-

ical costs are actually much higher. In Colorado, government funds, including Medicare, Medicaid, Workers' Compensation, and other government sources, covers 38 percent of hospital costs for all injuries. Private insurance pays for 44 percent of these costs, and self-pay accounts for 18 percent (see Figure 2). The government's share of expenditures varies by type of injury, ranging from 55 percent for falls, 23 percent for suicide attempts, and 10 percent for motor vehicle traffic crashes.⁷

Figure 2: Payment sources for hospitalizations due to injury, Colorado residents, 2001⁷



Other Costs

Costs for medical care actually make up only a small percentage of the lifetime cost of injuries. For childhood injuries, the medical costs account for only 17 percent of the lifetime costs. The bulk of the financial burden comes from work losses experienced by the injured persons and their caregivers.⁸ Another estimate of the long-term impact of injuries is the concept of Years of Potential Life Lost (YPLL). (See Appendix Four.) This measure estimates the number of productive years that have been lost before age 65 due to death from different causes. In Colorado, more years of potential life are lost due to injury than to any other cause of death. Each year in Colorado, it is estimated that over 33,000 YPLL are lost due to unintentional injuries, with an additional 14,000 YPLL due to suicide, and 6,000 YPLL due to homicide. These injury YPLL compare to the YPLL for other causes of death such as cancer (22,000 years) and heart disease (14,000 years).⁷

The Role of Prevention in Reducing Injuries

Our mothers were right when they observed, “an ounce of prevention is worth a pound of cure.” Injury prevention professionals use the adage: “Injuries are **not** accidents.” In fact, nearly all are predictable, controllable events that can be anticipated and avoided. With specific strategies, we can reduce the occurrence and severity of trauma. Through research, evaluation and development of effective programs, logical interventions can be applied to prevent the majority of injuries.

Essential Components of Injury Prevention

As a public health approach, the process of preventing health problems is based upon focusing on the problem by:

- Measuring the occurrence of the health problem (surveillance)
- Identifying relevant risk factors (epidemiological analysis)
- Ascertaining the natural history of the problem
- Intervening to reduce the number or severity of cases
- Evaluating the results of the interventions.²

Although injury prevention is a relatively new specialty within public health, the prevention process is essentially the same as that described above. Building a comprehensive and successful injury prevention program requires the application of a series of components. The five most critical, interrelated components for injury prevention are:

- data collection and dissemination (*Information*)
- promotion of evidence-based injury prevention guidelines and evaluation (*Best Practices*)
- coordination with other prevention programs (*Coordination and Collaboration*)

- development of leadership and infrastructure (*Human Resources*)
- strengthening legislation, rules and regulations to prevent injuries (*Public Policy*)¹⁶

Approaches to Prevention

Making an impact on injuries is not an easy task. It is not simply a matter of providing information to people and expecting them to “do the right thing.” Injury prevention literature offers many methods for organizing and designing prevention efforts. One way is to focus on the “three Es” of injury prevention: *education* to persuade and promote behavior change; *engineering* and environmental modifications to create safer products and surroundings; and *enforcement* of laws and requirements. Another approach, based on the Haddon Matrix, calls for designing strategies using the interactions between the three phases of injury—pre-injury, injury and post-injury—and the four factors: the individual, the injury agent, the physical environment and the cultural environment.² Recent modifications to the Haddon Matrix approach have made it even more useful to prevention efforts.^{9,10} The Spectrum of Prevention method emphasizes the need to focus on all of the following areas: educating individuals, providers and communities; fostering coalitions, changing organizational practices, and influencing policy and legislation.¹¹ Finally, health education and behavioral change models such as the Stages of Change, Health Belief Model, and the PRECEDE–PROCEED planning model can help direct prevention efforts.¹²

The common thread in all these approaches is developing a comprehensive, multi-faceted strategy. Education focused solely on increasing knowledge will have limited effectiveness. It is important to move to the next step—working to develop prevention skills and addressing behavioral factors that act as barriers to prevention. Education should also be combined with incentives, broad community participation, development and enforcement of laws and policies, availability and distribution of safety products, and modifications to the home and environment.

Prevention programs are beginning to use structured evaluations to determine which strategies and techniques work best. The concept of “Best Practices” means choosing programs and interventions that are known to be effective based on research and evaluation. Reviews of evidence-based strategies are now available from a number of sources.^{13,14,15} While a comprehensive approach to injury prevention is in its infancy, there are many opportunities to examine past successes and failures, and to design and implement programs that can reduce injuries.

The Colorado Injury Prevention Strategic Plan

Background and Planning Process

In 2001, the State Emergency Medical and Trauma Services Advisory Council (SEMTAC) formed a partnership with the Colorado Department of Public Health and Environment (CDPHE) aimed at enhancing the state’s capacity to prevent injury. To support this effort, a four-year grant was obtained from the national Centers for Disease Control and Prevention. SEMTAC, together with CDPHE’s Injury Prevention and Injury Epidemiology Programs and its Office of Suicide Prevention, were designated as key partners in this capacity-building initiative. One of the initiative’s most important goals is to produce a statewide, strategic injury prevention plan.

The partnering organizations began by defining the purpose of the plan, determining the target audience, and outlining a set of broad goals. These three components, which formed the foundation for the plan, are described in detail in the following sections. To further guide the planning process, the partners created an Injury Prevention Advisory Committee (IPAC) of the SEMTAC. This group was charged with prioritizing the types of injuries

on which the plan would be focused, and with developing recommendations for strategies and action steps for each priority area of focus. As they began the process of designing their recommendations, IPAC members recognized that there were some general issues which needed to be addressed, but did not fit easily within the three priority areas of focus that had been selected. Therefore, in addition to recommendations specific to each priority area of focus, the IPAC also developed a set of overarching goals and recommendations for the statewide Injury Prevention Plan.

Purpose

The purpose of the *Colorado Injury Prevention Strategic Plan, 2003–8* is *to serve as a blueprint to guide Colorado's injury prevention activities over the next five years*. The plan is meant to provide a comprehensive framework for injury prevention efforts at both the state and local levels, focusing on broad, system-level initiatives that address the priority needs of all Colorado citizens. The recommendations should offer direction and support for more focused injury prevention activities that respond to local priorities or are targeted toward specific sub-populations in Colorado.

Target Audience

The collaborating organizations have also identified a target audience for the plan, which includes:

- hospital trauma center professionals—from the 63 state designated trauma hospitals;
- emergency medical service (EMS) professionals—over 12,000 certified emergency medical technicians, and EMS agencies throughout the state;
- state and local public health staff—including CDPHE, 15 organized county health departments, and 39 public health nursing services;
- Regional Emergency and Trauma Advisory Councils (RETACs)—the state's eleven RETACS (see Appendix Five) coordinate emergency medical and trauma service systems and include representation from EMS, hospitals, law enforcement and health agencies.

These target groups have been selected because they have historically been closely involved with CDPHE and other state and community agencies in planning, developing and implementing injury prevention activities. In addition, the groups represent a sphere of influence associated with the planning partners. As a result, members of these target groups are likely to be responsive to the plan's recommendations, and capable of designing and carrying out initiatives to improve Colorado's injury prevention system.

Overall Goals

Finally, the planning partners developed broad goal areas for the statewide plan based upon recommendations from the State and Territorial Injury Prevention Directors' Association.¹⁶ The plan's goals, which mirror the interrelated components of Injury Prevention described previously, are organized in the following five areas:

GOAL 1—INFORMATION: Improve and maintain injury data collection and dissemination to focus prevention efforts.

GOAL 2—BEST PRACTICES: Promote the use of injury prevention guidelines and evaluation measures that are based upon current, evidence-based research and literature.

GOAL 3—COORDINATION AND COLLABORATION: Coordinate and link emergency medical services, trauma care, and public health agencies with other injury prevention programs at the national, state, and local levels to increase collaboration and maximize use of resources.

GOAL 4—HUMAN RESOURCES: Develop leadership and infrastructure to identify, promote, and respond to injury prevention needs at the state and local level.

GOAL 5—PUBLIC POLICY: Strengthen state and local legislation and policies that lead to the prevention of injuries.

Priority Areas

Recognizing that a strategic planning effort cannot solve all of the state's injury prevention issues, the collaborators directed the IPAC to focus its recommendations by prioritizing the types of injuries to be addressed in the five-year plan. In order to select the injuries that present the greatest needs and offer the largest opportunities, the IPAC examined data from the *Injury in Colorado*⁵ report, which had been developed by the CDPHE Injury Epidemiology program in 2002. Based on the data from the report, illustrated in Figures 3 and 4, the IPAC determined that the plan should concentrate on the three types of injuries identified as the leading causes of death and hospitalizations to Coloradans:

- Motor vehicle injuries,
- Falls, and
- Suicide.

Although other types of injuries, such as poisoning and homicide, are more prevalent in certain age groups or other sub-populations, the report shows that the three priority injury types are most prevalent overall. Selection of these areas of focus for the statewide strategic plan is not meant to constrain prevention activities targeted at other injuries or age groups. Rather, the recommendations are meant to provide a broad framework, encompassing and supporting all prevention activities.

Next Steps

The success of any strategic plan is dependent upon the actions and products that result from it. To begin the next phase of this initiative, the Injury Prevention Advisory Committee selected the highest priority recommendations in this document that are best implemented by SEMTAC committees. In April 2003, IPAC leadership presented the Injury Prevention Strategic Plan to the SEMTAC, which endorsed the plan and assigned the priority recommendations to committees for consideration and action.

The next step is for IPAC to select a similar set of priority recommendations that are best carried out by the IPAC membership. After this prioritization process is completed, IPAC will develop work groups based on the three leading injury areas (motor vehicle traffic, falls and suicide). The work groups will address the IPAC priority recommendations for each area by developing and implementing action plans and evaluation measures to chart the progress of their activities. The Colorado Department of Public Health and Environment will provide ongoing technical support for the injury prevention efforts of both SEMTAC and IPAC.

The *Colorado Injury Prevention Strategic Plan* can only be effective if agencies and individuals choose to adopt and act upon the recommendations. While there are no specific mandates for injury prevention within trauma centers, emergency medical services or public health under Colorado statutes, the data continue to show that it makes good common sense for these groups to take the lead in implementing the plan.

Figure 3: Five leading causes of injury hospitalizations: CO residents, 1999–2001

| | | |
|---|-----------------------|--------|
| 1 | Fall | 37,081 |
| 2 | Motor vehicle traffic | 13,304 |
| 3 | Suicide attempts | 7,371 |
| 4 | Assault | 3,613 |
| 5 | Poisoning | 3,288 |

Figure 4: Five leading causes of injury deaths: CO residents, 1999–2001

| | | |
|---|----------------------------|-------|
| 1 | Motor vehicle traffic | 1,947 |
| 2 | Suicide | 1,896 |
| 3 | Fall | 757 |
| 4 | Poisoning | 733 |
| 5 | Other unintentional injury | 619 |

Partners in injury prevention must be given the tools, resources, and training necessary to identify significant injury issues in their communities and to develop effective prevention strategies. The CDPHE Injury Prevention and Injury Epidemiology Programs maintain a commitment to injury prevention professionals, and to the public, to educate, promote injury prevention, and research effective strategies to reduce injuries in Colorado.

Contents of This Document

This document comprises the *Colorado Injury Prevention Strategic Plan* for the years 2003 through 2008. Following this introductory chapter, Chapter Two lists overall goals, strategies and recommendations, which are designed to provide a foundation for the plan. Three additional chapters contain detailed plans specific to the three priority injury areas: motor vehicle injuries, falls, and suicide. Each of these chapters includes the following sections: Injury Overview, Facts and Trends, Economic Costs, Special Issues, Best Practices, Barriers and Challenges, Recommendations, Resources and References.

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Chapter Two: General Recommendations

Overview

As the Injury Prevention Advisory Committee and staff from the Injury Prevention Programs developed this plan, it became apparent that there were overarching issues that did not fit within specific injury areas. The general recommendations listed below were developed to address broad-based data collection and surveillance concerns, programmatic and evaluation measures, coordination, leadership, and policy development.

Injury Surveillance

Injury surveillance is the development of systems to track and monitor the number, rates, causes, and circumstances of fatal and non-fatal injuries. At the Colorado Department of Public Health and Environment (CDPHE), the Injury Epidemiology Program is primarily responsible for these data systems. This program maintains and manages the Traumatic Brain Injury Surveillance System, and the Colorado Trauma Registry, which includes data from death certificates, hospital discharge data from the Colorado Health and Hospital Association, and case abstracts from Level I, II, and III trauma centers. Injury data are also available at CDPHE through the Vital Statistics Unit, the Colorado Child Fatality Review Committee, the Behavioral Risk Factor Surveillance System, and the Youth Risk Behavior Survey.

