

Needs Assessment
Intentional and Unintentional Injury
Denver County Youth Ages 10-19

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Executive Summary

Colorado Department of Public Health and Environment awarded Title V funds to Denver Public Health as part of an effort to implement population-based primary prevention efforts to improve the health of mothers and children in the city and county of Denver. While injury was identified as an area of interest, little was known about injury among children in Denver. Where is the biggest burden? Is anything improving and if so, can we identify any causal factors? And what is getting worse? Are specific populations at risk and are any community agencies currently engaging in primary prevention activities? This report is an attempt to shed light on these questions and identify where Denver Public Health should focus future efforts to prevent injury among youth ages 10 to 19 in Denver.

Through careful analysis of existing data sources that measure morbidity, mortality and injury-related risk factors, we have determined that:

- ◆ The rates of hospitalizations and death due to unintentional and intentional injuries have been decreasing among Denver youth ages 10 to 19 over the last decade.
- ◆ Boys are at a greater risk for injury than girls and older youth at greater risk than younger youth.
- ◆ Decreases in unintentional injury are the result of many prevention efforts including the success of state-wide changes in motor vehicle policies (graduated licensing, impaired and distracted driving enforcement and the increased use of seatbelts).
- ◆ After motor vehicles, accidental falls and “other” accidents (sport-related) are the most common unintentional injuries.
- ◆ Among younger youth, intentional injuries requiring hospitalization are largely a result of a suicide attempt whereas among older youth, assault is slightly more likely to be the primary cause of hospitalization.
- ◆ Bullying, fighting and carrying weapons are common among Denver youth:
 - ✦ Outpatient visits for injury (at DHHA hospital and clinics) among boys and girls of all ages are largely the result of assault.
 - ✦ The rate of assault hospitalizations is equal to the rate of motor vehicle-related hospitalizations.
- ✦ Alcohol use, a risk factor for unintentional and intentional injuries, is also prevalent among Denver youth:
 - ✦ In the past 30 days, 60% of 11th graders report having consumed alcohol and almost 1/2 report having binged (5 or more drinks on one occasion).
 - ✦ In the past 30 days, 24% of Denver youth report having been in a car with a driver who had been drinking and almost one in ten reports having driven after drinking.

In addition to empiric results, we solicited expert opinion from key stakeholders and the experience of those working in the field. With an understanding that change occurs through the coordinated effort of multiple stakeholders with a shared vision, we solicited input from those community members who work directly with youth and who might also function as valuable partners as we develop work plans around the four areas require attention:

- ◆ Maintain momentum of the downward trends in motor-vehicle accidents.
- ◆ Promote positive youth development in an effort to reduce intentional injury among all Denver youth.
- ◆ Reduce falls and sport-related injuries among all youth, but target those ages 10 to 14.
- ◆ Increase awareness about alcohol use and abuse among Denver youth to reduce alcohol-related injuries.

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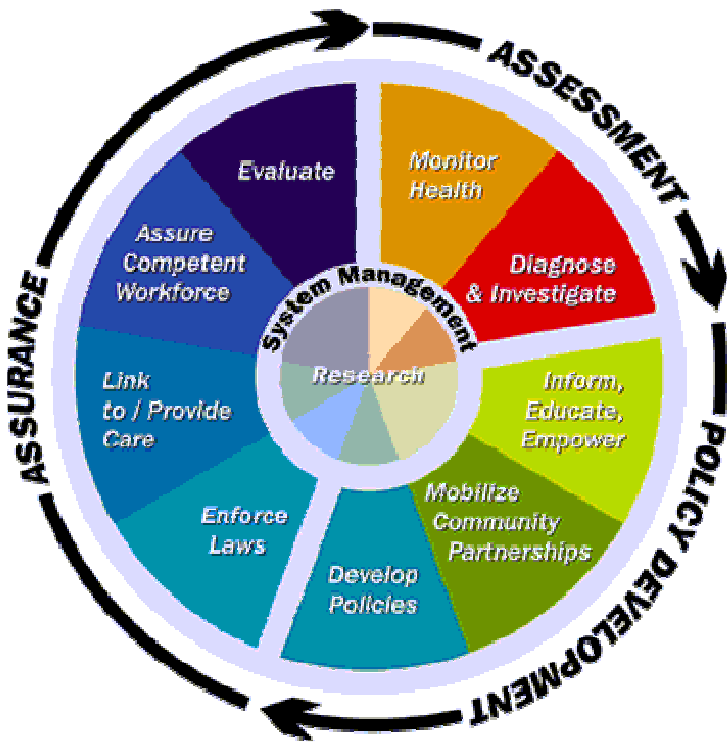
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Introduction

National, state and local public health agencies are charged with carrying out the core functions of public health. By implementing the ten essential services within assessment, policy development and assurance, Denver Public Health assures and improves the health and well-being of the citizens of Denver and beyond. Figure 1 depicts the core functions of public health surrounding the 10 essential services of public health (1).

Figure 1



This report addresses the assessment function: *monitoring health status*, specifically among Denver youth aged 10 to 19 years old. Utilization of this document and fulfillment of its recommendations will address at least two of the essential services under the Policy Development function: *to inform, educate, and empower people about health issues and mobilize community partnerships to identify and solve health problems*.

According to the Colorado Injury Prevention Strategic Plan 2010-2015, *Bold Steps toward Preventing Injuries*, the burden of injury in Colorado is profound: injury is the third leading cause of death, ranking below cancer and heart disease. More than 3,100 Coloradans die from injuries each year, with an additional 32,000 hospitalized for non-fatal injuries and thousands more treated in emergency departments and physicians' offices. An estimated one in eight Coloradans seek medical treatment for injuries each year (2).

The cost of injury can be measured in many ways: medical costs, reduced productivity and years of potential life lost (fatal injuries). These measures do not include the grief suffered by family members and reduced quality of life for the injured person.

Over the past decade, the leading cause of death among Colorado teenagers 15 to 19 was unintentional injury, followed by suicide and homicide. Among those aged 10-14, these injuries rank one, three and four respectively (3). Remarkably, the financial and the human cost of injury have historically evaded the public awareness they merit.

While many gains have been made since Dr. Koop's statement, injuries among children remain a burden to individuals, families and society but the good news is that many of these injuries are preventable.

In 1989, Surgeon General Everett Koop addressed the US Senate: *"If some infectious disease came along that affected children [in the proportion that injuries do], there would be a huge public outcry and we would be told to spare no expense to find a cure and be quick about it"*.

The conclusions of this report are founded on data derived from multiple Denver County, Colorado and national sources. The authors examine the burden and trends of intentional and unintentional injury and also investigate associated risk factors. However, in an effort to maximize the usefulness of this report as a program and policy planning tool, the authors interpret these data in the context of national, state and local priorities and strategies for maternal-child health (MCH) and injury prevention. The authors also consider injury prevention activities being conducted by community partners and discuss opportunities to forge new partnerships, as appropriate within the 10 essential services of public health as described above.

Section I: Definitions and Methodology

Defining Intentional and Unintentional Injuries

For the purposes of this report, injury is defined as “damage or harm to the body resulting in impairment or destruction of health.” Injuries can be fatal or nonfatal and they can occur unintentionally or as a result of purposeful acts of harm (4). Throughout this report, injuries are categorized according to external cause of injury codes which were developed as an addendum to the 9th version of the International Classification of Diseases (ICD-9) by the World Health Organization (5). These codes provide a systematic way to capture information about the manner of the injury (e.g. unintentional, intentional or self-inflicted), the mechanism (e.g. a fall, firearm, motor vehicle, dog bite) and place of occurrence (e.g. playground, workplace, home). Table 1 provides examples of some of the more common injuries; see Appendix A for a complete listing.

Examples of injuries by intentionality

Unintentional	Intentional
<ul style="list-style-type: none">◆ Transportation<ul style="list-style-type: none">✦ Motor vehicle/motorcycle accident✦ Other vehicle includes all-terrain vehicle, boats✦ Bicycle-related✦ Water/rail and air transport◆ Poisoning (includes overdose)◆ Falls<ul style="list-style-type: none">◆ Stairs or furniture◆ Playground◆ Cliff◆ Fire/Burn◆ Natural/environmental<ul style="list-style-type: none">✦ Prolonged exposure to heat/cold✦ Insect/snake bite◆ Other<ul style="list-style-type: none">◆ Sport-related◆ Machinery/power-tool◆ Firearm/air gun	<ul style="list-style-type: none">◆ Suicide/self-inflicted◆ Homicide and assault<ul style="list-style-type: none">✦ Unarmed brawl✦ Stabbing✦ Firearm-related✦ Legal intervention✦ Rape✦ Child abuse

Some mechanisms such as firearms can be coded as intentional, unintentional or self-inflicted, whereas others, a spider bite for example, would be used primarily for unintentional injuries.

Data sources

Injury Hospitalization Data

The Hospital Discharge Dataset is collected by the Colorado Health Association (CHA) from all acute care and many specialty hospitals throughout Colorado. The primary source of injury surveillance in the state and city since 1995, the dataset includes all hospital discharge records that contain at least one injury code within the first six diagnoses (6). Annual estimates for Denver and the state are generated via the queryable, on-line system, Colorado Health Information Dataset (COHID), available at the Colorado Department of Health and Environment (CDPHE) web-site (7). We present annual estimates for ten years: 2000 to 2009.

Mortality Data

Reporting on mortality (death) is part of the Colorado vital records system. Standard age-specific mortality rates are calculated using the underlying cause of death reported on the death certificate. The Health Statistics Section and Vital Statistics Unit at CDPHE manage these data which are available on COHID (7). We present annual estimates for ten years: 2000 to 2009.

Denver Health and Hospital Authority (DHHA) Data

DHHA includes the safety-net hospital for the city and county of Denver, providing care through the hospital and multiple community, school-based health and specialty clinics. The emergency department and certain specialty clinics (e.g. the eye clinic) capture injury data that allow more detailed analyses of less severe injuries, thereby potentially revealing details not readily apparent when investigating the relatively small number of severe cases that require hospitalization. The data analyzed are unique visits for which the primary external cause of injury is identified: between 2000 and 2009, we identified 506,694 unique visits, of which 29,507 (6%) were injury-related visits. The majority of these injury visits were outpatient (88%) and emergency department (9%). Although not representative of Denver County as a whole, analyses show that DHHA clinics and hospital served approximately 37% of the children ages 10-19 in 2008. See Appendix B for a detailed description of DHHA data and how this population compares to Denver County.

Youth Risk Behavioral Survey (YRBS) and the Denver Healthy Kids Colorado Survey (DHKCS)

Two school-based surveys provide estimation of health and risk behaviors of youth in Colorado and Denver. The Youth Risk Behavior Survey (YRBS), conducted in collaboration with the Centers for Disease Control (CDC), provides state-wide estimates among high-school students for odd-numbered years since 1999. In this report, we use weighted estimates for 2009 (7). The Denver Healthy Kids Colorado Survey (DHKCS) was conducted in Denver Public Schools in 2008 in grades 6, 8, 9 and 11 and provides city-level estimates. Both surveys include questions about sexual health, substance abuse, bullying and safety practices while driving a car or bicycle. However, the DHKCS includes additional questions about school performance, aspirations and family life. Estimates from both surveys are presented in the same tables and comparisons are made with caution: methodology, analyses and time of survey all differ between the two surveys.

Colorado Child Health Survey (CHS)

This survey was designed to fill the gap about risks and behaviors in children 1-14 years old. In 2004, the CHS was added to the Behavioral Risk Factor Surveillance System (BRFSS), a telephone survey conducted by random-digit dialing among adults ages 18 years and older who have a landline telephone (the BRFSS has been conducted annually by CDPHE in collaboration with the CDC since 1990). If a child between the ages of 1 and 14 years lives in the household of the consenting adult being interviewed, the parent is called a few days later and is asked questions about the child's physical activity, nutrition, access to health care, behavioral health, sun safety and injury. A state-wide survey: the sample for Denver County is small, averaging only 111 surveys per year (ages 1-14) and 37 surveys per year (ages 10-14). For this report, the Denver samples for three years (2004-2006) were collapsed to provide more reliable estimates.

Additional sources of information

From September 2010 through, August, 2011, the Denver Public Health (DPH) Maternal Child Health staff captured qualitative data that is reflected throughout this report. Through community partnerships, committee and task force participation, conference attendance and key participant interviews, contextual facts, opinions and priorities were considered as the report was drafted. Examples of these partnerships and activities include participation in or leadership of:

- ◆ Denver Health and Hospital Authority Injury Prevention Committee.
- ◆ Denver-Metro Teen Date Violence Task Force (funded by the CDC, facilitated by CDPHE).
- ◆ Webinars conducted by Prevent Protect on both broad and specific injury prevention.
- ◆ Webinars and interviews with experts regarding transitioning systems from injury response and victim services to primary prevention.
- ◆ Training and education (via webinar and literature review) regarding Policy, Systems and Environmental approach to injury prevention.
- ◆ Partnership discussions with Project PAVE (Promoting Alternatives to Violence through Education) and the Conflict Center, two of Denver’s leading violence prevention and response organizations.
- ◆ Annual Women’s Health Conference (sponsored by CDPHE).
- ◆ Western Regional Maternal-Child Health Epidemiology Conference (sponsored by CityMatCH).
- ◆ CityMatCH Annual Leadership Meeting.
- ◆ Public Health in the Rockies Annual Conference.

Community stakeholders who consented to key participant interviews included representatives of the following:

- ◆ CDPHE staff within the Injury Prevention Program and the Maternal Child Health Program.
- ◆ The Center for Health and Environmental Information and Statistics at CDPHE.
- ◆ The Pediatric and Adult Emergency Departments at DHHA.
- ◆ The school-based health clinics (includes Denver Public Schools (DPS) and DHHA).
- ◆ Rocky Mountain Poison and Drug Center at DHHA.
- ◆ The Data Analysis Unit at the Denver Police Department.
- ◆ Health and prevention specialists within Denver Public Schools.

Methods

Age categories

Injured youth are grouped into two categories (10-14 years of age and 15-19 years of age). Risk and protective factors, developmental changes and opportunities for primary prevention are similar within each of these age groups. Also, many existing data sources group age specific rates by these categories.

Rates and comparisons

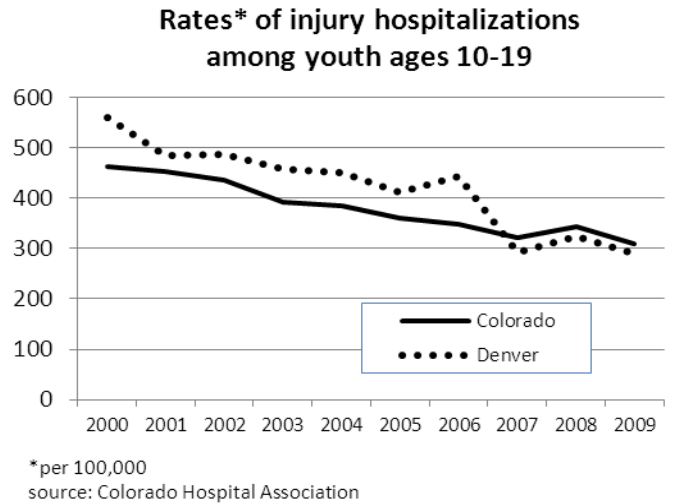
Rates of injury morbidity and mortality are actual, not weighted. Conversely, rates of behaviors related to injury are weighted to the geographic region of interest (state or city) unless otherwise noted. Comparisons that are statistically significantly different (or not) are noted in the text.

Review process

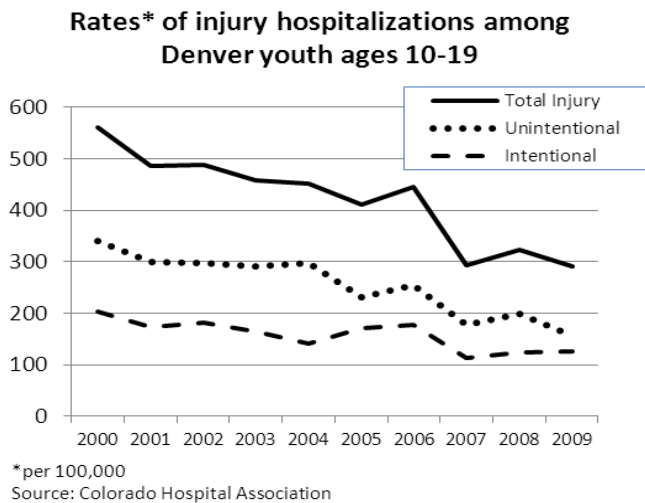
The first draft of this report was reviewed internally by DPH staff, specifically, the directors Drs. William Burman and Judith Shlay. The initial review addressed the potential audience, initial results and major formatting considerations. The second review included the initial reviewers (Dr. Judy Shlay) and an additional reviewer within DHHA. After correcting errors, omissions and redundancies, the third version was sent for review to three staff at CDPHE (injury and maternal-child health and health statistics), the DPH directors, and an additional, new reviewer from within DHHA.

Section II: Overall Burden and Trends

Over the past decade, the state of Colorado and the city and county of Denver have taken great strides to reduce injury among Coloradans of all ages. The effects of these efforts are reflected in the injury hospitalization rates of youth ages 10-19, which have been trending downward since 2000 (figure at right). The reduction is particularly profound for Denver, which has seen a rate reduction of almost 50%.



By type of injury: intentional vs. unintentional



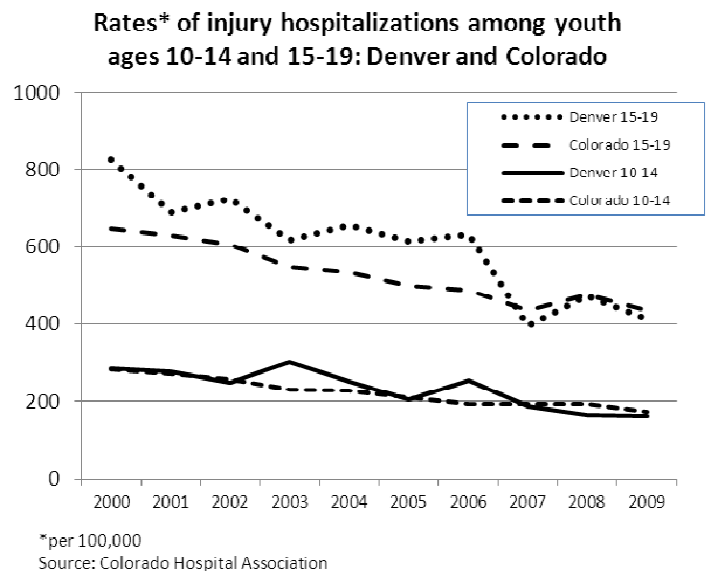
Hospitalizations due to both types of injuries are decreasing among Denver youth ages 10-19 (figure at left):

- ◆ From 2000 to 2009, the rate of unintentional injury hospitalizations decreased by 54% while the rate of intentional injury hospitalizations decreased by 38%.
- ◆ The gap between rates of intentional and unintentional injuries was wide at the beginning of the surveillance period (2000) but narrows considerably by 2009.