Additional injury data systems are being developed or considered in Colorado. The Pre-Hospital Care Program at CDPHE is working with pre-hospital care providers and transport agencies to develop a pre-hospital data collection system. Colorado also has the opportunity to develop statewide systems that can be linked to several national data systems. The federal Centers for Disease Control and Prevention (CDC) has taken the lead in developing guidelines for the development of the National Violent Death Reporting System. (www.cdc.gov/ncipc/dvp/dvp.htm or www.hsph.harvard.edu/hicrc/nviss/index.htm) and the Data Elements for Emergency Department Systems (www.cdc.gov/ncipc/pub-res/deedspage.htm). Guidelines for creating the National Trauma Data Bank have been developed by the American College of Surgeons (www.facs.org/dept/trauma/ntdb.html).

Surveillance must be followed with timely dissemination of information. The Injury Epidemiology Program, Injury Prevention Program, and Office of Suicide Prevention at CDPHE have addressed this requirement by producing the *Injury in Colorado* report, several additional brief reports, and other publications.

Injury Program Development

Injury programs can be implemented at the local, state, or even the federal level. The most effective programs are often created at the local level, where a multi-faceted, evidence-based program can be developed and evaluated to meet local needs. However, effective prevention requires coordination at all levels of government, as well as collaboration with many types of agencies and organizations.

These recommendations are aimed at developing a broad framework for all state and local prevention activities. They will serve as the foundational building blocks for the more specific recommendations found within the issue areas related to motor vehicle injury, falls, and suicide. They are also meant to encompass and provide support for state and local injury prevention activities focused on other types of injuries, specific age groups, and other target populations.

GOAL 1: Improve and maintain injury data collection and dissemination to focus prevention efforts.

- a. Continue to develop and maintain a statewide pre-hospital data collection system and the statewide trauma registry in Colorado.
- b. Support the development of a statewide emergency department surveillance system that utilizes the Center for Disease Control and Prevention's Data Elements for Emergency Department Systems. (www.cdc.gov/ncipc/pub-res/deedspage.htm)

- c. Strengthen the structure and funding for the Colorado Department of Public Health and Environment's (CDPHE) Injury Epidemiology Program to enhance and maintain injury surveillance systems.
- d. Establish and maintain linkages to collect and share injury data among public health agencies, emergency medical services, hospitals, transportation, public safety, and education to target high-risk groups and prevention efforts.
- e. Support the participation of CDPHE's Injury Epidemiology Program in the CDC's National Violent Death Reporting System.
- f. Support the participation of CDPHE's Injury Epidemiology Program in the CDC's National Trauma Data Bank.

GOAL 2: Promote the use of injury prevention guidelines and evaluation measures that are based upon current evidence-based research and literature.

- a. Promote the use of community prevention programs that are multi-faceted, evidence-based, and utilize effective evaluation, by all public health agencies, trauma centers, emergency medical services, and other partners.
- b. Promote injury prevention programs that are responsive to diverse populations, including high-risk groups based upon age, gender, disability, ethnicity/race, geographic region, and socio-economic status.
- c. Promote development and evaluation of new injury prevention programs.
- d. Increase awareness through statewide public education campaigns that injuries are a preventable public health problem and promote strategies for prevention through collaborative community programs.

GOAL 3: Coordinate and link emergency medical services, trauma care, and public health agencies with other injury prevention programs at the national, state and local levels to increase collaboration and maximize the use of resources.

- a. Develop injury prevention funding guidelines for the Emergency Medical Services Provider Grants in collaboration with the Injury Prevention and Injury Epidemiology Programs, Pre-Hospital Care, and SEMTAC, to ensure that newly funded injury prevention programs are multi-faceted, evidence-based and include evaluation measures.
- b. Encourage an increase in public and private funding to support collaborative injury prevention efforts at the state and local level.

GOAL 4: Develop leadership and infrastructure to identify, promote, and respond to injury prevention needs at the state and local level.

- a. Strengthen the structure and funding for the CDPHE's Injury Prevention Program to provide technical assistance, training, coordination of activities, and support to state and local injury prevention efforts.
- b. Increase awareness among trauma centers, emergency medical services, and public health agencies that injuries are a major preventable public health problem, and promote strategies for prevention through participation in collaborative community programs.
- c. Encourage the development and provision of injury prevention training programs for trauma centers, emergency medical services, and public health agencies on data utilization, and program development, implementation, and evaluation.

GOAL 5: Strengthen state and local legislation and policies that lead to the prevention of injuries.

- a. Strengthen the existing Trauma System statute to require injury prevention planning, funding, and program development and implementation for each trauma center and Regional Emergency Trauma Advisory Council.
- b. Provide data, information, and resources to agencies to support injury prevention legislation.

Chapter Three: Motor Vehicle Traffic and Related Non-Traffic Injuries

Overview

The term “motor vehicle injury” generally refers to injuries classified in the motor vehicle traffic category. This includes crashes that occur on public highways and roadways involving motor vehicle occupants and motorcyclists, in addition to incidents in which a bicyclist or pedestrian is injured by a motor vehicle. This chapter has been expanded to include information on injury deaths and hospitalizations involving non-traffic incidents, such as collisions with motor vehicles off the highway in places like parking lots, drive-ways or off-road activities, and other bicycle crashes in which bicyclists fall or hit people or objects. These categories have been added because prevention strategies for motor vehicle traffic and related non-traffic injuries are very similar. In addition, most data systems group these three injury categories together for reporting purposes.

More information on motor vehicle injuries is contained in the *Injury in Colorado* report available at <http://www.cdphe.state.co.us/pp/injepi>.

Facts and Trends: Motor Vehicle Traffic Injuries¹

Motor vehicle traffic-related injury is the leading cause of injury death for Coloradans ages 1–34 years and the second leading cause for Coloradans ages 35–84 years. Motor vehicle traffic incidents are the second leading cause of injury hospitalization in Colorado. In 2002, 746 Coloradans were killed, and more than 4,500 were hospitalized for injuries sustained in motor vehicle traffic crashes. Motor vehicle traffic-related deaths account for approximately 27 percent of all injury deaths and 45 percent of all unintentional injury deaths in Colorado.

From 1980 to 1988, the rate for motor vehicle traffic-related deaths in Colorado decreased significantly—from 24.5 per 100,000 population in 1980 to 16.2 per 100,000 in 1988. However, from 1988 to 1998, the death rate did not decline despite the passage of additional occupant protection laws and vehicle safety improvements such as air bags.

There are a number of population-based risk factors for motor-vehicle traffic-related injuries, including age, gender, ethnic status, and place of residence. Both death and hospitalization rates are highest for Coloradans ages 15–24 years, and 75 and older. In persons over age 15 years, death and hospitalization rates for motor vehicle traffic-related injuries are significantly higher for males than for females. The overall death rate for males is twice that for females (22.0 per 100,000 vs. 11.2 per 100,000, respectively).

Using ten-year annual averages, the age-adjusted rate for death due to motor vehicle traffic crashes is significantly higher for Hispanics and American Indians than for whites. Rates for Blacks and Asians do not differ significantly from the rate for whites. Finally, Colorado’s rural population, comprised of residents of 52 counties, has significantly higher death and hospitalization rates than those in the state’s 11 metropolitan counties.

High Risk Groups

- Groups at highest risk for motor vehicle traffic injuries include:
 - Young adults ages 15–24 years
 - Adults over age 75 years
 - Males
 - Hispanics and American Indians.
- Alcohol is a factor in over 32% of the fatal crashes in Colorado.
- Riding unrestrained significantly increases the risk of death and injury for both drivers and passengers.
- Rural counties’ motor vehicle death and hospitalization rates are significantly higher than rates for urban and suburban counties.¹
- Per vehicle mile traveled, young drivers and older adults have the highest rates of motor-vehicle fatalities in the US.²

Injury Facts: Motorcyclists, Bicyclists and Pedestrians¹

Motorcycle Injuries

- On average, 20 Coloradans are killed and 618 are hospitalized for injuries sustained in motorcycle crashes each year.
- Eighty-three percent of deaths and 88 percent of hospitalizations for injuries due to motorcycle crashes involve men. In particular, males ages 20–34 years have the highest rate of motorcycle deaths and hospitalizations in Colorado.
- According to the National Highway Traffic Safety Administration, a motorcyclist is approximately 18 times more likely to die in a crash than an automobile occupant, based on rates calculated per vehicle mile traveled.

Bicycle Injuries

- In the U.S., bicycle-related injuries account for approximately 900 deaths, 23,000 hospital admissions, 580,000 emergency department visits, and more than 1.2 million physician visits per year.
- Each year in Colorado, an average of nine bicyclists are killed and 517 are hospitalized for injuries sustained in bicycle crashes. An estimated 30 percent of these incidents result in traumatic brain injuries.
- Most of the hospitalizations for bicycle-related injuries, or 77 percent, result from crashes that do not involve a motor vehicle.
- Males account for 85 percent of the bicyclist deaths and 74 percent of hospitalizations. The male hospitalization rate is almost three times the female rate.
- Children ages 5–14 years have the highest rates of bicycle-related hospitalization and death.³

Pedestrian Injuries

- On average, 83 Coloradans are killed and 486 are hospitalized each year for injuries sustained as pedestrians.
- Pedestrian deaths are the third leading cause of unintentional injury death in Colorado.
- Males account for 70 percent of pedestrian deaths and 64 percent of pedestrian hospitalizations.
- Age groups at highest risk of hospitalization for pedestrian-related injuries include adults ages 75 and older and children ages 5–9 years. Nearly a quarter of the hospitalizations for pedestrian-related injuries involve children ages 0–14 years.

Economic Costs of Motor Vehicle Injuries and Benefits of Prevention

In 2000, the cost of motor vehicle crashes in the United States totaled over \$230 billion. This represents approximately \$820 for every person in the nation, and 2.3 percent of the U.S. Gross Domestic Product. This figure includes medical, emergency services and rehabilitation costs as well as non-medical costs such as productivity losses, property damage, and legal, insurance, and workplace costs. Adjusting the costs for Colorado, the estimated state economic costs due to motor vehicle crashes in 2000 was over \$3.2 million, representing \$762 per person and 2.3 percent of per capita personal income.³

Several studies have looked at the cost benefits of using safety devices that are known to be effective. Some examples of these cost savings include:

- Seat belt use prevents about 11,900 fatalities and 325,000 serious injuries each year in the United States. This saves an estimated \$50 billion in medical care, lost produc-

tivity and other injury-related costs. On the other hand, failure to wear seat belts results in about 9,200 avoidable deaths and 143,000 needless injuries, costing society \$26 billion.³

- From 1994 to 2000, Colorado children ages 5–12 years who were hospitalized with bicycle-related traumatic brain injuries had hospital charges totaling \$4.8 million.⁴ If all Colorado bicycle riders had worn helmets, an estimated 1,568 bicycle-related head injuries could have been prevented in 1997. This represents an estimated \$1.2 million in direct and \$3.5 million in indirect costs.⁵
- For United States children ages 0 to 4 years, every dollar spent on child safety seats saves \$33. This includes \$2 in medical costs, \$6 in future earnings, and \$25 by preventing pain, suffering and lost quality of life.⁶

Special Issues

Although many factors may contribute to motor vehicle injury incidents, the use of alcohol and the non-use of safety devices are major contributing factors. Young and older drivers also have special characteristics that increase their risk of being involved in motor vehicle-related injury incidents.