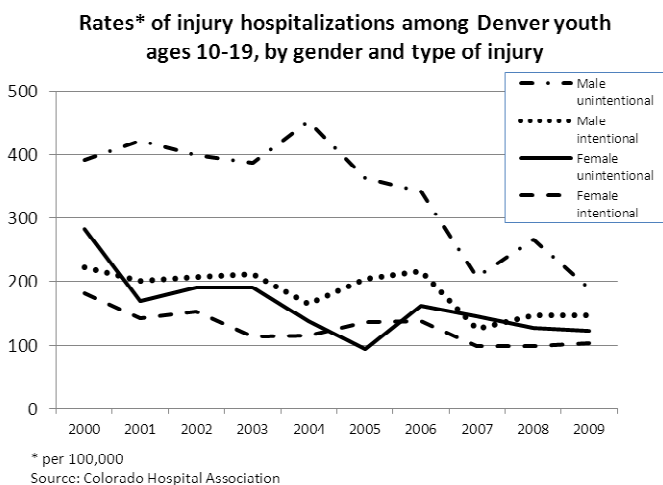
By age

The figure (at right) shows the rate of injury hospitalizations among Denver and Colorado youth, by age group. Of note:

- ◆ Rates among youth aged 15-19 are 2 to 3 times greater than the rates among 10 to 14 year olds in Denver and the state of Colorado.
- ◆ The downward trend from 2000 to 2009 is consistent for both Colorado and Denver and the two age groups.
- ◆ Among 15-19 year olds, the rate of injury was higher in Denver than the state but in 2007, the rates appear to converge.



By gender



The figure to the left reveals differences by gender and the intent of the injury:

- ◆ The rate of hospitalizations for unintentional injury among boys is considerably higher than the rate of hospitalizations for intentional injuries.
- ◆ While the ratio of unintentional to intentional injuries among boys is high, among girls, there is no difference between the rates of intentional and unintentional injuries.
- ◆ For both genders, the rate of unintentional injuries has decreased by approximately 50%.

When examining the burden (or number) of hospitalizations by age among Denver youth, there is a significant difference by age:

- ◆ Older youth suffer a significantly higher number of injury hospitalizations than younger youth.
- ◆ Among youth ages 10-14, almost 1 in 4 injury hospitalizations are the result of an intentional injury.
- ◆ Among older youth, significantly more hospitalizations (almost half) are due to an intentional injury.

Number of hospitalizations among Denver and Colorado youth by age and type of injury, 2000-2009

Injury Type	10-14		15-19	
	number	% of total	number	% of total
Unintentional	593	77%	1,119	56%
Intentional	178	23%	885	44%
Total	771	100%	2,004	100%

Source: Colorado Hospital Association

Injuries that result in death

Rates of death* among Denver and Colorado youth ages 10-14 and 15-19 years old by type of injury, 2000-2009

Injury Type	10-14		15-19	
	Denver rate (n)	Colorado rate (n)	Denver rate (n)	Colorado rate (n)
Unintentional	6 (18)	7 (210)	22 (70)	30 (994)
Intentional	5 (15)	3 (108)	25 (79)	18 (601)
Total	11 (33)	10 (318)	47 (149)	48 (1,595)

*per 100,000

Source: Colorado Vital Records

Total injury mortality rates are about the same for Denver and the state for both age groups (table at left) however;

- ◆ Rates due to both types of injury are higher among the older age group for both Denver and Colorado.
- ◆ When comparing Denver and Colorado rates, the difference is more pronounced among older age groups: Denver's unintentional injury mortality rate among 15 to 19 year olds is almost one third lower than the state rate, although the intentional injury mortality rate is about 25% higher than the state.

- ◆ Across both age categories and geographic locations, girls are significantly less likely to die from an injury than boys (data not shown).
- ◆ When comparing the type of injury: for Denver youth of both age categories, the mortality rate due to intentional injury is about the same as the mortality rate due to unintentional injury. For the state, the mortality rate due to unintentional injury is higher than the mortality rate due to intentional injury.

A note about race, ethnicity and injury surveillance data

Injury surveillance data, in general, does not allow reliable estimates by race and ethnicity. While limited coding options and inaccurate coding contribute to misclassification, it is hard to estimate the scope of these errors. However, missing data is easily quantified and subsequently, well-documented. For example, the CDC’s Web-based Injury Statistics Query and Reporting System (WISQARS) (8) does not recommend queries by race/ethnicity because approximately 17% of cases, nation-wide, are missing this information. Similarly, 21% of Colorado injury hospitalization cases reported through COHID for youth aged 10-19 are missing race and ethnicity.

The ratio of type of injury hospitalizations (2000-2009) among Denver youth ages 10-19, by race/ethnicity

Race/ Ethnicity	Unintentional n	Intentional n	Ratio of Unintentional to Intentional
White	474	216	2.2
Black	199	169	1.2
Hispanic	552	356	1.6
Other	102	69	1.5
Unknown	359	221	1.6

Source: Colorado Hospital Association

The ratio of type of injury visits (2000-2009) among DHHA youth ages 10-19, by race/ethnicity

Race/ Ethnicity	Unintentional n	Intentional n	Ratio of Unintentional to Intentional
White	5,674	1,375	4.1
Black	2,824	1,128	2.3
Hispanic	13,184	4,012	3.3
Other	489	169	2.9
Unknown	389	173	2.2

Source: DHHA

Despite the high proportion of missing data (21%), if it is assumed that the reasons for missing data are systematic over time and are equally likely to be missing for all race/ethnicity groups, it is reasonable to look at the ratio of type of injury by race and ethnicity. The table to the left indicates that:

- ◆ Among white children, for every child hospitalized for an intentional injury, two are hospitalized for an unintentional one.
- ◆ Conversely, among black children, for every unintentional injury hospitalization, close to one is hospitalized for an intentional injury while Hispanic children and those in the remaining categories are in between that of white and black children.

For outpatient and emergency department visits to DHHA facilities (table at left), all race/ethnicity groups show a higher ratio of unintentional to intentional injury visits. Rankings are similar to those seen with hospitalizations (chart above), with white children having the highest ratio, and black children having the lowest.

Research about race and ethnicity and risk of injury among children

A number of recent reports and publications might provide additional information about risk of injury by race and ethnicity. Over 2000 to 2005, the CDC issued a report that Native American boys suffered the highest death rate from unintentional injury, followed by White and Black boys and Native American girls. The lowest rates were among Asian children and White and Black females. Hispanic ethnicity was not reported (9). However, there is research to suggest that Latino children are at lower risk for injury requiring a health care visit than white children (10, 11), even when controlling for health insurance status. Whether this is an effect of healthcare seeking behavior among parents or degree of parental supervision is unclear (12). The same research indicates that white and black children have the highest rates of injury while Asian children have the lowest.

Summary of overall burden and trends

- ◆ Rates of hospitalizations due to injury among youth in Denver are decreasing. Specifically:
 - ✦ Both types of injury, unintentional and intentional.
 - ✦ Both age categories (10-14 and 15-19) and both boys and girls.
- ◆ Data suggest that that when hospitalized for an injury, black children are as likely to be hospitalized for an unintentional injury as for an intentional injury, white children are twice as likely to be to be hospitalized for an unintentional injury as for an intentional injury and the ratio for Hispanic children falls in between.
- ◆ Older teens (15-19 years) are more likely to be hospitalized for an injury than younger youth (10-14 years) and boys are more likely to be hospitalized than girls.
- ◆ Overall, the rate and number of injury hospitalizations and deaths are more likely to be associated with an unintentional injury but as children grow older, they are increasingly likely to be hospitalized for or die from an intentional injury.

Section II: Unintentional injury and related behavioral measures

Hospitalization rates* for unintentional injuries, Denver and Colorado youth ages 10-19, 2000-2009

	10-14		15-19	
	Denver rate (n)	Colorado rate (n)	Denver rate (n)	Colorado rate (n)
Total unintentional injury [†]	197 (593)	179 (5,799)	356 (1,119)	361 (12,086)
Transportation	73 (221)	69 (2,244)	170 (534)	186 (6,221)
Motor vehicle	54 (162)	34 (1,091)	153 (481)	146 (4,878)
Other transport	20 (59)	36 (1,153)	17 (53)	40 (1,343)
Poisoning	5 (15)	6 (193)	25 (80)	24 (786)
Fall	55 (166)	56 (1,813)	74 (232)	76 (2,533)
Natural/environmental	12 (36)	7 (237)	10 (32)	8 (280)
Other unintentional	54 (164)	40 (1,303)	80 (251)	70 (2,337)

* per 100,000

[†]Total number of unintentional injuries does not equal of the sum of specific categories because intent cannot be determined in a small number of cases and/or because one event can be classified in more than one sub-category.

Source: Colorado Hospital Association

Comparing Denver with the rest of the state

The rates of hospitalizations due to all unintentional injuries among Denver youth are not statistically different from those among Colorado youth, regardless of age (table above). However, there are geographic differences among the unintentional injuries that occur most commonly:

- ◆ The rate of hospitalizations due to motor vehicle accidents (MVA) is higher among Denver youth ages 10-14 than their counterparts state-wide. While there is an indication that the same may be true among older children, the difference is not statistically significant.
- ◆ The rate of hospitalizations due to “other” transportation accidents (this includes snowmobiles, ATVs, off-road vehicles (includes motocross) and, farm animals and machinery) is approximately half the state rate among both age groups.
- ◆ Hospitalizations due to “other” unintentional injuries (includes sport-related, over-exertion, machinery/power tools and accidental firearm-related injuries) among youth ages 10-14 are more common among Denver youth than youth state-wide. While there is an indication that the same may be true among older children, the difference is not statistically significant.

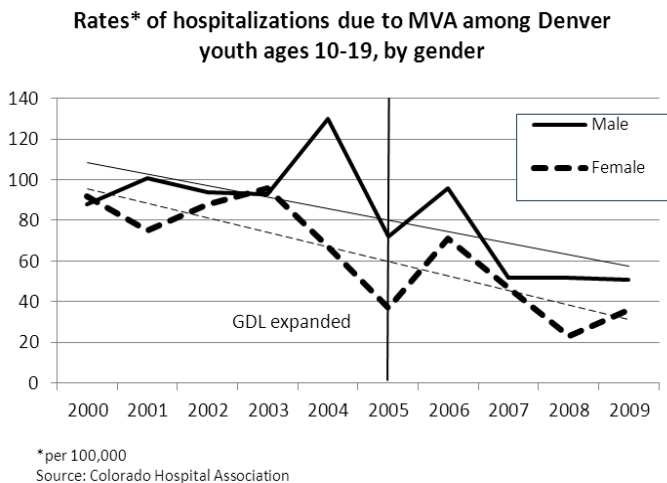
Comparing Denver youth by age

- ◆ The rate of hospitalizations for most types of unintentional injuries are higher among older youth compared to younger youth in Denver, including motor vehicle accidents, poisonings, falls and other unintentional injuries (includes sport-related, machinery/power tools and accidental firearm-related injuries).
- ◆ Among both age groups, motor vehicle accidents, falls and other unintentional injuries (includes sport-related, over-exertion, machinery/power tools and accidental firearm-related injuries) comprise the greatest proportion of the unintentional injury hospitalizations in Denver. These types of injuries are discussed in greater detail below.