Alcohol Use

In 1999, 32 percent of fatal crashes in Colorado were alcohol-related. The percent of drivers involved in fatal motor vehicle crashes who had evidence of alcohol use varies by age, with the highest percentage in the 20–34 years age group.¹ In the United States, alcohol was involved in 41 percent of fatal crashes in 2001. Alcohol involvement—for the driver, bicyclist or pedestrian—was reported for 41 percent of all pedestrian fatalities⁷ and 33 percent of all bicycle fatalities.⁸ Sixty-four percent of passengers younger than age 15 years who were killed in drinking driver-related crashes during 1985–1996 were riding in the vehicle with the drinking driver.⁹

Safety Devices

Research has shown that restraints such as lap/shoulder belts for adults, and car seats for children, reduce the rates of fatal and hospitalized injuries. Nationally, an estimated 147,246 adults and 5,085 children were saved by safety belts or child restraints from 1975 to 2001.¹⁰

In 2001, observational seatbelt surveys showed Colorado to be at 72 percent seat belt use.¹¹ The national goal for seat belt use is 78 percent by 2003.¹² Females in Colorado are more likely than males to use seatbelts consistently. Persons ages 18–24 years reported the lower percent seatbelt use at 56 percent.¹³ In a survey of adults, 85 percent reported using a seatbelt or car seat for their children under age 16. Young children ages 0–4 years were much more likely to be reported to be restrained while riding in a car, for a total of 96 percent, than children ages 13–15, for a total of 73 percent. Children living in a household with an adult who always uses a seatbelt are 15.7 times more likely to always use car seats or seatbelts.¹⁴

In addition to seatbelt use, helmets are known to be effective in reducing the risk of head injuries for motorcyclists and bicyclists. National figures estimate that motorcycle helmet use is

Seatbelts, child restraints and helmets save lives¹

- Seat belts are 45–60% effective in preventing fatal injuries. Airbags, combined with lap/shoulder safety belts, offer the most effective safety protection for adults.
- When correctly installed and used, child safety seats reduce the risk of death by up to 71% for infants and 54% for children ages 4 years and younger in passenger cars.
- Children in booster seats (recommended for ages 4–8 years) have 45% fewer major injuries compared to those children in crashes who use seat belts only. Colorado's booster seat law for children ages 4–6 years and less than 55 inches in height goes into effect August 2003.
- A federal study showed that motorcycle helmets are 67% effective in preventing brain injuries.
- A bicycle helmet reduces the risk of serious head injury by as much as 85%, and the risk for brain injury by as much as 88%.

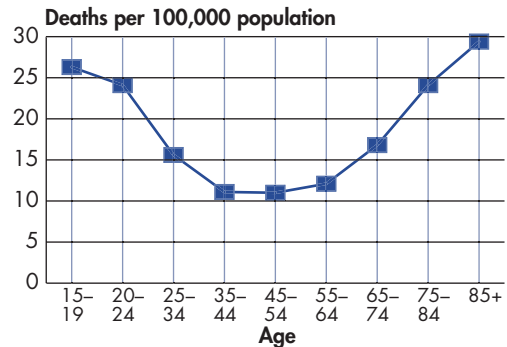
48 percent in 2002 in states without strong helmet laws.¹⁵ Motorcycle helmet use is probably lower in Colorado, one of three states without a helmet law. Bicycle helmet use in Colorado is also low.

Young Drivers

As shown in Figure 5, the 15- to 24-year-old age group has significantly higher fatality and hospitalized injury rates than all age groups except the older drivers. Inexperience with driving and risky behaviors such as non-seat belt use and speeding characterize this population, especially teenage drivers.¹⁶

Colorado's graduated licensing law for 16 to 18 year olds went into effect July 1, 1999, and includes provisions for gaining driving experience with an adult, and limiting night driving. Other state graduated licensing laws include stricter nighttime driving restrictions, increased fines for traffic violations, and limits on the number of passengers.¹⁸

Figure 5: Motor Vehicle Occupant Fatality Rates by age group, CO residents, 1994–1999



Older Adults

Motor vehicle and pedestrian safety is an increasing concern as the national population ages. Older adults are at increased risk for injuries due to declining vision and physical and mental skills, and to physical impairments. In addition, the frailty of older adults contributes to their increased death and injury rates from motor vehicle crashes.^{19,20}

Best Practices: Preventing Motor-Vehicle Traffic Injuries

Motor vehicle prevention activities have a longer history than most other injury prevention efforts. For example, in the United States, seatbelt education started well before the first seatbelt laws were passed in 1984. Motor vehicle traffic injury prevention has successfully combined “the three Es”—education, enforcement and engineering. Recommendations for prevention strategies and best practices are described below.

Overall

Three national organizations—the Task Force on Community Preventive Services, the National Safety Council, and Mothers Against Drunk Driving—have developed recommendations for motor-vehicle prevention strategies based on their reviews of best practices across the nation. Their recommendations emphasize strengthening legislation and increasing enforcement, combined with focused education.

The Task Force on Community Preventive Services, an independent, non-federal public health group, completed an extensive review of evidence-based best practices.²¹ Their recommended strategies for reducing injuries to motor-vehicle occupants all involve legislation and enforcement, sometimes combined with specialized education, such as car seat incentives and distribution, and alcohol server interventions. There was insufficient evidence to recommend car seat education-only programs. For the safety belt and alcohol-impaired driving categories, the task force did not review the strategies of incentives, mass media, and education programs. Reviews of additional interventions will be published as they are completed.^{22,23}

FIGURE 6: INTERVENTIONS AND RECOMMENDATIONS FROM THE TASK FORCE ON COMMUNITY PREVENTIVE SERVICES²¹

| INTERVENTION | RECOMMENDATION |
|--|-----------------------|
| Interventions to Increase the Use of Child Safety Seats | |
| Child safety seat laws | Strongly Recommended |
| Community-wide information + enhanced enforcement campaigns | Recommended |
| Distribution + education programs | Strongly Recommended |
| Incentive + education programs | Recommended |
| Education-only programs | Insufficient Evidence |
| Interventions to Increase the Use of Safety Belts | |
| Safety belt use laws | Strongly Recommended |
| Primary enforcement laws (versus secondary enforcement laws) | Strongly Recommended |
| Enhanced enforcement programs | Strongly Recommended |
| Interventions to Reduce Alcohol-Impaired Driving | |
| 0.08% blood alcohol concentration (BAC) laws | Strongly Recommended |
| Lower BAC laws for young or inexperienced drivers | Recommended |
| Minimum legal drinking age laws | Strongly Recommended |
| Sobriety checkpoints | Strongly Recommended |
| Server intervention programs | Recommended |

The National Safety Council has recommended: enforcement, primary seatbelt laws, booster seat laws for children 4–8 years old, strengthening of penalties, and education programs only if proven effective.²⁴

Mothers Against Drunk Driving (MADD) has developed an eight-point plan to revitalize the fight against drunk driving. Six components of the plan address increased enforcement and enactment of primary seat belt laws, tougher sanctions and underage drinking provisions. The plan's two additional components call for increased public education.²⁵

Other research supports the approach of enhanced laws and strict enforcement, in combination with specific educational campaigns.^{26,27}

Legislation and Enforcement

Most effective prevention strategies include increased legislation and enforcement of traffic laws. Studies have shown the effectiveness of legislation in reducing alcohol related fatalities, young driver injuries, motorcycle and bicycle injuries, and increasing occupant restraint use.^{11, 28, 29, 30}

Results of Motor-Vehicle Legislation

- The implementation of a .08 BAC level state law has been associated with reductions in alcohol-related fatalities in at least 10 studies.²⁸
- The average seat belt use rate in primary enforcement state is 78%. In secondary enforcement states (like Colorado), the average use rate is only 67%.¹¹
- States with motorcycle helmet laws have a reduced incidence of motorcycle deaths and injuries.²⁹
- States with graduated licensing programs have reported 5–26% reduction in crashes in the teenage age group.³⁰

Behavior Change

Motor-vehicle prevention has been one of the first injury prevention fields to examine risk factors and to apply health behavioral change theories and social marketing strategies. Extensive work has been done in the motor-vehicle field to examine specific groups that are at high risk for motor-vehicle fatalities and injuries. Interventions and social marketing strategies can then provide specific messages for each target audience. Some examples are part-time seat belt users, teen drivers, older drivers, Hispanics, Blacks, and people in rural areas.^{31,32,33} Many of the health behavior change theories have been applied to developing and evaluating traffic safety programs.^{33, 34, 35}

Conclusion

Programs developed to reduce motor vehicle injuries should continue an integrative approach, incorporating all types of prevention strategies. Programs that center on education alone are generally not recommended. Effective traffic safety programs should have a strong component of effective legislation and enforcement. Engineering solutions to redesign vehicles and safety features, separate bicyclists and pedestrians from vehicles, and improve roadway and intersection designs are also necessary.

Health agencies and safety advocates can assist in prevention by participating in community coalitions that promote enforcement of existing laws, advocate for stronger traffic safety legislation, develop and implement effective educational strategies, and provide program evaluation. Education may include using social marketing techniques, segmenting the target audience with specific messages, applying health behavior change theories, and developing programs that build specific driving or traffic safety skills.

Best Practices: Prevention Strategies For Bicycle and Other Wheeled Sports Injuries

Bicycling and other wheeled sports, such as in-line skating, skateboarding, scooters, are popular recreational activities in the United States. Nearly 28 million children ages 5–14 ride bikes, and the popularity of other wheeled sports has skyrocketed.³⁶ Adults are also involved in these recreational pursuits.

Wheeled recreational activities provide many health and recreational benefits, but also

carry the risk of injury. Head injuries account for 22 to 47 percent of injuries to bicyclists, and are responsible for over 60 percent of all bicycle-related deaths.³⁷ An estimated 30 percent of the Coloradans hospitalized for injuries from a bicycle crash have a traumatic brain injury.¹ These injuries can be reduced through the use of helmets. However, bicycle helmet use is still relatively low nationally and in Colorado. The limited data for other wheeled sports shows that helmet use is not higher than bicycle helmet use.^{38,39}

Many bicycle helmet, bicycle safety, and wheeled sports injury prevention programs and strategies have been developed. Few programs have been thoroughly evaluated to determine which strategies actually lead to increased helmet use. It is not enough to measure effectiveness by looking at changes in knowledge about brain injury or bicycle safety, helmet ownership, or self-reported helmet use. The generally accepted “gold standard” for evaluating helmet use is a well planned and executed observational survey.⁴³

Figure 7: Bicycle Helmet Use Data for Colorado and the US

| Location/Date | Helmet Use |
|--|------------|
| CO, ages 5–14 years (1999) ¹⁴ | 40% |
| CO, ages 18+ years (1998) ⁴⁰ | 37% |
| Obs. Surveys in 3 CO towns, ages 5–12 years (2000) ⁴¹ | 0–35% |
| US, ages 4–14 years (1994) ⁴² | 25% |



Bicycle helmet laws are quite effective, especially if combined with educational efforts and the support of law enforcement agencies.^{39,43,44} A review of the literature of health behavior change shows that safety messages about the risk of injury are not sufficient to convince children or adults to wear helmets. Helmet use may be increased by promoting the social norm of helmet use by everyone, establishing family helmet rules, and addressing the barriers of cost, “coolness” factor, and comfort.³⁹

As with other injury prevention efforts, single interventions are unlikely to lead to an increase in bicycle helmet use. A successful bicycle safety community education campaign should include the following combination of strategies: formation of a community coalition; public awareness media campaign; coordination with other school and community groups; counseling by medical professionals to use bicycle helmets; school and community interventions; distribution of low-cost, discount, or free helmets; policies requiring helmet use for schools, recreation facilities, and other programs; and evaluation of helmet use. Other prevention strategies may include: promoting bicycle helmet laws; encouraging development of separate bike trails and lanes and pedestrian paths; and collaborating with community groups that promote safe bicycling and walking for physical fitness.

Best Practices: Prevention Strategies For Pedestrian Injuries

The mainstay of pedestrian education is often seen as teaching children how to cross the street safely. However, community pedestrian safety should focus more broadly on solutions for all age groups and include enforcement and engineering strategies.

For many reasons, reducing pedestrian injuries and deaths in children is not a simple job. First, street crossing is a difficult skill to master, with as many as 26 tasks needed to negotiate traffic safely.⁴⁵ Experts say that children under the age of 10 years are not ready to cross streets alone.⁴⁶ A successful child pedestrian safety program in New York City stressed teaching children the tools for being safe pedestrians, and emphasizing problem solving while recognizing children’s cognitive limitations.⁴⁷ A review of community pedestrian safety programs showed that some programs can lead to increased knowledge, and a few

programs have documented behavior change in street crossing skills. Education programs have been demonstrated to be more successful if multiple educational and skill building methods are used; parents are included as teachers; and engineering, regulations and enforcement strategies are included.^{35,45}

Pedestrian injuries in the elderly population generally result from limited vision and walking skills, combined with inattention by drivers. Communities will need to examine the transportation needs of older adults, as well as engineering solutions to create safe walking and street crossing routes, education of both pedestrians and drivers, and enforcement of existing traffic laws.²⁰

A successful community pedestrian safety program would include education on safe driving behavior when pedestrians are present; identifying injury hot zones and targeting specific age groups; training programs to improve child pedestrian crossing skills that recognize children's cognitive limitations; increased enforcement of speed limit and other traffic laws; collaborative efforts with community traffic engineers and citizens to improve traffic devices, including traffic calming, improved signal timing and crosswalk markings; and the development of safe walking environments in the community.

Traffic safety prevention programs in Colorado.⁴⁹

Based on information gathered through the CDPHE survey of hospital trauma programs, EMS providers, and local health departments, most injury prevention programs focus on the promotion of bicycle helmet and car seat use. Some are focused on seatbelt education and alcohol impaired driving. There are few programs directly addressing teen and young drivers and older adult drivers.

Barriers And Challenges

- Most data sources identify “motor vehicle traffic” incidents. This category consists of crashes occurring on public highways and roadways, and includes injuries to motor vehicle occupants, motorcyclists, and bicyclists or pedestrians involved in incidents with motor vehicles. Depending on the project, it may be important to look at only motor vehicle occupant data, or to include non-traffic motor-vehicle data and bicycle crashes that do not involve motor-vehicles.
- Bicycle helmet safety programs should be combined with other wheeled sports. However, most medical record data do not contain specific information on scooter, skateboard and in-line skating injuries.
- Public health agencies and coalitions have traditionally not been heavily involved with legislative and enforcement prevention strategies.
- Most motor vehicle injury prevention programs concentrate on children, especially car seat education and bicycle helmet promotion. There are few programs focused on other high risk groups, including young drivers and older adults.

Recommendations

GOAL 1: Improve and maintain data collection and dissemination to focus injury prevention efforts.

- a. Develop data linkage between the electronic Traffic Accident Report system, maintained by the Colorado Department of Revenue, and the CDPHE Trauma Registry system.

- b. Encourage improvements in data collection systems for medical records and emergency medical services trip reports to provide more details on alcohol, drugs, restraint use, and other contributing factors for motor-vehicle traffic-related injuries.
- c. Improve the details on death certificates for motor-vehicle injuries regarding alcohol, drugs, restraint use, and other contributing factors.

GOAL 2: Establish guidelines and evaluation measures for injury prevention programs that are based on current evidence-based research and literature.

- a. Promote state and local motor vehicle injury prevention efforts that include a combination of: enforcement of existing laws; advocacy to strengthen traffic safety laws; and public education activities that support enforcement efforts and address barriers to restraint use.
- b. Promote effective motor vehicle, bicycle, and pedestrian injury prevention programs that are multi-faceted, evidence-based, culturally competent, and include an evaluation component.
- c. Promote motor vehicle injury prevention programs that target the high-risk groups identified through data.

GOAL 3: Coordinate and link emergency medical services, trauma care, and public health agencies with other injury prevention programs at the state and local levels to increase collaboration and maximize the use of resources.

- a. Promote participation by all emergency medical services, trauma centers, and public health agencies in community-based traffic safety efforts.
- b. Promote the collaboration of traffic safety programs with community agencies to include physical activity promotion, safe school and community walking and bicycling programs, and older adult driving concerns.

GOAL 4: Develop leadership to identify and respond to injury prevention needs to initiate policy changes, provide technical assistance, training and support to injury prevention efforts at the state and local level.

- a. Expand the role of the Colorado Department of Transportation to collaborate with and fund local, regional, and statewide programs.
- b. Establish the CDPHE Injury Prevention Program as one of the statewide resources for program development, implementation, evaluation, and training on the issues of motor vehicle safety, bicycling and other wheeled sports, and pedestrian safety.

GOAL 5: Strengthen state and local legislation and policies that lead to the prevention of injuries.

- a. Advocate for the strengthening of Colorado's safety belt use law to a primary enforcement law for all seating positions and all ages.
- b. Advocate for state legislation that requires mandatory motorcycle helmet use for all ages.
- c. Advocate for the strengthening of Colorado's graduated licensing laws.
- d. Advocate for state legislation for 0.08 percent blood alcohol concentration as the standard for impaired driving.
- e. Advocate for the passage of local and statewide helmet laws for bicycling and other wheel-related sports.

- f. Encourage increased enforcement of existing traffic laws by all law enforcement agencies.
- g. Support stronger state and local penalties for non-compliance with traffic laws.
- h. Encourage hospital policies to require appropriate child passenger safety restraint education and use for all children discharged from the hospital.
- i. Encourage policies for pre-hospital transport agencies to provide appropriate restraint systems for transporting all patients and passengers.
- j. Encourage mandatory employee seatbelt policies for all trauma centers, emergency medical services, and public health agencies.
- k. Encourage state and local agencies to examine requirements for license renewal and driving restrictions based on age, medical conditions, and other criteria.

Resources

- The Injury Prevention Program at the Colorado Department of Public Health and Environment at www.cdphe.state.co.us/pp/injury_prevention/
- Centers for Disease Control and Prevention, National Center for Injury Prevention and Control at www.cdc.gov/ncipc
- Colorado Child Passenger Safety Program at 1-877-LUV-TOTS and www.carseats.colorado.com
- Task Force on Community Preventive Services at www.thecommunityguide.org
- Safe USA at www.cdc.gov/safeusa
- National SAFE KIDS Campaign at www.safekids.org
- National Highway Traffic Safety Administration at www.nhtsa.dot.gov/people/injury
- National Safety Council at www.nsc.org
- AAA Foundation for Traffic Safety at www.aaafoundation.org
- Who's Who in Traffic Safety at www.edc.org/HHD/csn/buildbridges/whoswho
- Risk Watch at www.riskwatch.org

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Chapter Four: Falls

Overview

The “falls” category includes falls on stairs or steps; from ladders; out of buildings; into holes; from one level to another such as from playground equipment, cliffs, or furniture; and falls on level ground as a result of slipping, tripping, or pushing. Also included are sports injuries involving falls due to slipping, tripping, or pushing; and collisions due to pushing or shoving by another person. This category does not include falls from bicycles, but does include falls while using recreational equipment such as scooters, in-line skates, or skateboards, or while participating in such activities as skiing or snowboarding.

Facts and Trends: Falls¹

Falls are the leading cause of injury hospitalization and the third leading cause of injury death in Colorado. Annually, about 273 Coloradans die as the result of falls. Each year approximately 12,000 Colorado residents are hospitalized for fall-related injuries, accounting for 44 percent of all injury hospitalizations.

Nationally, falls are the leading cause of injury death for people ages 65 years and older and the leading cause of nonfatal unintentional injury and emergency department visits for children ages 0–14 years.

In Colorado, the death rate from unintentional falls has remained relatively stable from 1980 to 1998 at 8 to 10 deaths per 100,000 population. Little progress has been made in reducing the death rate from fall-related injuries. Colorado is among a block of states in the West and upper Midwest with age-adjusted, fall-related death rates that are significantly above the U.S. rate of 4.7 per 100,000 population.

Fall-related death rates vary by both age and gender. For individuals ages 15 and older, males are more likely than females to die from falls. Fall-related death rates increase with age but remain relatively low until age 65. The death rate for Coloradans ages 65–74 is triple the rate for those ages 55–64, and the death rate for those ages 85 and older is 85 times the rate for 55–64 year olds. Coloradans ages 65 and older experience 79 percent of all fall-related deaths. Falls are the leading cause of injury death among Coloradans ages 65 and older.

Hospitalizations are also highest in the oldest age groups, with more than 7,200 Coloradans ages 65 and older hospitalized for fall-related injuries each year. For persons under age 55, males are hospitalized for falls at higher rates than females. After age 64, fall-related hospitalization rates for females surpass the rates for males.

Deaths due to falls also appear to vary by race/ethnicity. The age-adjusted death rate for falls is significantly higher for whites and Hispanics than for Blacks.

Of particular concern is the large number of people who do not return directly to their homes after hospitalization for injuries sustained in falls. Only 47 percent of individuals are discharged directly to home after hospitalization for fall-related injuries. For all other unintentional injuries, 70 to 80 percent are able to return directly to home.

For the years 1999 to 2001, three Colorado counties had fall death rates that were higher than the state rate—Boulder, Denver and Fremont. There was no significant difference in the fall hospitalization rates for the metropolitan and rural regions of the state.

More information on fall injuries is contained in the *Injury in Colorado* report available at <http://www.cdph.state.co.us/pp/injepi>.

High Risk Groups¹

- Males (0–54 years)
- White
- 65+ years old (female for hospitalizations, male for deaths)

Economic Costs of Fall Injuries

Fall injuries are costly due to the impact of fall-related deaths and hospitalizations in older adults, and the hospitalization costs for children. It is estimated that a fall costs \$4,200 per injured child ages 0 to 19 years in the United States. Other types of injuries cost more per injury, but the frequency of falls in children means that falls have the highest total cost of any unintentional childhood injury.²

Among older adults, falls, especially those resulting in hip fractures, are also quite costly. Each year, hospitalization charges for older Coloradans' fall-related injuries total more than \$132 million, with an average hospitalization charge of over \$15,000. A 1997 national study found that the cost of a hip fracture, including direct medical care, formal non-medical care, and informal care provided by family and friends, averaged between \$16,300 and \$18,700 for the first year following the injury.³

Special Issues

Older Adults

Adults over age 65 in Colorado and throughout the nation bear a disproportionate burden of fall injuries. In Colorado, 73 percent of the fall-related deaths and 62 percent of the fall-related hospitalizations involve older adults. Falls are the leading cause of injury death and hospitalization for older Coloradans.³

Many fall-related injuries involve serious health consequences and bring significant losses of mobility and independence for older adults. Among older adults in Colorado who died from their injuries, nearly 40 percent sustained a traumatic brain injury and 38 percent suffered a hip/femur fracture.

Fall hospitalizations for older adults (65+ years)³

- Same level, slipping/tripping/ stumbling (36%)
- Falls from stairs or steps (6%)
- Falls from beds or other furniture (6%)
- Unspecified falls (48%)

Nearly half, or 43 percent, of older Coloradans who are hospitalized for fall-related injuries have hip/femur fractures. Of about 3,300 older adults hospitalized each year for hip/femur fractures sustained in a fall, nearly 75 percent are women. Osteoporosis in this population is a significant risk factor.³

There are many factors that contribute to falls in older adults. The natural physiologic changes that are part of the aging process can be major contributors. These may include decreases in vision, strength, cognition, balance and flexibility. In addition, there may be chronic health problems, specific physical and functional impairments, alcohol and medication use, and home environmental hazards.⁴ It is impor-

tant to remember, however, that poor health is not an inevitable consequence of aging.⁵ About 45 percent of older Coloradans list their health as excellent or very good.⁶ Healthy lifestyles can help reduce falls, injury rates, and the consequences of injury.⁵

Fall-related injuries can lead to changes in functional independence. Of the older adults in Colorado who were hospitalized after a fall in their homes, only 27 percent were discharged directly back to their homes. The majority, 53 percent, required ongoing care in a skilled nursing facility, while 15 percent were treated in an intermediate care facility. National studies have shown that half of all older adults hospitalized for hip fractures cannot return home or live independently after their injuries.³

Childhood Falls

In Colorado, falls are the leading cause of injury-related hospitalizations for children ages 14 years and younger. Falls account for 30 percent of the injury-related hospitalizations for children under the age of one, 33 percent for ages 1–4 years, 35 percent for ages 5–9, and 23 percent for ages 10–14.²

Nationally, falls are the leading cause of non-fatal unintentional injuries and emergency department visits for children ages 0–14 years. Each year, more than 2.5 million children ages 14 years and under are treated in hospital emergency rooms for fall-related injuries.⁷

The types of falls resulting in hospitalization mirror the developmental stages and activities of growing children. In Colorado, infants are at greatest risk for falls from beds and other furniture and falls on stairs. Falls on stairs often involve an adult falling while carrying the child. Toddlers ages 1–4 years experience falls from beds and other furniture, from buildings, and from playground equipment. Falls resulting in hospitalizations for older children ages 5–14 years are most often due to slipping, tripping, or stumbling. These injuries often occur in sports or recreational activities and playground injuries.¹

An average of 95 Coloradans are hospitalized each year for injuries due to falls from playground equipment. The vast majority, or 91 percent, are children ages 1–14 years. Over half, or 52 percent, of these hospitalizations involve children ages 5–9 years.¹ Nationwide, each year more than 200,000 children ages 14 and younger are treated in U.S. hospital emergency departments for playground falls. Most of these injuries involved public equipment in schools and parks, and are associated with climbing equipment, slides, and swings.⁸ Home playground equipment also poses risks of injury to children, including hangings from ropes and cords, and injuries from intentional jumping or dismounting from equipment.⁹

Location of the Fall

Almost 40 percent of fatal falls in Colorado occur in the home, 17 percent occur in residential institutions, including nursing homes, and four percent in public buildings. Only two percent occur in recreational settings. Information on where the fall occurred is not available for nearly 30 percent of fatal falls.¹

Best Practices: Prevention Strategies for Childhood Falls

Because falls happen to children in many different ways, it is difficult to develop a plan to impact all childhood falls. In fact, how an injury happened is not specified in the medical record for 42 percent of the hospitalized childhood falls in Colorado.¹ However, there are known strategies available that can reduce some types of falls. A combination of strategies, targeted for specific age groups and activities, could be effective in reducing childhood injury and death.