Motor Vehicle Accidents

Colorado has made significant gains in motor vehicle legislation over the past decade:

- ◆ In 1999, the Colorado legislature implemented a Graduated Driver's License (GDL) process for teenagers. Teens must be 16 to attain a permit to drive however, younger teens can apply after completing a state-approved driver's education program (at age 15) or an abbreviated driver's awareness course (15 and ½). In July, 2005, the legislature strengthened the law, disallowing cell phone use, limiting the number and age of passengers and prohibiting driving between the hours of 12 AM and 5 AM for drivers under the age of 18 (13,14).
- ◆ Additional legislative gains have been made in the efforts to deter drunk driving. In 2004, Colorado lowered the blood alcohol level from 0.1 to 0.08 to be considered driving under the influence (DUI) while maintaining the 0.05 limit of driving while impaired (DWAI) (15). In 2006, Colorado Senate Bill 06-192 created the Interagency Task Force on Drunk Driving (ITFDD) which has endorsed successful and meaningful legislation (16). In 2009, Colorado mandated ignition interlock systems (breathalyzers installed in vehicles) for first time offenders and increased criminal and financial penalties for all offenders (17).
- ◆ A nationwide campaign emanating from the National Highway Traffic Safety Administration (NHTSA), *Click It or Ticket* was initiated in Colorado in 2002. Comprised of a mass media campaign and a \$65 fine as a secondary offense (i.e. if an officer stops a driver for a different offense and then observes that the driver is not using proper restraint) (18); recent legislative efforts to strengthen the law by making it a primary offense (i.e. an officer can stop a driver if he or she observes that the driver is not using proper restraint) have been unsuccessful (19).



The rates of MVA-related hospitalizations (figure at left) have fallen significantly among Denver youth who were either a driver or occupant in the motor vehicle. Of note:

- ◆ Among boys, rates began to fall in 2005 from a high of 130 per 100,000 in 2004 to 51 per 100,000 in 2009, a 60% reduction.
- ◆ Among girls, rates fell from a high of 96 per 100,000 in 2003 to 36 per 100,000 in 2009, a 67% reduction.
- ◆ 40% of MVA-related hospitalizations among Denver youth ages 10-19 from 2000-2009 resulted in a traumatic brain injury (data not shown).

Outpatient and emergency department data from Denver Health facilities confirm these conclusions. In 2000, 29% of visits were MVA-related, falling significantly to 18% in 2009.

Motor vehicle injuries that result in death

Over the last ten years, the motor vehicle mortality rate for Denver youth ages 10-19 was 9.9 per 100,000, compared to the state rate of 13.5 (table at right). This Denver rate represents 67 youth dying in car accidents during the last decade and nearly 900 dying statewide.

Motor vehicle mortality among youth ages 10-19, 2000-2009

	# of fatalities	Crude Rate*
Denver	67	9.9
Colorado	899	13.5

*per 100,000

Source: Vital Records

Behavioral risk factors for motor vehicle injuries and deaths

Risk behaviors related to unintentional injury, Colorado and Denver youth.

	Colorado YRBS 2009 (%)	Denver DHKCS 2008 (%)
Rarely or never wore a seat belt <i>(when riding in a car driven by someone else)</i>	8	15
Rode with a driver who had been drinking alcohol one or more times <i>(during the 30 days before the survey)</i>	25	24
Drove when drinking alcohol one or more times <i>(during the 30 days before the survey)</i>	7	9

Source: Colorado Youth Risk Behavior Survey, Denver Healthy Kids Colorado Survey

Data from the Colorado Youth Risk Behavior Survey (YRBS) and Denver Healthy Kids Colorado Survey (DHKCS) show that:

- ◆ Approximately 8% of Colorado and 15% of Denver students rarely or never wore a seat belt when someone else was driving.
- ◆ One quarter of high school students in Denver and Colorado rode with a driver who had been drinking alcohol, one or more times in the month preceding the survey.
- ◆ In the past 30 days, 7% of Colorado youth and 9% of Denver youth drove after drinking alcohol one or more times.

Data from the Colorado Department of Transportation (table at right) teen seat belt usage survey shows that over the last three years, Denver teens' seat belt use has remained stable (20). These data show that about one fifth or 20% of teens do not wear seat belts, which is much worse than the data from the YRBS and DHKCS (above) which reports that only 7% of Colorado teens and 15% of Denver youth rarely or never wear seat belts. The CDOT survey has consistently shown that teens in vans, SUVs and cars have a higher rate of seat belt usage than those in trucks (data not shown).

Estimated seatbelt usage by teen drivers and front seat passengers

Year	Denver %	Colorado %
2008	83	79
2009	76	81
2010	78	82

Source: Colorado Department of Transportation

A note about young, distracted drivers

The National Highway Traffic Safety Administration reports that in 2009, 16% of fatal car injuries among those under 20 involved a distraction while driving, the highest proportion of all age groups (21). Additionally, the AAA Foundation for Traffic Safety recently released a report showing that teens are 50% more likely to have an accident within the first month of getting a license, compared to the first year. Fifty-seven percent of these accidents are due to driving too fast, inattention or failing to yield to other drivers (22).

A note about sport-related injuries and external cause of injury codes

Surveillance of sport-related injuries is not standardized for two primary reasons. First, the definition of a “sport” varies by audience and intent of surveillance. Further, the codes that describe sports are not neatly categorized into major sub-categories in a manner similar to, for example, accidental poisonings. Instead, codes that describe sport-related accidents are embedded throughout sub-categories of unintentional injury. For example, accidents involving skis or skateboards are sub-categorized within “Falls” whereas a water skier who drowns might be coded under “Drowning”. Because many accidents involve motor vehicles and bicyclists, bike accidents must be pulled from the “Motor Vehicle Accident” category and most other sport-related injuries are coded under “Other Accident” and are defined by the type of injury (e.g. a fall, being struck). In summary, it is often difficult to discern exactly what type of sport-related injury has occurred and therefore, reporting is challenging. Injury hospitalization data (available through COHID) does not provide a standardized way to query sport-related injuries.

In an attempt to provide some information about injuries that result from sports, DHHA outpatient visits for unintentional injury were examined to determine the burden and distribution (by age and gender) of sport-related injuries from 2000 to 2009.

Among outpatient visits due to unintentional injuries (2000-2009) at DHHA, what proportions are sport-related?

	Number sport-related	Number non sport-related	% sport-related
10-14	1,481	6,671	18%
15-19	1,299	13,109	9%
Male	2,194	11,604	16%
Female	586	8,176	7%

Source: DHHA

Among outpatient visits due to unintentional injuries (2000-2009) at DHHA, what proportions are bicycle-related?

	Number bike-related	Number non bike-related	% bike-related
10-14	516	7,636	6%
15-19	336	14,072	2%
Male	691	13,107	5%
Female	161	8,601	2%

Source: DHHA

Among outpatient visits due to unintentional injuries (2000-2009) at DHHA, what proportions are fall-related?

	Number fall-related	Number non fall-related	% fall-related
10-14	2,301	5,851	28%
15-19	2,580	11,828	18%
Male	2,984	10,814	22%
Female	1,897	6,865	22%

Source: DHHA

Sport-related injuries are defined as those involving exercise, skates, skateboards, skis and snowboards, falls from sports, being struck in sports and diving or jumping.

Injuries for these types of sports comprise a greater amount of unintentional injury visits for those who are younger and for boys.

Although the relationships within demographics (age and gender) are the same for sport- and bike-related injury visits, it is interesting to note that overall, bike-related accidents comprise a markedly lower proportion of accidents than “sport”-related injury (8.6% vs. 27.2%).

Falls (from all causes, including sports) comprise a large proportion of unintentional injury. Of note:

- ◆ Within unintentional injury visits at DHHA, one in five (26.1%) are the result of falls.
- ◆ Younger children sustain more injury from falls than older youth.
- ◆ There is no difference by gender. For both boys and girls seen at DHHA, approximately 22% of unintentional injury visits are for falls.

Risk Behaviors related to unintentional injury

The Colorado Youth Risk Behavior Survey, conducted among Colorado high school students in 2009, and the Denver Healthy Kids Colorado Survey, conducted in 2008 in grades 6, 8, 9 and 11 surveyed youth about bicycle helmet use: 75% of Colorado youth reported rarely or never wearing a bike helmet; boys appeared slightly less likely to wear a bike helmet (78%) than girls (72%). Reports from Denver youth were consistent: 76% of Denver youth reported rarely or never wearing a bike helmet with boys less likely to wear a helmet (81%) than girls (68%) (data not shown).

A more comprehensive set of questions about behaviors related to unintentional injury are included in the Child Health Survey (CHS), which targets parents of Colorado youth who have not yet reached high school.