Playground Safety

While playground falls do not constitute a large number of fall deaths and hospitalizations, this is an area where prevention solutions are available. The National Program for Playground Safety is a leader in developing and publicizing important strategies. An effective community or school playground safety program would include: assessing the equipment and surfaces used in school, community, and home playgrounds; encouraging and



Figure 8: Fall Hospitalizations in Children¹
(Common Causes by Age Groups)

| Infants | 1–4 Years | 5–14 Years |
|---------------------|--------------------------------------|---------------------------------|
| Furniture Stairs | Furniture Buildings Playground | Slip/Trip/Stumble Playground |

assisting in modifying playgrounds; ensuring that playground equipment meets the guidelines of the Consumer Product Safety Commission; and encouraging children to play on age-appropriate equipment and to use it properly. Programs can be developed that encourage children and parents to be involved in the assessment and modifications of playground equipment. Many of the effective solutions involve redesigning equipment to make it safer, but education of parents, children, and school and recreation staff is also important.^{10,11}

Reducing Childhood Falls in Homes

An important first step in reducing childhood falls in the home is to ensure that unsafe products are not used, and that proper safety equipment is utilized. The most effective prevention strategies are legislation, voluntary standards, and recalls of unsafe nursery, home and recreation products.¹² While it is known that safety practices in the home, such as window bars, stair gates, and the elimination of infant walkers are effective,^{7,13} it has been difficult to design, implement, and evaluate educational strategies that lead to significant changes in injury rates. Programs to provide home safety checklists, counsel parents, and provide safety equipment have led to some changes in safety practices and some evidence of injury rate change.^{14,15,16} Likewise, programs promoting the use of safety equipment such as helmets, wrist guards, and recreational equipment modifications have met with some success.^{17,18}

Education and Supervision

Supervision of children is a critical issue in the prevention of falls. This includes ensuring that appropriate safety equipment is used; supervising children at home, school and recreational playgrounds; and teaching children to play sports safely. Parents often overestimate the ability of their children to make appropriate safety decisions.¹⁹ Schools, health departments, health care providers, and community programs can educate parents about injury risks and prevention measures, as well as parenting skills such as supervision, rule-setting, and enforcement of safety rules.^{20,21} Caregivers, school and recreation staff also need training in how to provide proper recreational supervision and lead sports activities.^{21,22}

School-based education is an excellent way to reach the majority of students. Comprehensive curricula have been developed which can lead to an increase in students' knowledge about safe behavior and teach safety skills. Schools can include developmentally appropriate instruction on injury prevention within comprehensive health education programs.²¹

Combined Strategies

Effective falls prevention programs should include a combination of strategies, including formation of community coalitions; public awareness media campaigns; counseling by medical professionals; variety of school and community interventions; environmental improvements of equipment; distribution of low-cost, discount, or free safety equipment; policies requiring safety equipment for schools, recreation facilities, and other programs; and program evaluation.

Prevention Strategies for Falls in Older Adults

This strategic plan will address fall prevention for older adults living independently; fall prevention for older adults in residential care facilities is handled separately by other national and state agencies. There is great diversity in the physical and mental capabilities of older adults who live independently.²³ The following groups have been identified as having the highest risk factors for falls: those over age 79; those who have presented at

an emergency department or been hospitalized for a fall; those identified by health professionals as having deficits in strength, balance, or range of motion; and those with osteoporosis and other conditions such as diabetes and arthritis.^{4,24}

Significance of fall hospitalizations for Coloradans over age 64³

- 7,752 older Coloradans are hospitalized for falls each year.
- 43% of the falls are due to hip/femur fractures.
- Average length of hospital stay for a fall injury was 4.7 days. Of those injured at home, 27% go back home and 68% are discharged to a skilled nursing home or intermediate care.
- Average hospitalization charge is \$15,073.
- 65% of falls happen in the home; 30% to residents/visitors in nursing homes.

Community education

Community education programs for the general population can lead to an increase in awareness and knowledge, but there is no evidence that education alone leads to reductions in falls.^{4,24,25} Education, used in conjunction with other strategies, can be an effective tool to increase community awareness and provide older adults with prevention actions.^{24,25}

Exercise

Physical activity is a key element in promoting healthy aging and the reduction of many health conditions.⁵ Exercise programs, especially those incorporating balance training, have been shown to be effective in some, but not all, studies in reducing falls in older adults.^{4,22,25,26,27,28} Generally the value of exercise is seen in programs for selected high-risk populations such as those who have presented to a hospital emergency room after a fall,²⁹ those over 79 years old,²⁷ those with osteoporosis,³⁰ or those with identified physical deficiencies in strength and balance.²⁸ The most effective programs seem to be ones where a health professional, such as a nurse or physical therapist, provides a combination of individual home exercises and a group or class program to improve strength, balance and coordination.^{28, 33, 34, 35}

Most review articles report that stand-alone exercise programs for the general population do not show a significant reduction in the number of falls.^{4,24,28} However, there is some evidence that a modified Tai Chi exercise program for community-dwelling older adults, or other programs stressing balance and strength, have proven to be effective.^{24,25,28} A 2002 Australian review article recommends that a weekly exercise program focusing on balance, plus exercises at home, be more widely implemented for persons aged 70 years and older living at home and in good health.²⁶

Environmental modifications

Many falls are the result of slips, trips and falls in and around the home. It makes sense to consider home safety modifications such as eliminating rugs, installing grab bars, improving lighting, and reducing clutter. However, home assessments that only identify hazards or distribute checklists are not likely to reduce falls.^{4,32} Some, but not all, programs focused on removing or modifying home hazards have led to significant reductions in falls or fall-related injuries.^{4,24,25,26,34} In some cases, the programs have been successful in removing or decreasing the hazards, but have not reduced falls. The authors of a randomized control study suggest that the major challenges are gaining the commitment from the older adults to reduce or improve all home hazards, and the development of

Falls safety prevention programs in Colorado⁴⁰

- Falls are not perceived by the health community as a major injury problem. In a CDPHE survey, 80% of hospitals, 20% of health agencies, and 45% of EMS providers said falls were a substantial to major injury problem.
- Currently, there are few fall prevention programs. From the CDPHE survey, there are 14 programs on balance and home modifications, twelve programs in elderly fall education, and 5 childhood fall prevention programs.



effective and practical solutions to all home hazards.³⁴ In addition, 50–66 percent of falls may occur outdoors, and there are fewer effective modifications for outdoor hazards.²⁵ Home hazard assessment and modification may be more effective in older people at high risk of falling, with limited effectiveness for the general older population.^{4,24,25,31}

Individual risk assessment

Home visits, which include environmental assessment as well as individual assessment of fall risk factors, have generally proven successful in reducing falls.^{22,25,28,33} These programs assess an older adult's physical and medical condition, as well as home hazards, and may include referral to medical attention, environmental modifications, and individual exercise programs. Home visitation programs seem to be most effective when performed by trained health professionals, include more than one follow-up visit, and target older adults with multiple risk factors.^{25,28,31,35} In particular, reductions in medications taken, withdrawal of psychotropic medication, and proper treatment of hypotension are recommended strategies.^{4,28,35}

Multifaceted Strategies

The difficulty with evaluating multifaceted programs is determining the components that are the most effective.^{4,25,28,32} A recent article that studied the effectiveness of different interventions found that the largest component of fall reduction came from improved balance due to exercise, with further reductions by home hazard management and vision management.²⁶

Most review articles recommend individual risk assessment and targeted intervention strategies.^{4,22,25,28} This should include environmental assessment and home modifications, medical and vision assessment and referrals to health care professionals, medication assessment, individualized physical assessment and exercise program, and client education.^{4,26,28}

Other programs

Some fall prevention programs target specific health consequences of osteoporosis by promoting drug therapies to improve bone strength, and vitamin D and calcium supplementation. The effectiveness of these programs to reduce falls has not been thoroughly evaluated.^{4,25}

Barriers and Challenges

- Many fall-related hospital records or death certificates lack detailed information about the circumstances of the fall. Details are particularly deficient for the elderly population. Seventy-four percent of death certificates do not specify the circumstances of the fall, and 45 percent of the hospitalized falls are listed as “unspecified fall.”¹ This lack of information makes it challenging to characterize the falls and to design appropriate prevention strategies.
- Details from the data are not available to identify specific circumstances, such as “falls on the same level, by slipping/tripping/ stumbling.” Many of the circumstances identified by “falls on the same level by collision, pushing, shoving” are probably due to sports/recreation activities. Data on the specific type of sport or recreation is not available without special surveillance studies.

- There is a lack of public awareness about the risk of fall injuries for all ages. It is difficult to reach all the target groups, including adults engaging in sports, parents, and caregivers, with each fall prevention message.
- There is a lack of public awareness, especially by seniors, on the significance of falls and what prevention strategies are available. Home safety is often seen as a low interest area.
- It is difficult to determine how to develop prevention strategies for falls in the 15–64 age group where 33 percent of hospitalized falls are due to slipping/tripping/stumbling; 9 percent are on stairs/steps; 9 percent are from ladders/scaffolding; 6 percent are from buildings/structures, and 2 percent are due to collision/pushing/shoving—including those in sports. Almost 40 percent of the falls are listed with cause “unspecified” in the medical records.¹
- It can be challenging to decide how to monitor success of any fall prevention program. Databases usually record only deaths or hospitalizations, and it is difficult to use these injury numbers to monitor short-term success of a program. It is common in studies to use calendar postcards and/or follow-up phone calls to evaluate the number of falls, not necessarily just fall injuries requiring medical care.^{26,27,32,34,36}

Recommendations

GOAL 1: Improve and maintain data collection and dissemination to focus injury prevention efforts.

- a. Encourage the improvement of data collection systems for medical records and emergency medical services trip reports to provide more details on the mechanism of injury and contributing factors for fall injuries.
- b. Improve the details on death certificates regarding falls.

GOAL 2: Establish guidelines and evaluation measures for injury prevention programs that are based upon current evidence-based research and literature.

- a. Develop and promote effective older adult fall prevention programs for persons over age 64 within all public health agencies, trauma centers, and emergency medical services that are multi-faceted, culturally competent, evidence-based, and include an evaluation component.
- b. Develop and promote falls prevention programs that utilize specific prevention strategies targeted to the particular risks and types of falls for each age group and are multi-faceted, culturally competent, evidence-based, and include an evaluation component.

GOAL 3: Coordinate and link emergency medical services, trauma care, and public health agencies with other injury prevention programs at the state and local levels to increase collaboration and maximize use of resources.

- a. Encourage all programs that target seniors, including CDPHE programs, to include information on fall hazards and prevention.
- b. Encourage all programs that target children, including CDPHE programs, to include information on fall hazards and prevention.
- c. Collaborate on older adult fall prevention programs with agencies working in the areas of health and safety, such as osteoporosis, chronic diseases, nutrition, recreation programs, and physical activity.

- d. Collaborate on childhood fall prevention programs with agencies working in the areas of health and safety, such as playground safety, home safety, recreation safety, and physical activity.
- e. Collaborate with other agencies addressing falls in childhood agricultural injury prevention and occupational fall prevention.

GOAL 4: Develop leadership to identify and respond to injury prevention needs to initiate policy changes and provide technical assistance, training and support to injury prevention efforts at the state and local level.

- a. Encourage trauma center, emergency medical services, and local health departments to develop and implement programs for follow-up of older adult patients identified with a fall injury.
- b. Establish the CDPHE Injury Prevention Program as a lead agency and resource for the development and evaluation of older adult fall prevention programs at the state and local level.
- c. Establish the CDPHE Injury Prevention Program as a resource for the development and evaluation of childhood fall prevention programs at the state and local level.

GOAL 5: Strengthen state and local legislation and policies that lead to the prevention of injuries.

- a. Advocate for the passage of local and statewide policies regarding helmet use and safety equipment for bicycling, other wheeled-sports, winter sports, and equestrian activities.
- b. Support building standards and enforcement of laws and ordinances that require the installation of window guards.
- c. Encourage local governments, schools, and others controlling playgrounds to adopt evidence-based safety standards for playgrounds and adopt safe maintenance and management practices.
- d. Advocate for building standards and laws and ordinances that require safety equipment in housing for older adults.