Colorado Child Health Survey, 2004-2006, 10-14 year olds

Injury Question	% of Colorado children	
During the past 3 months, child was injured seriously enough to get medical advice or treatment or missed school for at least half a day because of an injury?	8	
As a result of the injury, which one of the following occurred?	Child missed school for at least half a day; did not seek medical care	13
	Child went to a physician or clinic	47
	Child went to an emergency room, but not admitted to the hospital	36
	Child stayed in hospital overnight	4
What type of activity (was child doing) when injury happened?	Organized sports or athletics	29
	Riding a bicycle	10
	Other specific recreational activity	13
	Just playing	30
	Walking	5
How did the injury happen?	Other	13
	Ran into or struck by an object	11
	A person struck or ran into him/her	5
	Fell from playground equipment	1
	Fell for other reasons	57
	Overexertion	2
Where did this injury happen?	Bicycle crash	9
	Other	16
	Transportation area	1
	Home or private residence	32
	School or child care center	36
	Retail, commercial, public building	3
	Indoor or outdoor recreation area	16
Lake, river, reservoir, ditch	4	
Other	7	

Source: CDPHE

According to the Colorado Child Health Survey, approximately 8% of Colorado children 10-14 years old were injured seriously enough to stay home from school or seek medical treatment in the previous three months before the survey. Of these:

- ◆ Almost half (47%) of those who were injured went to a doctor’s office or clinic.
- ◆ More than one third (36%) went to an emergency department for the injury.
- ◆ The majority of injuries occurred while the child was playing (30%) or participating in organized sports (29%).
- ◆ Most of the injuries happened by falling (tripped while running, falling from a tree) (57%).
- ◆ School (36%), home (32%) and recreation areas (16%) were the most common places for injuries to occur.

A note about traumatic brain injury and sports among children in the US

The Centers for Disease Control analyzed non-fatal, sports-related visits to emergency departments among youth ages 10-19 from 2001 to 2009 to estimate the proportion of traumatic brain injury (TBI) by type of sport. Among boys ages 10-14 and 15-19, the sports with the greatest risk of TBI are football, bicycling and basketball (in that order). Among girls ages 10-14, the top three are bicycling, basketball and soccer and among older girls (15-19), the top three are soccer, basketball and gymnastics (23).

Summary of unintentional Injury

- ◆ The motor vehicle hospitalization rate has been declining steadily over the last decade however:
 - ✦ MVA-related injury remains a significant burden for outpatient and emergency health care visits.
 - ✦ Estimates of seatbelt use among teens are variable and indicate there is room for improvement.
 - ✦ Drinking while driving or riding in a car with someone who has been drinking is not uncommon.
- ◆ In addition to MVA-related injuries, the most common unintentional injuries are falls and “other “ unintentional injuries which include sport-related injuries;
 - ✦ Among younger youth, most falls occur during sports or recreation activities.
 - ✦ Three out of four youth ages 15-19 report never or rarely wearing a helmet when riding a bike; estimates regarding the use of protective gear during other sporting activities (such as football and snowboarding) are not available.
 - ✦ Outpatient visits for falls comprise the same proportion of injury visits for boys and girls but visits for sports and bike-related injuries comprise a greater proportion for boys than girls.
- ◆ Although DHHA hospital data indicate that while younger youth (10-14) are more likely to seek outpatient and emergency care for unintentional injuries such as falls and sport-related injuries, older teens (15-19 years) are more likely to be hospitalized for an unintentional injury.

Section II: Intentional injury and related behavioral measures

Hospitalization rates* for intentional injuries,
Denver and Colorado youth ages 10-19, 2000-2009

	10-14		15-19	
	Denver rate (n)	Colorado rate (n)	Denver rate (n)	Colorado rate (n)
Total intentional injury	59 (178)	37 (1,203)	281 (885)	165 (5,678)
Suicide/self-inflicted	37 (111)	31 (997)	128 (403)	118 (4,069)
Assault/legal intervention	22 (67)	7 (209)	153 (482)	47 (1,628)

*per 100,000

Source: Colorado Hospital Association

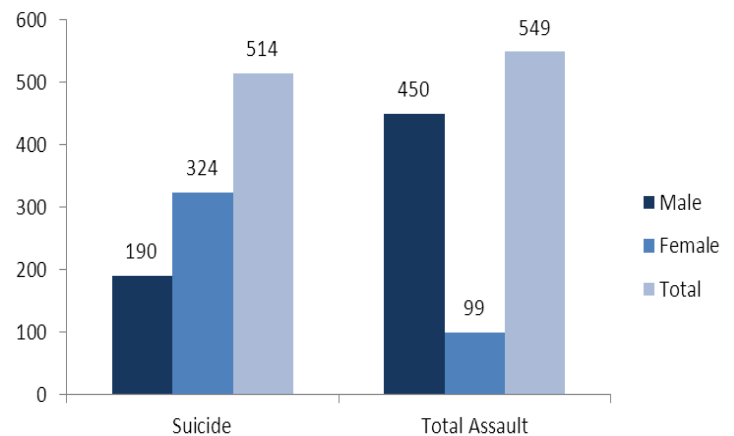
- ◆ Compared to state-wide rates (table at left), the rates of hospitalizations due to intentional injury are higher in Denver among both age groups; the difference is driven largely by assaults.
- ◆ The rates of assault hospitalizations are three times higher in Denver compared to the state across both age groups.
- ◆ Suicide related hospitalization rates are the same for Denver and the state but are nearly four times higher among the older youth than those aged 10-14.

Denver hospitalizations for intentional injury (figure at right) among youth ages 10-19 over the past decade show that:

- ◆ The number of hospitalizations for suicide attempts or intentional self-harm and for assaults is nearly equal.
- ◆ 63% of hospitalizations for suicide attempt are among girls.
- ◆ 82% of hospitalizations for assaults are among boys.

When looking more closely at the 450 assault hospitalizations among boys ages 15-19, 159 (37%) involved a firearm, 100 (23%) involved a knife, 98 (32%) were the result of an unarmed brawl and the remainder were classified as "other" (being hit by a blunt object, human bites, being pushed or use of an airgun).

Number of intentional injury hospitalizations, by type, among Denver youth ages 10-19: 2000-2009



Source: Colorado Hospital Association

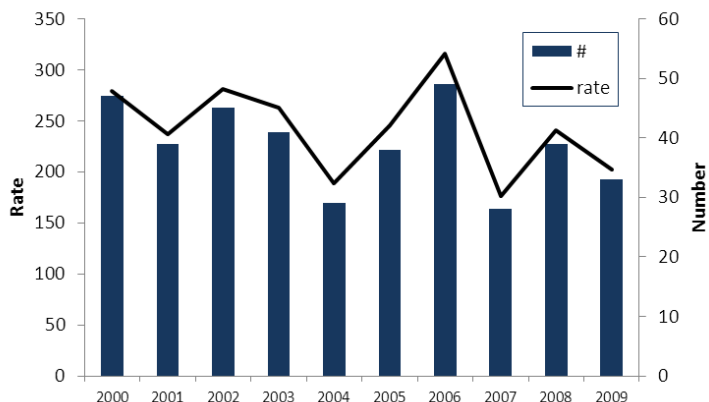
Outpatient and emergency department data from DHHA clinics and hospital paint a different picture: among 10-19 year old boys, 96% of intentional injury visits from 2000 to 2009 were the result of assault although the majority did not involve a weapon: 13% involved a knife and 11% involved a firearm. Among girls over the same time period, assault was quite prevalent, with 66% of intentional injury visits being the result of a fight and 8% involving a weapon. Girls are more likely to receive outpatient care for rape and child abuse: almost one in five (19%) injuries were the result of rape and slightly more than one in six (16%) were the result of child abuse.

Assault and Homicide

Among Denver boys ages 15-19, most hospitalizations are due to assault. A closer look over time reveals that (figure at right):

- ◆ While the trend is downward, annual rates are not stable.
- ◆ The number of assault hospitalizations varies widely over this time frame, ranging from 28 to 49 per year.
- ◆ Of the 388 hospitalized boys, 11 (3%) died and 75 (19%) suffered a traumatic brain injury.

Rate* and number of hospitalizations for assault among Denver boys aged 15-19



*per 100,000
Source: Colorado Hospital Association

Youth homicide rate*, 2000-2009

	10-14	15-19	10-19
	Rate (n)	Rate (n)	Rate (n)
Denver	2 (6)	13 (43)	7 (49)
Colorado	1 (28)	5 (183)	3 (211)

*per 100,000

Source: CDPHE, Vital Statistics

The youth homicide rate in Denver is more than twice the rate for the state, for both age groups. In the past decade, 49 Denver youth were killed and 211 were killed statewide. The majority of these homicides involved firearms and the majority of victims were boys.

Firearms

Hospitalization rates* for all fire-arm** related injuries, Denver and Colorado youth ages 10-19, 2000-2009

	10-14		15-19	
	Denver rate (n)	Colorado rate (n)	Denver rate (n)	Colorado rate (n)
Firearm-related**	6 (19)	2 (68)	61 (191)	16 (544)

*per 100,000

** Firearm-related injuries can be either suicide, assault or unintentional

Source: Colorado Hospital Association

Fire-arm related hospitalizations (table at left), whether the result of an unintentional injury (accident), suicide or assault, indicate that:

- ◆ The rate of fire-arm hospitalizations among older youth is four times higher in Denver compared to the state.
- ◆ From 2000 to 2009, youth ages 15-19 in Denver have the highest rate of fire-arm related hospitalizations of any other age group (data not shown).

Risk behaviors related to intentional injury: Bullying

In 2001, in response to the events at Columbine High School in 1999, the Colorado legislature passed the Colorado Bullying Prevention Act, requiring all school districts to adopt a mission statement that includes safety as a priority. The legislation also requires each district to develop a safety plan and a conduct and discipline code (24). Further, the law requires that each district submit an annual report to the Colorado Department of Education describing all bullying prevention programs implemented within the district.

The Blueprints for Bullying Prevention defines bullying as (25):

- ◆ Aggressive behavior of intentional “harmdoing”.
- ◆ Repeatedly carried out over time.
- ◆ An interpersonal relationship characterized by an imbalance of power.