Resources

Childhood Fall Prevention

- The Injury Prevention Program at the Colorado Department of Public Health and Environment at www.cdphe.state.co.us/pp/injuryprevention/
- Centers for Disease Control and Prevention, National Center for Injury Prevention and Control at www.cdc.gov/ncipc
- National SAFE KIDS Campaign at www.safekids.org
- Harborview Injury Control and Research Center at <http://depts.washington.edu/hiprc/childinjury/topic/falls>
- The National Program for Playground Safety at www.uni.edu/playground
- Kaboom www.kaboom.org
- Consumer Product Safety Commission at www.cpsc.gov
- The Brain Injury Association at www.biausa.org
- Think First www.thinkfirst.org
- Safer America for Everyone at www.saferam.org

- National Children's Center for Rural and Agricultural Health and Safety at <http://research.marshfieldclinic.org/children>

Older Adult Fall Prevention

- AARP at www.aarp.org
- *A Tool Kit to Prevent Senior Falls* at www.cdc.gov/ncipc/pub-res/toolkit/toolkit.htm
- National Resource Center on Aging and Injury at www.olderadultinjury.org
- Consumer Product Safety Commission at www.cpsc.gov
- Risk Watch at www.riskwatch.org

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Chapter Five: Suicide and Suicide Attempt Injuries

Overview

The field of injury prevention encompasses not only unintentional injuries, such as falls, but also intentional injuries such as suicide and homicide. Suicide is a major national public health issue, resulting in almost twice as many deaths each year as homicide. It is the eighth leading cause of death in the United States, claiming more than 30,000 lives each year.

Facts and Trends: Suicide¹

The nation's highest suicide rates occur in the Rocky Mountain region. In 2000, Colorado had the seventh highest suicide rate in the United States, with as many persons dying from suicide as are killed in motor vehicle crashes. Each year, an average 640 Coloradans die and 2,400 individuals are hospitalized for suicide/self-directed violence.

Colorado's suicide rate remained relatively stable for almost 20 years. However, since 1996, there has been a significant decrease in the age-adjusted suicide rate. In 1996, the Colorado suicide rate was 18.4 per 100,000. By 2000, the rate had dropped to 14.2 per 100,000.

Overall, suicide is the state's ninth leading cause of death. However, for certain age groups, suicide is an even more alarming issue. Suicide is the second leading cause of death for Coloradans ages 10–34, and the leading cause of injury death for Coloradans age 35–74. Suicide death rates vary significantly by gender, age, race/ethnicity, and geographic location. Among Colorado residents, the age-adjusted suicide rate is more than four times higher for males than for females. Suicide is the leading cause of injury deaths for males and the third leading cause of injury deaths for females.

The suicide rate for whites is significantly higher than for other race/ethnic groups. The rate for whites is almost twice that for Black or Asian Coloradans. White males account for almost 70 percent of all suicide deaths in Colorado. Ten-year annual averages show significant differences in age-adjusted suicide rates by county of residence. Four counties—Chaffee, Denver, Mesa, and Teller—have age-adjusted suicide rates that are statistically higher than the overall state rate.

Suicide attempts are among the five leading causes of injury hospitalization for Coloradans ages 10–84 years, and rank second and third for the 15–19 and 10–14 year age groups respectively. As with suicide deaths, hospitalization rates for suicide attempts also vary by gender, age, and geographic location; however, hospitalization patterns are quite different from those found in suicide deaths. For example, the age-adjusted hospitalization rate for suicide attempts is significantly higher for females than for males. This difference between males and females is particularly evident among younger age groups, from ages 10–54. Higher rates of hospitalization for suicide attempts are seen among adolescents and young adults ages 15–44. The highest rate of hospitalization for suicide attempts occurs among females ages 15–24. For males, the highest rate is seen in the 25–34 age group.

More information on suicide injuries is contained in the *Injury in Colorado* report available at <http://www.cdphe.state.co.us/pp/injepi>.

High Risk Groups¹

- Over age 75 for suicide deaths
- Ages 15–44 years for suicide attempts
- Males for deaths
- Females for attempts
- Whites

Economic Costs of Suicides and Suicide Attempts

In 2000, the total national burden of suicide was estimated to be \$125 billion. This includes direct health care costs and indirect costs related to the loss of productive life. For Colorado, it is estimated that suicide deaths and attempts cost \$59 million in direct health care costs, and \$571.3 million in indirect costs in 2000.²

Special Issues

“Undetermined Intent”

Each year, a number of deaths and hospitalizations are labeled as having “undetermined intent.” This means that no information clearly identifies the event as intentional (suicide or homicide) or unintentional. In Colorado, an average 73 deaths and 279 hospitalizations of undetermined intent occur each year. Many of these deaths involve poisonings, hanging/strangulation, or use of firearms. An unknown proportion of these hospitalizations and deaths could be suicides or suicide attempts. Some deaths and hospitalizations that result from legal intervention might also be considered suicide. There are an average eight deaths and 25 hospitalizations resulting from legal intervention in Colorado each year. In some cases, it is clear that the person’s intent is to be killed by the law enforcement officer.¹

Older Adults

One of the most striking trends is the increase in suicide rates among older adults. Suicide rates steadily increase from age 65 and older. The highest rate of suicide in Colorado is among adults ages 85 and older. People in this age group are almost three times as likely to die from suicide as people ages 15–24. This increase is particularly pronounced among men. Colorado men ages 75 and older are seven times more likely to commit suicide than are women of the same age group.¹

Other Risk Factors

There are strong associations between suicide and the presence of depression, other psychiatric disorders and substance abuse. Other prominent risk factors include physical illnesses, having a family history of suicide, living alone, being unemployed and owning a gun.²

Methods and Lethality¹

Males and females differ in the methods used in suicide deaths. Forty percent of suicide deaths in women involve firearms, and 28 percent result from drug overdoses. In men, 60 percent of suicide deaths involve firearms and 19 percent involve hanging or suffocation.

The methods used in suicide deaths also differ by age. Although firearms are involved in the majority of suicides in all age groups, hanging/suffocation is seen more frequently in younger age groups, 26 percent of suicides of Coloradans ages 10–34 years, than in older age groups, at 14 percent of suicides of Coloradans ages 35 and older. Seventy-three percent of suicide deaths occur in the home.

The methods used in suicide attempts resulting in hospitalization are quite different from those resulting in death. The majority of hospitalizations for suicide attempts are for drug overdoses, at 82 percent, or cutting or piercing, at 13 percent. In contrast, the majority of suicide deaths involve firearms, at 55 percent, or hanging/suffocation, at 18 percent. Less than four percent of suicide events involving drug overdose result in death, whereas 92 percent of the events involving firearms are fatal.

The difference in lethality of suicide methods explains the difference in suicide attempt and death rates by age. Young people are more likely to attempt suicide by drug overdose while older individuals are more likely to use firearms. Due to the differences in the methods used, less than 10 percent of suicide events involving children ages 10–14 result in death, whereas approximately 50 percent of events involving individuals age 55 and older are fatal. Men ages 65 and older have the highest proportion of events resulting in death. Nearly 75 percent of suicide events in this age/gender category result in death; 80 percent of these deaths involve firearms.

Best Practices: Prevention Strategies for Suicide

While the risk factors for suicide are known, there is insufficient research that identifies effective strategies for measurably reducing suicide.² However, both the National Strategy for Suicide Prevention³ and the 1992 CDC report on youth suicide prevention⁴ support the need for a comprehensive and integrated approach to suicide prevention. A program implemented by the United States Air Force demonstrated the effectiveness of a comprehensive approach. This program included widespread and repeated suicide awareness and prevention training, gatekeeper training, screening questionnaires, changes in mental health confidentiality policies, and messages from the Air Force Chief of Staff designed to change community attitudes about seeking and providing help. Preliminary data suggest that suicides have been significantly reduced among Air Force personnel. However, it is unclear which prevention strategies alone or in combination are most responsible for the demonstrated reduction in suicide rates.⁵

In 2002, the Colorado Department of Public Health and Environment's Office of Suicide Prevention and The Colorado Trust developed the report *Suicide in Colorado*. This report identified people who are most at risk of committing suicide, identified suicide-prevention resources, and examined the strategies for combating the problem.² The report's key suicide prevention strategies are listed in Figure 9.

Evidence for the effectiveness of several of the strategies used in a comprehensive approach are summarized below:

Public Awareness

Research indicates that most individuals with suicide plans do not seek professional help due to the stigma associated with suicide, depression and other mental health issues.⁶ Increased public awareness can result in knowledge change, which then influences beliefs and behaviors.³ Organizations such as the American Association of Suicidology, the American Foundation for Suicide Prevention, and the Suicide Prevention Advocacy Network have developed information campaigns to educate the public that suicide is preventable and to alert professional, community, and lay groups about the common signs and symptoms associated with suicidal behavior. Preliminary evidence at a state level suggests that media campaigns may help reduce youth suicide rates.⁷

Figure 9: Key Suicide-Prevention Strategies²

| |
|--|
| 1. Encourage at-risk individuals to seek care: |
| Encourage public awareness of suicide |
| Develop community-based prevention programs |
| Improve primary care providers' ability to detect, treat and refer suicidal patients |
| Create suicide prevention programs in schools |
| Expand gatekeeper training for targeted professional groups and the general public |
| Provide services to people experiencing traumatic events |
| 2. Improve care for at-risk individuals by: |
| Refine and distribute screening assessment tools |
| Expand training on suicide prevention for health professionals |
| Improve the ability of mental health providers to address suicide |
| Provide support for suicide survivors |
| Encourage culturally competent approaches |
| 3. Promote policies to help reduce the risk of suicide by: |
| Improve financing for mental health services |
| Reduce access to lethal means |

Informational crisis lines and hotlines can also be important parts of community-wide public awareness. These telephone lines have been shown to provide information, referrals and client support, but do not appear to decrease suicide rates.²

Gatekeeper Training

Gatekeeper training involves educating key lay and professional community members who may have contact with someone at risk of suicide. It consists of learning the warning signs and risk factors for suicide, referral and resource information, and how to access assistance. The rationale behind gatekeeper training is that people at risk of suicide often come into contact with police, clergy, doctors, friends or others who may not recognize the risk factors for suicide.⁴ Results have demonstrated that participants in specific gatekeeper training programs have enhanced their readiness to intervene by increasing their comfort, competence and confidence in helping people at risk, and that participants generally retain the skills they were taught.^{8,9,10}

Screening Programs

Screening programs use structured tools to identify high-risk individuals, such as those with depression, other mental illnesses, substance abuse, stressors or suicidal thoughts or history.³ The rationale for this strategy is that since suicide is a rare event, prevention efforts will be most efficient if high-risk individuals can be identified and referred for specific interventions. Several potential screening instruments have been shown to be fairly accurate in detecting adult patients with depressive symptoms or substance abuse.¹⁴⁻¹⁷

Mental Health Treatment

Treatment for mental disorders can reduce suicidal behavior.² Some 60 to 90 percent of all suicidal behavior is associated with some type of mental illness or substance abuse. Effective treatments exist for these disorders; however, due to the stigma of suicide, as well as other factors, people with suicidal behavior do not seek treatment.³ Public awareness campaigns and the availability of treatment facilities can help lead to an increase in the number of people being treated.



Of particular concern is improving treatment of depression and other psychiatric disorders in older adults. Primary care providers are more likely to see older patients who do not seek out mental health specialists. Recently, some programs have been developed to test the effectiveness of increased screening and treatment of depression through primary care practices.³

School-based Programs

Most school programs are designed to provide knowledge and increased awareness to students and staff about problems of adolescent suicide. Gatekeeper training has shown some promise in identifying students at risk and providing referral and treatment.^{2,3,13} There have also been reported increases in students asking for help or utilizing a crisis line if suicidal.^{11,12} In addition, there has been some progress in getting schools to institutionalize suicide prevention activities over time.¹³

Follow-Up for Suicide Survivors

People who have attempted suicide are at increased risk for another attempt. Follow-up outpatient programs have shown positive results in increasing survivors' compliance with recommendations; however, not all such programs have demonstrated reductions in suicides. Suicide survivor or postvention programs have shown some success in decreasing depression and "copy-cat" suicides among adolescents impacted by suicide.^{2, 3}

Another strategy under study is addressing persons who are discharged from an emergency department after a suicide attempt. Hospital staff can help establish a therapy plan for survivors, offer family education, or provide links to mental health and other treatment facilities.³

Access to Lethal Means

There is evidence that limiting access to lethal means and methods of self-harm is effective in reducing suicides that result from impulsive behavior. A CDPHE study concluded that the presence of a gun in the home increased the risk in youth who committed suicide.² Strategies to restrict access to firearms include education of homeowners and youth, proper firearm storage, product safety features on guns, and strengthening laws and enforcement.^{2, 20} One recent review found that requiring safety features on guns and the application of emerging technologies could reduce unintentional shootings among children or other unauthorized users. There is also evidence that strong stances against gun violence by community leaders, in cooperation with community-based policing approaches, can promote safety to youth. Research also shows that educational efforts to persuade children and youth to stay away from firearms have had limited effectiveness. The recommended solutions are to provide more parental monitoring, and to store firearms locked, unloaded, and separate from ammunition.²⁰

It is also important to examine access to other lethal means of self-harm, such as poisoning agents and car exhaust emissions, through public education, safer dispensing of medication, improved automobile design, and other technologies.³

Multi-Faceted Community Programs

Successful suicide-prevention efforts should be community-based and include a variety of strategies, including public education, professional medical personnel training, clinical interventions, and broad-based community efforts. Strategies will involve collaboration among many organizations such as public health, mental health, medical professionals, education, social services, justice system and law enforcement.²

Colorado Office of Suicide Prevention

In 2000 the Colorado legislature established the Office of Suicide Prevention (OSP) within CDPHE. The OSP addresses suicide and suicidal behavior among Coloradans of all ages in order to reduce the suicide rate in Colorado. Serving as the statewide coordinator of suicide prevention programs, the OSP works in the following areas: technical support and capacity building for local programs; statewide needs and resource assessment; gatekeeper and other training; public awareness and education campaigns; grant making to local suicide prevention efforts; and management of a cash fund of gifts, grants and donations. The OSP utilizes approaches and practices that have been found to be effective or promising in all of the identified program areas.