Behavioral risk factors related to intentional injury:
Colorado and Denver youth

	Colorado YRBS 2009 (%)	Denver DHKCS 2008 (%)
Bullied on school property *	19	38
Did not go to school because they felt unsafe at school or on their way to / from school on at least 1 day **	5	11
Carried a weapon on school property on at least 1 day (for example, a gun, knife, or club)**	6	9
Threatened or injured with a weapon on school property one or more times (for example, a gun, knife, or club)*	8	9
In a physical fight one or more times*	32	38
In a physical fight on school property one or more times *	11	22
Injured in a physical fight one or more times (injuries had to be treated by a doctor or nurse)*	4	9

* during the 12 months before the survey

** during the 30 days before the survey

- ◆ Additionally, in the past year, about 8% of students were threatened or injured with a weapon on school property. Males were more likely to be threatened or injured (11% CO, 12% Denver) than females (5% CO, 6% Denver).
- ◆ Almost one in three students in Colorado and nearly 2 in 5 (38%) students in Denver reported being in a physical fight one or more times in the year before the survey; males were almost twice as likely (42% CO, 47% Denver) as females (22% CO, 29% Denver) to be in a fight.
- ◆ Physical fights are less common on school grounds but not unusual: more than 10% of Colorado students and 22% of Denver students reported being in a physical fight on school property one or more times; males were much more likely to report fighting at school (16% CO, 30% Denver) than females (5% CO, 14% Denver).
- ◆ In the year before the survey, 4% of Colorado students and 9% of Denver students were injured in a fight and needed medical treatment. There is no difference in the rates between males and females.

Risk behaviors related to intentional injury: Alcohol

Alcohol: a risk factor for many types of injury

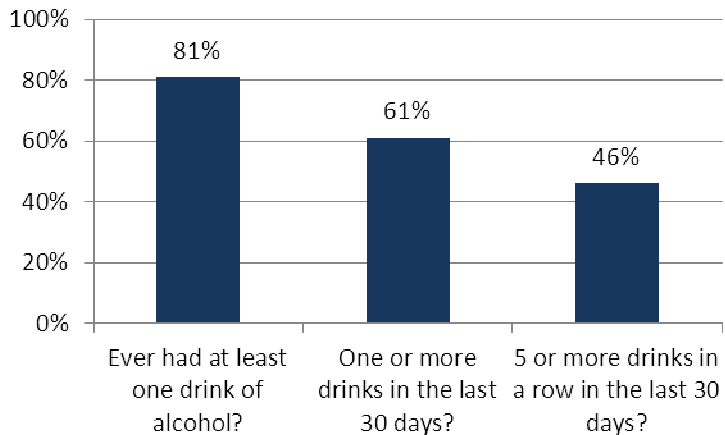
According to a recent study by the World Health Organization, half of all alcohol-related deaths are the result of injury (26). We have reported on the use of alcohol among teens when driving or riding as a passenger in a motor vehicle but in addition, alcohol is a risk factor for falls, firearm-related injuries and assault, including sexual assault. In fact, alcohol is increasingly implicated as one of the most common date-rape drugs; it is effective, socially acceptable and easily accessible. Teasing out the contribution of alcohol in injury surveillance data and hospital data is not straight-forward. However, survey data do give an idea of behaviors among Denver and Colorado youth and present an alarming situation that should be a call to action.

The Youth Risk Behavior Survey (YRBS) conducted among high school youth in Colorado and Denver Healthy Kids Colorado Survey (DHKCS) conducted among 6th, 8th, 10th and 11th graders in Denver collect data for behaviors and experiences related to bullying, fighting and carrying weapons on school property. Data suggest that there is a higher prevalence of violent behaviors in Denver than the state as a whole:

- ◆ In the past year, almost 19% of Colorado high school students and 38% of Denver youth have been bullied on school property.
- ◆ In the 30 days preceding the survey, 5% of Colorado students and 11% of Denver students did not go to school at least once because they did not feel safe at school or on the way to or from school.
- ◆ In the 30 days preceding the survey, almost 6% of Colorado high school students and 9% of Denver students carried a weapon on school property. Males were more likely to do so than females (CO males: 8%, CO females: 3%, Denver males: 15%, Denver females: 5%).

Estimates from the 2009 YRBS conducted state-wide indicate that 72.4% of Colorado youth ages 15 to 19 reported having ever consumed alcohol while 41% drank in the last 30 days. Data from the 2008 Denver Healthy Kids Colorado Survey (DHKCS) indicates that 50% of Denver youth in grades 6 through 11 ever consumed alcohol with approximately 30% reported drinking in the past 30 days. Both reports show a direct relationship between age and alcohol consumption: consumption and frequency increase with age or grade.

Drinking behaviors among 11th graders in Denver: 2008



Source: Denver Health Kids Colorado Survey

Results to the left indicate that Denver youth are abusing alcohol. Among 11th graders:

- ◆ 4 out of 5 have ever consumed alcohol.
- ◆ 3 out of 5 have had at least one drink in the past 30 days.
- ◆ 46%, almost half, have engaged in binge drinking in the past 30 days.
- ◆ Drinking increases with age but there is little difference between boys and girls (data not shown).
- ◆ Reports of ever using alcohol are higher than all other substances including marijuana, ecstasy or prescription drugs (data not shown).

Sexual violence

Sexual violence is not uncommon. One in six women and one in thirty-three men report an attempted or completed forced sexual act sometime in their lives. Moreover, it is estimated that 50% of female victims and 70% of male victims are raped before their 18th birthday, usually by someone who is known or related to them (27). Youth in Denver and state-wide, both male and female, are at risk.

Data from the Colorado Youth Risk Behavior Survey (YRBS) and the Denver Healthy Kids Colorado Survey (DHKCS) shows that (table at right):

- ◆ More than 9% of Colorado high school students and 13% of Denver youth reported being hit, slapped or physically hurt on purpose by their boyfriend or girlfriend. Males were significantly more likely to report this (11.2%) than females (6.9%) in Colorado, but in Denver there was no difference.

Risk behaviors related to sexual violence, Colorado and Denver youth

	Colorado YRBS 2009 (%)	Denver DHKCS 2008 (%)
Hit, slapped, or physically hurt by their partner*	9	13
Ever physically forced to have sexual intercourse	8	11

* during the 12 months before the survey

- ◆ Nearly 8% of Colorado students and 11% of Denver students reported that they had been physically forced to have sexual intercourse at least once. Females were significantly more likely (11%) than males (4%) to report forced sex in Colorado, but in Denver there was no difference.

Outpatient visits at DHHA for rape among youth

From 2000 to 2009, 461 Denver Health visits among youth aged 10 to 19 included the ICD9 code for rape. Of these, 445 (97%) occurred among girls and more specifically, 308 (67% of rape-related visits) occurred among girls aged 15-19 while 137 (30%) occurred among younger girls aged 10-14.

Suicide

Suicide rates in Colorado have consistently been among the highest in the country. In 2000, the Office of Suicide Prevention (OSP) was created within CDPHE and has worked to provide cohesion for the state's fragmented awareness, prevention and support groups (28). The OSP has also created a crisis phone line (Lifeline) and provided surveillance, training and funding to agencies and community-based organizations throughout the state. Focus is primarily on high-risk populations which include working-aged men, the elderly and gay, lesbian, bisexual and transgender (GLBT) youth.

Gender-specific hospitalization and mortality rates* due to suicide, 2000-2009

	Male		Female	
	Denver Rate (n)	Colorado Rate (n)	Denver Rate (n)	Colorado Rate (n)
Hospitalizations	61 (190)	51 (1,780)	107 (324)	105 (3,411)
Deaths	9 (29)	11 (382)	4 (13)	3 (109)

* per 100,000

Source: CDPHE, Vital Statistics

Consistent with research and surveillance data nation-wide, the table above indicates that girls in Denver and Colorado are more likely to be hospitalized for a suicide attempt but boys are more likely to complete a suicide. Additionally:

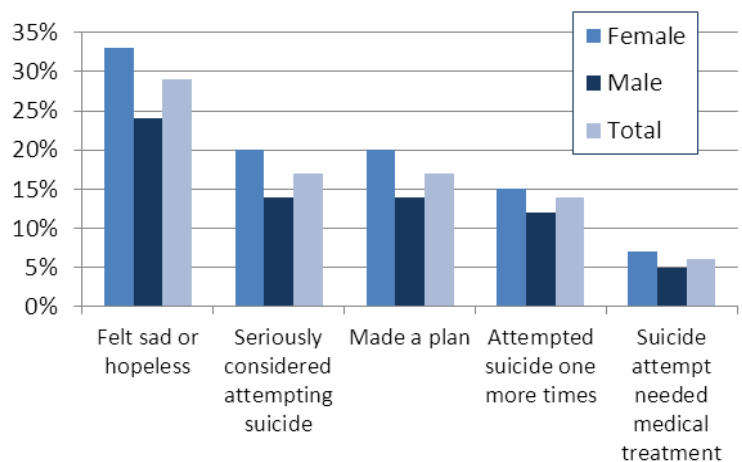
- ◆ There is no difference in rates between Denver and the state except hospitalizations among boys: boys in Denver are more likely to be hospitalized for a suicide attempt than boys statewide.
- ◆ During the past decade, 42 Denver youth and 491 youth in Colorado lost their lives to suicide.

Risk behaviors related to suicide

Also consistent with risk behaviors reported nation-wide, in comparison to boys, girls are more likely to report suicide-related risk behaviors. Data from the 2008 Denver Healthy Kids Colorado Survey (DHKCS) show:

- ◆ 29% of Denver youth felt sad or hopeless almost every day for two or more weeks.
- ◆ 17% of Denver youth seriously considered attempting suicide, and the same proportion made a plan.
- ◆ 14% attempted suicide at least one time in the past year and 6% required medical treatment.

Suicide risk behaviors in the past year*:
Denver youth, 6th-11th grade



Source: Denver Healthy Kids Colorado Survey

How do suicide risk behaviors among Denver youth compare to Colorado youth?