Colorado Suicide Prevention Programs¹⁸

- Suicide is not always perceived by the health community as a major injury problem. In a recent CDPHE survey on suicide, only 32% of hospital traum programs, 38% of health agencies, and 18% of EMS providers indicated that suicide was a substantial to major injury problem.
- There are currently few suicide prevention programs. The CDPHE survey found eight health department programs for professional training, five telephone crisis hotlines, four school-based programs, and four post-interventions.

Barriers and Challenges

- The lack of specific injury data in suicides and suicide attempts prevents complete understanding of the problem. Annually, there are approximately 73 deaths and 279 hospitalizations of “undetermined intent.”¹
- Coroners in Colorado have varying expertise, education, and training in completing death certificates. As a result, suicide reporting may not be accurate.
- Suicide prevention resources exist in all counties, but are characterized as minimally adequate. Sixteen counties in the San Luis Valley and in Northeastern Colorado, are recognized as “mental health management shortage areas.”² Funding is needed to develop additional mental health services.
- There continues to be a stigma in the general population surrounding suicide, mental illness and mental health treatment.
- There is a lack of public awareness about suicide and the availability of prevention strategies.

Recommendations

GOAL 1: Improve and maintain data collection and dissemination to focus injury prevention efforts.

- a. Increase evaluation measures to determine effective strategies for reducing suicide, such as conducting psychological autopsies and evaluating existing programs.
- b. Encourage the improvement of data collection systems to provide more details about suicides and contributing factors on death certificates and medical records.
- c. Encourage the improved accuracy of death certificates regarding suicides.
- d. Support the collection of the data elements outlined in the National Violent Death Reporting System for the investigation and reporting of suicide deaths.

GOAL 2: Establish guidelines and evaluation measures for injury prevention programs that are based upon current evidence-based research and literature.

- a. Endorse the “Key Components of a Comprehensive Suicide-Prevention System” outlined in the Suicide in Colorado report.
- b. Develop suicide prevention programs that are community-based, comprehensive, culturally competent, evidence-based, and include an evaluation component. It is recommended that programs follow the guidelines established in the Suicide in Colorado report.
- c. Promote suicide prevention programs that are responsive to diverse populations, including high-risk groups based upon age, gender, disability, ethnicity/race, geographic region, and socio-economic status.

GOAL 3: Coordinate and link emergency medical services, trauma care, and public health agencies with other injury prevention programs at the state and local levels to increase collaboration and maximize use of resources.

- a. Coordinate suicide prevention efforts of hospitals, emergency medical services (EMS), and public health agencies with mental health service providers, substance abuse programs, violence prevention programs, schools, and the faith community to identify risk factors, gaps in services, and strategies to prevent suicide.
- b. Include representatives from emergency medical services, hospitals and public health on the state Office of Suicide Prevention Advisory Council.

- c. Incorporate recommendations from the Office of Suicide Prevention within other programs at CDPHE that target high-risk populations for suicide.

GOAL 4: Develop leadership to identify and respond to injury prevention needs to initiate policy changes and provide technical assistance, training and support to injury prevention efforts at the state and local level.

- a. Continue support for the Office of Suicide Prevention at CDPHE as the lead agency in the state to develop and coordinate suicide prevention programs.
- b. Encourage the development and implementation of a comprehensive training program for hospital staff, EMS, and public health agencies to detect, treat and refer suicidal patients.
- c. Encourage the development and use of standardized screening instruments for EMS, hospitals, and public health to identify people at high risk, such as individuals with depression, mental illness, substance abuse, stressors or suicidal thoughts or history.
- d. Encourage the development and implementation of standardized follow-up protocols and programs for patients identified with suicide attempts for all hospital emergency departments and EMS.

GOAL 5: Strengthen state and local legislation and policies that lead to the prevention of injuries.

- a. Support the funding of the Office of Suicide Prevention at CDPHE as the lead agency in the state to develop and coordinate suicide prevention programs.
- b. Encourage the development and implementation of suicide prevention programs and crisis response or post-vention plans for students and staff in all school districts in Colorado.
- c. Promote the funding of a statewide Suicide Prevention Hotline to provide information, referrals, and client support.
- d. Advocate for the requirement that all health plans and employee assistance programs include mental health services.
- e. Support an increase in funding to support mental health services in each county.
- f. Advocate that a team of EMS, public health agencies, and hospital staff in each Regional Emergency and Trauma Advisory Council attend gatekeeper training to increase knowledge on the warning signs and risk factors for suicide, referral and resource information, and how to access mental health assistance.
- g. Advocate for the requirement of ongoing competencies by hospitals and EMS in depression assessment and management and suicide prevention.
- h. Support the reduction in access to firearms and lethal means of suicide.

Resources

- The Office of Suicide Prevention at the Colorado Department of Public Health and Environment at www.cdphe.state.co.us/pp/emsphom.asp
- American Association of Suicidology at www.suicidology.org
- Centers for Disease Control and Prevention, National Center for Injury Prevention and Control at www.cdc.gov/ncipc
- National Institute of Mental Health at www.nimh.nih.gov
- Suicide Prevention Advocacy Network at www.spanusa.org

- National Strategy for Suicide Prevention at www.mentalhealth.org
- American Foundation for Suicide Prevention at www.afsp.org
- Suicide Awareness/Voices of Education at www.save.org
- Yellow Ribbon Suicide Prevention Program at www.yellowribbon.org

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Appendix One: Leading causes of death in Colorado, 1999–2001 total deaths

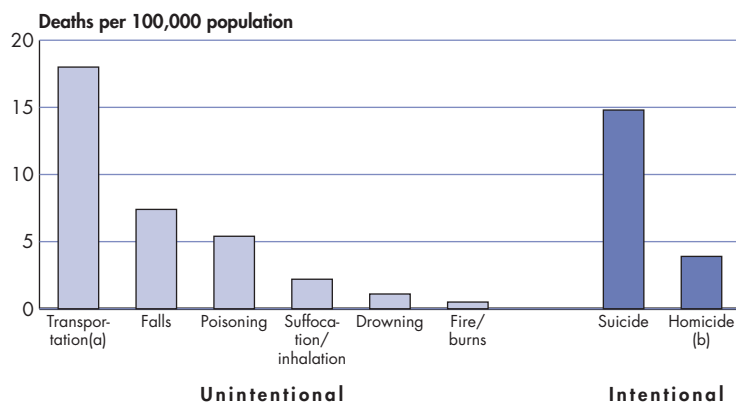
| Rank | Age <1 | Ages 1–4 | Ages 5–9 | Ages 10–14 | Ages 15–24 | Ages 25–34 | Ages 35–44 | Ages 45–54 | Ages 55–64 | Ages 65+ | TOTAL |
|------|-----------------------------------|--------------------------------|--------------------------------|--------------------------------|---------------------------------|---------------------------------|--|--|--|--|--|
| 1 | Congenital anomalies N=229 | Unintentional injuries N=67 | Unintentional injuries N=53 | Unintentional injuries N=83 | Unintentional injuries N=660 | Unintentional injuries N=646 | Unintentional injuries N=841 | Malignant neoplasms N=1,700 | Malignant neoplasms N=2,915 | Heart disease N=15,427 | Heart disease N=18,792 |
| 2 | Short gestation N=178 | Congenital anomalies N=30 | Malignant neoplasms N=17 | Suicide N=24 | Suicide N=268 | Suicide N=342 | Malignant neoplasms N=639 | Heart disease N=1,030 | Heart disease N=1,717 | Malignant neoplasms N=12,313 | Malignant neoplasms N=17,860 |
| 3 | SIDS N=154 | Homicide N=16 | Homicide N=13 | Malignant neoplasms N=20 | Homicide N=147 | Malignant neoplasms N=173 | Heart disease N=424 | Unintentional injuries N=662 | Bronchitis, Emphysema, Asthma N=495 | Cerebrovascular disease N=4,926 | Bronchitis, Emphysema, Asthma N=5,496 |
| 4 | Placenta, cord, membranes N=63 | Malignant neoplasms N=16 | Heart disease N=7 | Heart disease N=12 | Malignant neoplasms N=62 | Homicide N=122 | Suicide N=408 | Suicide N=396 | Unintentional injuries N=352 | Bronchitis, Emphysema, Asthma N=4,782 | Cerebrovascular disease N=5,496 |
| 5 | Maternal complications N=56 | Heart disease N=10 | Congenital anomalies N=5 | Homicide N=11 | Heart disease N=37 | Heart disease N=108 | Chronic liver disease/ Cirrhosis N=247 | Chronic liver disease/ Cirrhosis N=336 | Cerebrovascular disease N=279 | Alzheimer disease N=2,292 | Unintentional injuries N=4,923 |

Source: Colorado Trauma Registry, Colorado Department of Public Health and Environment. (2003). Unpublished data.

Appendix Two: Leading causes of injury death in Colorado

Approximately 64 percent of injury deaths in Colorado are from unintentional causes, 32 percent are from intentional causes, and for four percent, the intent is undetermined.

Age-adjusted injury death rates by cause, Colorado residents, 1999–2001



Close to half (47 percent) of the unintentional injury deaths are due to transportation, and most of the intentional deaths (78 percent) are due to suicide. Homicide, falls and poisoning also contribute significantly to the total number of injury deaths.

a. "Transportation" includes incidents that involve any type of transportation device such as motor vehicles, motorcycles, bicycles, airplanes or other aircraft, boats or other watercraft, trains, snowmobiles, off-road vehicles, animals being ridden, animal-drawn vehicles, or pedestrians.

b. "Homicide" also includes legal intervention.

Five leading causes of injury deaths by age, Colorado residents, 1999–2001 total

| Rank | Age <1 year | Ages 1–4 years | Ages 5–9 | Ages 10–14 | Ages 15–24 | Ages 25–34 | Ages 35–44 | Ages 45–54 | Ages 55–64 | Ages 65+ | TOTAL |
|------|---|----------------------------------|----------------------------------|-------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------|------------------------------------|--|-------------------------------------|
| 1 | Homicide N=13 | Motor vehicle traffic N=25 | Motor vehicle traffic N=29 | Motor vehicle traffic N=53 | Motor vehicle traffic N=480 | Suicide N=342 | Suicide N=408 | Suicide N=396 | Suicide N=170 | Fall N=551 | Motor vehicle traffic N=1,947 |
| 2 | Suffocation/inhalation/aspiration N=11 | Homicide N=16 | Homicide N=13 | Suicide N=24 | Suicide N=268 | Motor vehicle traffic N=326 | Motor vehicle traffic N=360 | Motor vehicle traffic N=249 | Motor vehicle traffic N=133 | Other Unintentional injury N=424 | Suicide N=1,896 |
| 3 | Motor vehicle traffic N=9 | Drowning N=14 | Drowning N=9 | Homicide/legal intervention N=11 | Homicide/legal intervention N=147 | Poisoning N=145 | Poisoning N=257 | Poisoning N=195 | Fall N=56 | Suicide N=288 | Fall N=757 |
| 4 | Fewer than 3 deaths in this category | Fire/burn N=6 | Other transportation N=6 | Other transportation N=7 | Poisoning N=53 | Homicide/legal intervention N=122 | Homicide/legal intervention N=116 | Falls N=54 | Other Unintentional injury N=44 | Motor vehicle traffic N=283 | Poisoning N=733 |
| 5 | Fewer than 3 deaths in this category | Motor vehicle non-traffic N=5 | Motor vehicle non-traffic N=5 | Drowning N=5 | Other transportation N=39 | Other transportation N=53 | Other transportation N=52 | Other transportation N=52 | Poisoning N=42 | Suffocation/inhalation/aspiration N=140 | Other Unintentional injury N=619 |

"Motor vehicle traffic" includes motor vehicle occupants, motorcyclists, pedestrians, and bicyclists injured by a motor vehicle on a public road.