2009 estimates from the Colorado Youth Risk Behavior Survey (YRBS), weighted to the state of Colorado, are consistently lower than Denver estimates presented above: where 17% of Denver youth reported making a suicide plan, 11% of Colorado youth report the same. Likewise, while 14% of Denver youth made at least one attempt and 6% required medical attention, 8% of Colorado youth made an attempt and 3% required medical care.

Summary of intentional Injury

- ◆ Intentional injury hospitalization and mortality rates are higher in Denver than the state as a whole. This is in contrast to the rates of hospitalization for unintentional injuries which are about the same.
- ◆ Among 15-19 year olds in Denver, the rate of hospitalizations due to assault/legal intervention are comparable to the rate of hospitalizations for motor vehicle accidents.
 - ✦ At DHHA clinics and hospital, 96% of outpatient/emergency department visits for intentional injuries among 15 to 19 year olds involve assault.
 - ✦ Reports of bullying and fighting are generally more prevalent among Denver boys than girls but girls are not immune: in 2008, 1 in 5 girls reported having been in a physical fight in the last year.
- ◆ Suicide mortality rates among Denver youth are comparable to state rates but hospitalization rates for a suicide attempt are higher among boys in Denver compared to those state-wide. The striking differences occur by gender:
 - ✦ Girls are more likely to report risk behaviors related to suicide
 - ✦ Girls are more likely to be hospitalized for a suicide attempt.
 - ✦ Boys are more likely to complete a suicide attempt
- ◆ One in 10 Denver middle and high school youth report having been a victim of sexual violence. Although hospitalization for rape is rare:
 - ✦ At DHHA clinics and hospital, 1 in 6 outpatient/emergency department visits for intentional injuries among girls is due to sexual assault.
- ◆ Alcohol use and abuse is highly prevalent among Denver youth:
 - ✦ One in two Denver youth between the grades of 6 and 11 report ever having had alcohol and one in three reports having had a drink in the past 30 days.
 - ✦ Almost 1 in 2 eleventh graders drank 5 or more drinks on one occasion in the past 30 days.

Section III: Recommendations

Areas of focus:

Results in this report identify many areas that warrant prevention efforts. To begin, we recommend a focus on four key areas. We include an example of work that could be done:

- ◆ Reduce motor vehicle accidents among all youth by advocating for strengthened motor vehicle legislation.
- ◆ Reduce falls and sports-related injuries among all youth, with a focus on those ages 10-14, by building on momentum initiated by the Safe Routes to School program. This could include a partnership with Denver Public Schools and Colorado Department of Transportation to improve the safety of public access routes, intersections, playgrounds and the environments surrounding public schools and common playgrounds.
- ◆ Reduce assaults by working with schools and community-based organizations that promote positive youth development policies and programs in an effort to reduce bullying and teen date violence.
- ◆ Reduce alcohol-related injuries by working with the community to raise awareness about the scope of the problem, and develop policies and programs to target the problem.

Established efforts in public health that focus on the Core Functions and Essential Services (see introduction) are now combining with policy and funding directives to move resources toward strategies that are meaningfully collaborative and population-based. Within each of the focus areas, we recommend that the next step for Denver Public Health is to identify and convene public and private stakeholders that share common goals, objectives, efforts and target populations. Once strong partnerships are established, the department can help to develop shared agendas and assist with prioritization to allow greater synergy, efficiency and ideally, improved outcomes. Potential and existing partners currently working within the community include (by area of focus):

Motor vehicle injuries:

- ◆ The Interagency Task Force on Drunk Driving (Colorado Department of Transportation).
- ◆ Colorado Department of Transportation.
- ◆ Mothers Against Drunk Driving (MADD).
- ◆ The DHHA Injury Prevention Committee (Denver Public Health).
- ◆ Denver Public Schools.

Falls and sports-related injuries:

- ◆ Safe Routes to School (Denver Public Health, Denver Public Schools, Denver Department of Public Works).
- ◆ Denver Public Schools.
- ◆ Denver Housing Authority.
- ◆ Colorado Department of Transportation.
- ◆ The DHHA Injury Prevention Committee (Denver Public Health).
- ◆ Living Streets (Denver Department of Public Works).
- ◆ Denver's Bike Program (Denver Department of Public Works).

Intentional injuries:

- ◆ Project Pave.
- ◆ The Conflict Center.

- ◆ The Piton Foundation.
- ◆ Colorado Department of Public Health and Environment.
- ◆ The Gang Reduction Initiative of Denver (GRID) and the Pediatric Emergency Department within DHHA.
- ◆ Denver Public Schools.

Alcohol use and abuse:

- ◆ The Interagency Task Force on Drunk Driving (Colorado Department of Transportation).
- ◆ Mothers Against Drunk Driving (MADD).
- ◆ DHHA.

Recommendations regarding data and surveillance

As part of the core functions of public health, surveillance allows us to identify the needs of a community and also allows us to determine whether or not our efforts are effective. While much of the surveillance data presented in this report can be triangulated to provide a decent snapshot of the state of injury among Denver’s youth, reliable estimates are missing for some injuries and risk and protective factors. Making recommendations within the context of existing data collection systems (e.g. YRBS) identifies areas of missing data while negating the need to create new systems and in some cases, necessary partnerships and procurement of funds. The following list highlights the most immediate needs and at times, the most easily attainable.

- ◆ Youth Behavior Risk Survey/Denver Healthy Kids Colorado Survey

The Youth Risk Behavior Survey (YRBS) is a statewide survey conducted among high school students at randomly selected schools throughout Colorado. Administered by CDPHE, the YRBS is conducted in odd-numbered years and monitors six types of health-risk behaviors that contribute to the leading causes of death and disability among youth and adults, including: behaviors that contribute to unintentional injuries and violence, tobacco use, alcohol and other drug use, sexual risk behaviors, unhealthy dietary behaviors, physical inactivity and the prevalence of obesity and asthma. Data from YRBS can be used to determine the prevalence of health risk behaviors and to assess whether health risk behaviors increase, decrease, or stay the same over time. Data and reports are available from CDPHE.

Although the survey has been conducted every other year since 1999, weighted estimates for the state of Colorado are available for 2005 and 2009 only. Estimates for Denver are not as easily available. In 2008, Denver Public Schools completed a district-wide Healthy Kids Colorado Survey with that included some YRBS questions and additional questions about self-worth, personal aspirations and social support systems. These data allow for more reliable estimates of risk behaviors among Denver high-school and middle school aged youth. Currently, the 2008 data are the only available district-wide health and risk behavior data. Over the 2011/2012 school year, DPS is conducting the Healthy Kids Colorado Survey in Denver public middle and high schools, intending to garner a sample size that will allow reliable estimates for Denver and possibly sub-populations within Denver. Denver Public Health has contributed financially to this effort in 2011/2012. DPH should encourage DPS to conduct the survey regularly to obtain trends over time.

- ◆ Guidelines for Adolescent Preventive Services (GAPS) health risk assessment tools

Developed by the American Medical Association in 1997, the guidelines include assessment tools to collect information on adolescent behaviors and risk factors. All community health service clinics that see adolescents and all school-based health clinics within DHHA administer the health risk assessment among youth aged 11 to 17. Particular to injury there are questions relating to weapons, violence, safety and emotions. Specifically a few items

address risk factors such as having weapons in the home; carry a weapon for protection, worrying about violence or safety, having been in a physical fight, wearing a seat belt, wearing a helmet, suicide ideation and depression.

Currently the GAPS tools are used for clinical, not epidemiologic purposes: the paper surveys are scanned into the electronic medical record. Having these data in electronic form would allow for analysis of the data and to provide an assessment of the risk and protective factors of the adolescent patient population served by DHHA clinics. It is anticipated that when DHHA develops a comprehensive electronic health record, these data will be collected electronically. It is not clear if historic data will be converted.

◆ Child Health Survey

The Colorado Child Health Survey is a telephone survey that is conducted among respondents who have participated in the BRFSS and report having a child aged 1-14 years old. The survey was designed to fill a gap about risks and behaviors in this age group. It asks questions about the child's behavior, risk factors, health care access and other health issues. Some questions are asked every year while other questions are asked only in specific years. Since it is a state-wide survey, the sample for Denver County is small, averaging only 111 surveys per year (1-14 year olds) and only 37 surveys for the 10-14 year old age group. Although the survey has been done every year since 2004, the sample size is too small to determine estimates for Denver, even by aggregating years since none of the questions were asked for more than four years. Given the small sample size in Denver County for this survey, responses to most questions do not allow for conclusions or meaningful program planning. Denver Public Health should consider the cost and feasibility of garnering resources to add new questions or support the consecutive inclusion of questions over 3 or more years and or oversample Denver on the BRFSS, from which the Child Health Survey is derived.

◆ Expansion of the Colorado Injury Hospitalization dataset to include all emergency department visits

The Colorado Hospital Association (CHA) has begun to collect emergency department data with the vision of providing access to the public in a manner identical to that of the current Colorado Injury Hospitalization dataset available on COHID at CDPHE. Starting in 2010, hospitals submitted data to the CHA voluntarily with approximately 75% of the hospitals in the state doing so. It is important to note that Children's Hospital did not participate at this time. Starting in 2011, all hospitals started submitting data and CDPHE anticipates public access (pending procurement of adequate funds) in 2014. In addition to providing the benefits of a complete (and therefore representative) picture of ED injury data, it is possible that this will provide an opportunity to break out, in more detail, sport-related injury. To date, these data have been unusable data because of the awkward coding system in the ICD-9 addendum. Further, it is hoped that race and ethnicity will be included for a greater proportion of cases, thereby providing a more accurate assessment of injury risk by racial and ethnic populations.

◆ Mapping

Denver Public Health has the expertise, software and technical assistance to map injury, risk and protective factors by geographic area within the city. When data are available, maps allow identification of areas of need, location of health care facilities and can be used as a tool of persuasion in legislative arguments.

◆ Elucidate identified problems through additional analyses

Data sources from the Denver Police Department, the coroner's office, and community task forces, among others, provide an opportunity to further investigate the problems identified in this report. Denver Public Health should engage partners in these investigations as it has begun to do with the Community Health Assessment in the fall of 2011.

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Appendix A

External Cause of Injury Codes

Mechanism of Injury	Codes for emergency department and outpatient visits, hospitalizations and deaths
Hospitalizations with mechanism mentioned	E800-848, E850-869, E880-928, E950-958, E960-968, E970-976, E980-988
Total unintentional injury	E800-848, E850-869, E880-928
Transportation	E800-848
Railway	E800-807
Railway employee/passenger	E800-807 (.0-. 1)
Pedestrian	E800-807 (.2)
Bicyclist	E800-807 (.3)
Motor vehicle traffic	E810-819
Motor vehicle occupant	E81 0-819 (.0-.1, .9)
Driver	E810-819 (.0)
Passenger	E810-819 (.1)
Motorcyclist	E810-819 (.2-.3)
Driver	E810-819 (.2)
Passenger	E810-819 (.3)
Bicyclist	E810-819 (.6)
Pedestrian	E810-819 (.7)
Rider of animal or occupant of animal-drawn vehicle	E810-819 (.5)
Motor vehicle non-traffic	E820-825
Motor vehicle occupant	E820-825 (.0-.1, .9)
Driver	E820-825 (.0)
Passenger	E820-825 (.1)
Motorcyclist	E820-825 (.2, .3)
Driver	E820-825 (.2)
Passenger	E820-825 (.3)
Bicyclist	E820-825 (.6)
Pedestrian	E820-825 (.7)
Snowmobile driver/passenger	E820 (.0-. 1, .9)
Rider of animal or occupant of animal-drawn vehicle	E820-825 (.5)
Other road vehicle crashes	E826-829
Pedestrian	E826-829 (.0)
Bicyclist	E826-829 (.1)
Rider of animal or occupant of animal-drawn vehicle	E826-829 (.2-.3)
Water transport	E830-838
Occupant of watercraft	E830-838 (.0-.3)
Water-skier/swimmer	E830-838 (.4-.5)
Air transport	E840-845
Occupant of aircraft/spacecraft	E840-845 (.0-.7)
Other transport related	E846-848

Mechanism of Injury	Codes for emergency department and outpatient visits, hospitalizations and deaths
Drowning	E830, E832, E910
Water transport-related	E830, E832
Non-water transport-related	E910
Recreational	E910 (.0-.2)
Bathtub	E910.4
Poisoning	E850-869
Heroin/opiates/narcotics	E850 (.0-.2)
Aspirin	E850.3
Aspirin	E850.3
Barbiturates	E851
Tranquilizers	E853
Other psychotropic agents	E854
Alcohol	E860
Carbon monoxide	E867-868
Fall	E880-888
From stairs/steps	E880
From ladders/scaffolding	E881
From building/structure	E882
Into a swimming pool	E883.0
Into a well/manhole/hole	E883 (.1 -.2, .9)
From playground equipment	E884.0
From cliff	E884.1
From chair/furniture (not bed)	E884 (.2, .5)
From wheelchair	E884.3
From bed	E884.4
From commode	E884.6
On same level, by slipping, tripping, or stumbling	E885
Roller skates, in-line skates (since 2001)	E885.1
Skateboard (since 2001)	E885.2
Skis (since 2001)	E885.3
Snowboard (since 2001)	E885.4
On same level by collision, pushing, shoving, by or with other person (including in sports)	E886
Other unspecified fall	E884.9, E887-888
Fire/burn	E890-899, E924
Fire/burn due to flames	E890-899
House fires	E890
From ignition of clothing	E893
Scalds/caustic substances/hot objects	E924
Natural/environmental	E900-909
Excessive cold (weather)	E901 .0
Hunger, thirst, exposure, and neglect	E904
Venomous snakes/lizards	E905.0
Venomous spiders	E905.1
Hornet, wasps, bees	E905.3

Mechanism of Injury	Codes for emergency department and outpatient visits, hospitalizations and deaths
Dog bite	E906.0
Cat/rodent (except rat) bite	E906.3
Other animal-related Injury, not being ridden	E906.8
Lightning	E907
Struck by or against	E916-917
Struck by falling object	E916
Striking against or by objects/ persons (including in sports)	E917
Machinery/cutting instrument	E919-920
Machinery	E919
Agricultural machines	E919.0
Lifting machines	E919.2
Woodworking/forming machines	E919.4
Cutting and piercing instruments	E920
Powered lawn mower	E920.0
Powered hand tools	E920.1
Knives, swords, daggers	E920.3
Other hand tools/implements	E920 (.4-.5, .8-.9)
Other unintentional	E911-915, E918, E921-923, E925-928
Aspiration/suffocation	E911-913
Foreign body	E914-915
Caught in or between objects	E918
Firearms/Airguns	E922
Handgun	E922.0
Shotgun	E922.1
Rifle	E922.2
Airgun	E922.4
Unspecified	E922.9
Electric current	E925
Overexertion	E927
Other unspecified injury	E921, E923, E926, E928

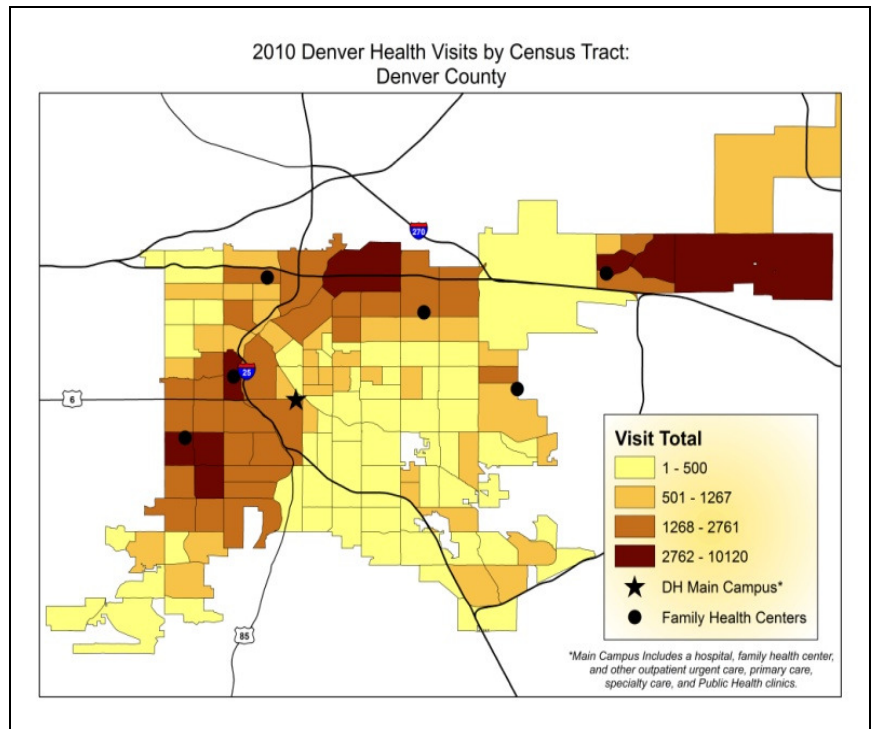
Mechanism of Injury	Codes for emergency department and outpatient visits, hospitalizations and deaths
Total intentional injury	E950-958, E960-968, E970-976
Suicide/self-inflicted	E950-958
Solid/liquid drug overdose	E950
Gas	E951-952
By motor vehicle exhaust	E952.0
Hanging/suffocation	E953
Firearms/airguns	E955 (.0-.4, .6)
Handgun	E955.0
Shotgun	E955.1
Rifle	E955.2
Airgun	E955.6
Other/unspecified	E955 (.3-.4)
Jumping from high place	E957
Cutting/piercing	E956
Other means	E954, E955.5, E955.9, E958
Assault	E960-968
Unarmed fight/brawl	E960.0
Firearms	E965 (.0-.4)
Handgun	E965.0
Shotgun	E965.1
Rifle	E965.2
Other/unspecified	E965 (.3-.4)
Stabbing	E966
Child/adult abuse	E967
Other or unspecified means	E960.1, E961 -964, E965.5-965.9, E968
Legal intervention	E970-976
Firearms	E970
Total undetermined intent injury	E980-988
Poisoning by solids/liquids	E980
Poisoning by gases	E981-982
Hanging/strangulation/suffocation/ drowning	E983-984
Firearm/airguns	E985 (.0-.4, .6)
Cutting/piercing	E986
Other means	E985.5, E987-988
Total firearm-related	E922 (.0-.3, .8-.9), E955 (.0-.4) E965 (.0-.4), E970, E985 (.0-.4)

Appendix B

Comparison of DHHA patients and Denver County, Ages 10-19

The hospital and clinics within DHHA serve as the safety-net health care provider for the city and county of Denver. The map to the right shows that, in 2010, the patient population served by DHHA lives in the neighborhoods in the northern and western parts of the city.

It should be noted that two major, recent events occurred in pediatric emergency care in Denver: Children’s Hospital, which at the time, was the city’s only Level 1 Pediatric Trauma Center, moved from Denver to Aurora in September, 2007. The following year, in September, 2008, DHHA expanded the existing Emergency Department to include Level 1 trauma services for children. As a result, the number of visits increased after 2007 and the proportion of injury-related visits increased as well.



Racial/Ethnic distribution of Denver county youth and DHHA youth, ages 10-19:
2008 Estimates

	Denver County	DHHA
	Rate (n)	Rate (n)
Hispanic	49% (31,561)	66% (15,814)
White	32% (20,760)	13% (3,118)
Black	13% (8,112)	14% (3,423)
Other/Unknown	6% (3,973)	6% (1,552)
Total	64,406	23,907

*Source: US Census, DHHA

When comparing unique patients seen at DHHA with census estimates for the city and county of Denver in 2008, DHHA sees more Hispanic children between the ages of 10-19 (66% versus 49%) and less white children (13% versus 32%). The proportion of black children and all others is consistent between DHHA and Denver. Overall, DHHA hospital and clinics provided care for 37% of Denver’s children ages 10-19.