"Motor vehicle non-traffic" includes all motor vehicle incidents not on a public road, collision with a moving object not on a public road, collision with a non-moving object not on a public road, boarding or alighting, and other events not on a public road.

"Other transportation" includes incidents that involve any non-motor vehicle type of transportation.

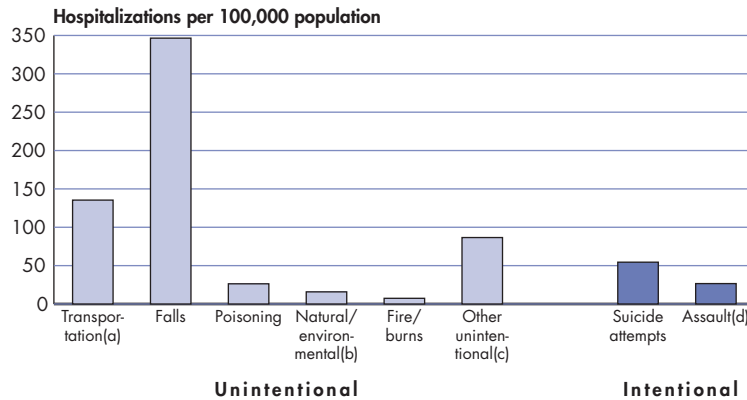
"Other unintentional" includes struck by falling objects, machinery, electric current, and striking against or by objects or persons, etc.

Source: Colorado Trauma Registry, Colorado Department of Public Health and Environment. (2003). Unpublished data.

Appendix Three: Leading causes of injury hospitalization in Colorado

While suicide and transportation injuries cause nearly 55 percent of injury deaths in Colorado, they are responsible for less than 30 percent of injury hospitalizations. The leading cause of injury hospitalization is falls.

Age-adjusted injury hospitalization rates by cause, Colorado residents, 1999–2001



a. “Transportation” includes incidents that involve any type of transportation device such as motor vehicles, motorcycles, bicycles, airplanes or other aircraft, boats or other watercraft, trains, snowmobiles, off-road vehicles, animals being ridden, animal-drawn vehicles, or pedestrians.

b. “Natural/environmental” includes lightning, excessive cold, and bites, stings or other injuries due to animals/insects except animals being ridden.

c. “Other unintentional” includes suffocation, struck by falling objects, machinery, unintentional firearm injuries, electric current, and striking against or by objects or persons, etc.

d. “Assault” also includes legal intervention.

Five leading causes of injury hospitalizations by age, Colorado residents, 1999–2001 total

| Rank | Age <1 year | Ages 1–4 years | Ages 5–9 | Ages 10–14 | Ages 15–24 | Ages 25–34 | Ages 35–44 | Ages 45–54 | Ages 55–64 | Ages 65+ | TOTAL |
|------|-------------------------------------|--------------------------------|-------------------------------------|-------------------------------------|---------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|---------------------------------|---------------------------------------|
| 1 | Fall N=148 | Fall N=449 | Fall N=608 | Fall N=637 | Motor vehicle traffic N=3,410 | Motor vehicle traffic N=2,355 | Fall N=2,735 | Fall N=3,152 | Fall N=2,941 | Fall N=22,982 | Fall N=37,081 |
| 2 | Assault/legal intervention N=144 | Poisoning N=220 | Motor vehicle traffic N=308 | Motor vehicle traffic N=436 | Suicide/self-inflicted N=2,070 | Fall N=1,815 | Motor vehicle traffic N=2,339 | Motor vehicle traffic N=1,770 | Motor vehicle traffic N=876 | Motor vehicle traffic N=1613 | Motor vehicle traffic N=13,304 |
| 3 | Poisoning N=45 | Motor vehicle traffic N=178 | Other road vehicle crashes N=156 | Suicide/self-inflicted N=326 | Fall N=1,614 | Suicide/self-inflicted N=1,657 | Suicide/self-inflicted N=1,815 | Suicide/self-inflicted N=1,025 | Poisoning N=242 | Poisoning N=672 | Suicide/self-inflicted N=7,371 |
| 4 | Fire/burn N=23 | Natural/environmental N=138 | Natural/environmental N=109 | Other road vehicle crashes N=248 | Assault/legal intervention N=1,071 | Assault/legal intervention N=873 | Assault/legal intervention N=833 | Poisoning N=517 | Suicide/self-inflicted N=242 | Natural/environmental N=377 | Assault/legal intervention N=3,613 |
| 5 | Motor vehicle traffic N=19 | Fire/burn N=80 | Motor vehicle non-traffic N=47 | Motor vehicle non-traffic N=138 | Poisoning N=430 | Poisoning N=417 | Poisoning N=631 | Other road vehicle crashes N=449 | Other road vehicle crashes N=222 | Suicide/self-inflicted N=234 | Poisoning N=3,288 |

“Motor vehicle traffic” includes motor vehicle occupants, motorcyclists, pedestrians, and bicyclists injured by a motor vehicle on a public road.

“Other road vehicle crashes” includes animals being ridden, animal-drawn vehicles and bicycle crashes not involving a motor vehicle.

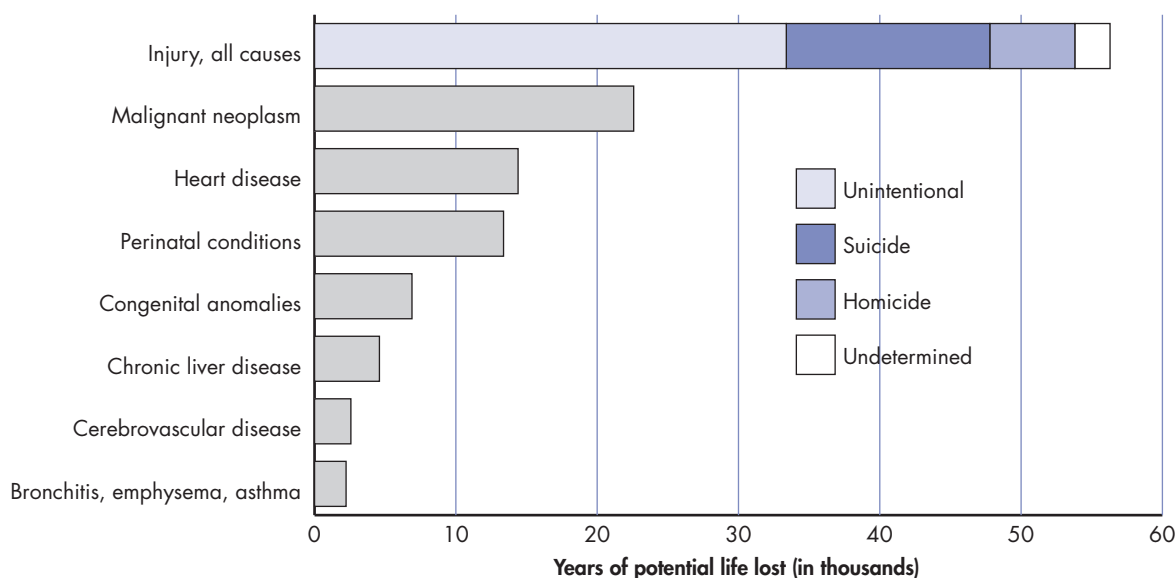
“Motor vehicle non-traffic” includes all motor vehicle incidents not on a public road, collision with a moving object not on a public road, collision with a non-moving object not on a public road, boarding or alighting, and other events not on a public road.

Source: Colorado Trauma Registry, Colorado Department of Public Health and Environment. (2003). Unpublished data.

Appendix Four: Years of potential life lost due to injury

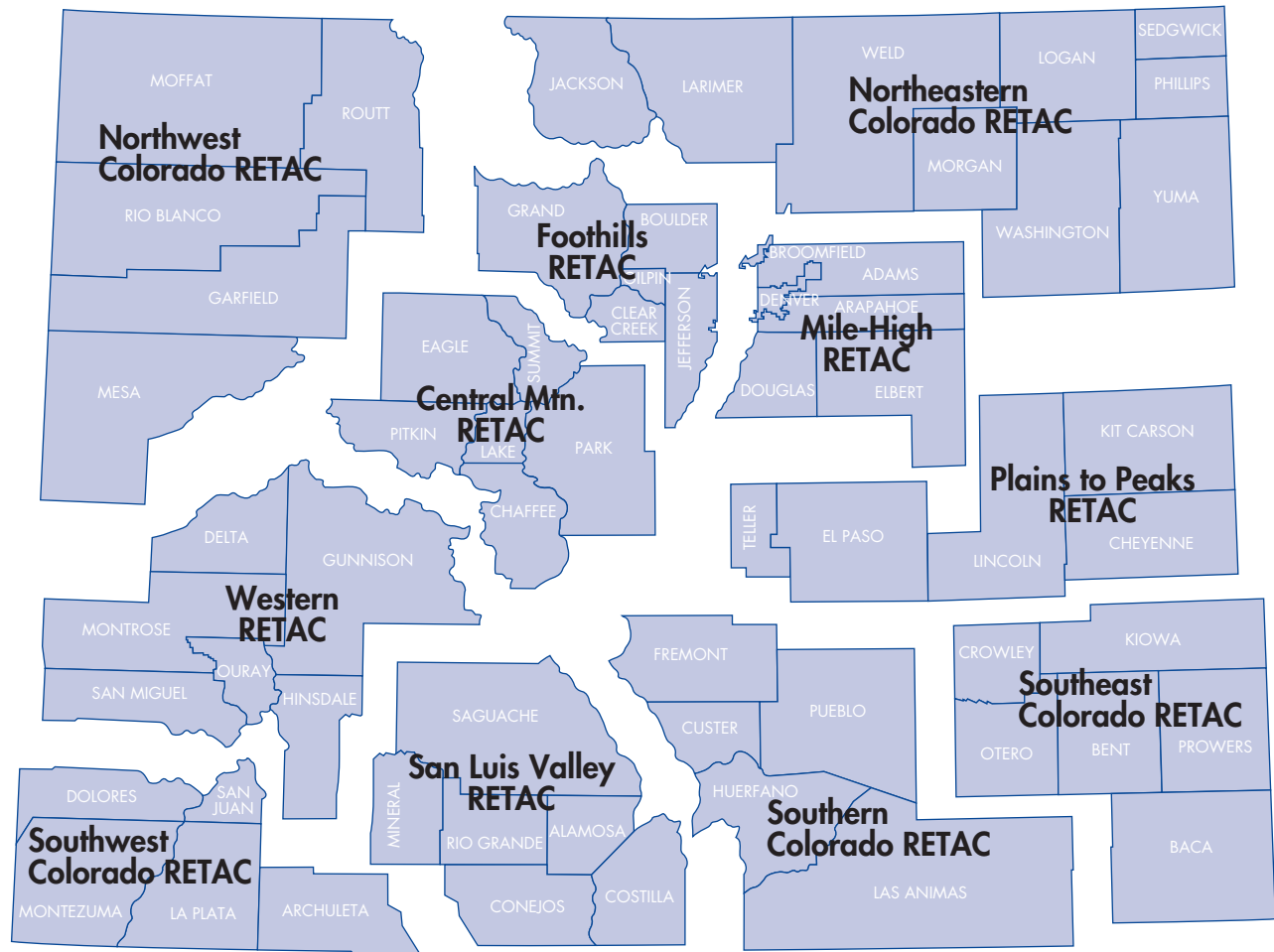
The Years of Potential Life Lost (YPLL) is a statistic that measures the number of productive years that have been lost due to death from different causes. One method for calculating this statistic totals the number of years from the age of death to age 65. Based on this method, in Colorado, more years of potential life are lost due to injury than to any other cause of death.

Years of Potential Life Lost (YPLL) before age 65 by cause of death, Colorado residents, annual average, 1999–2001



Source: Colorado Trauma Registry, Colorado Department of Public Health and Environment. (2003). Unpublished data.

Appendix Five: Regional Emergency and Trauma Advisory Councils



Source: *Injury in Colorado*. Denver, CO: Colorado Department of Public Health and Environment; 2002.



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