BICYCLING AND WALKING IN COLORADO:

ECONOMIC IMPACT AND HOUSEHOLD SURVEY RESULTS

EXECUTIVE SUMMARY

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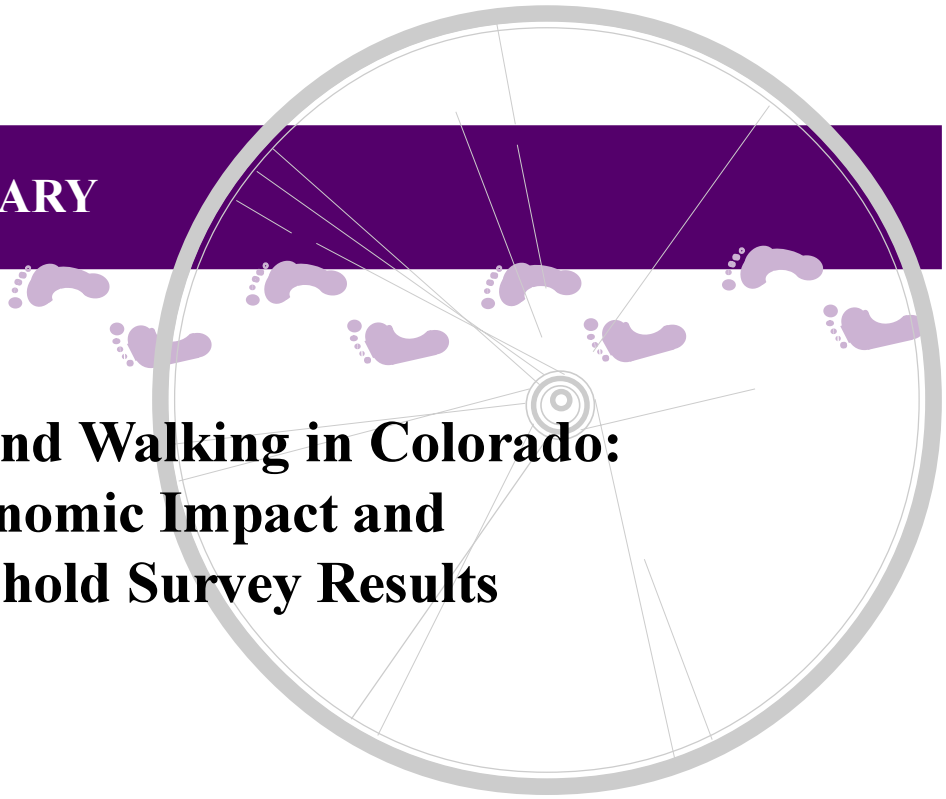


Bicycling and Walking in Colorado: Economic Impact and Household Survey Results

Executive Summary

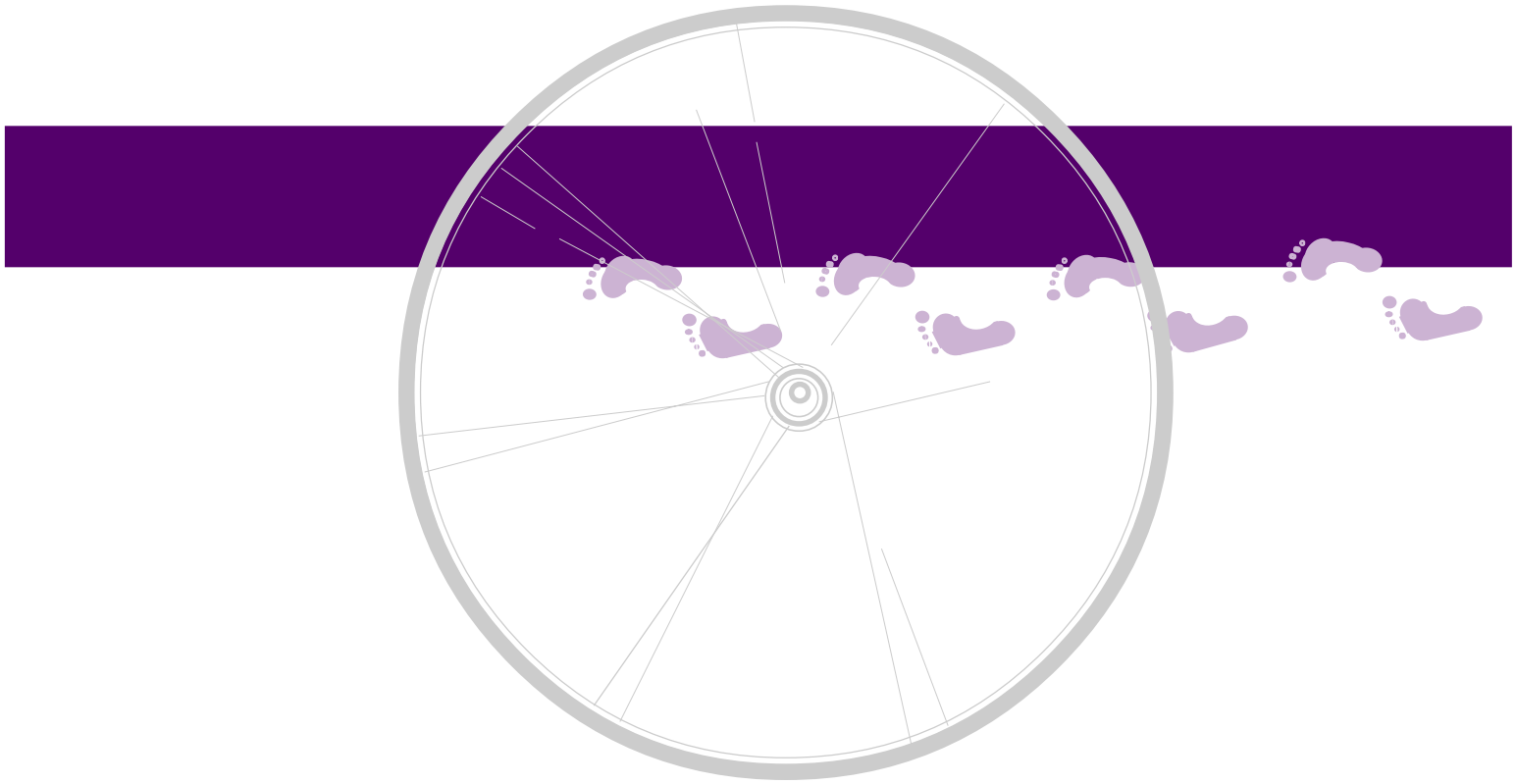
April 2000

Commissioned by:

The Colorado Department of Transportation
Bicycle/Pedestrian Program

Survey and Analysis Conducted by:

The Center for Research on Economic and Social Policy (CRESP)
of the University of Colorado at Denver



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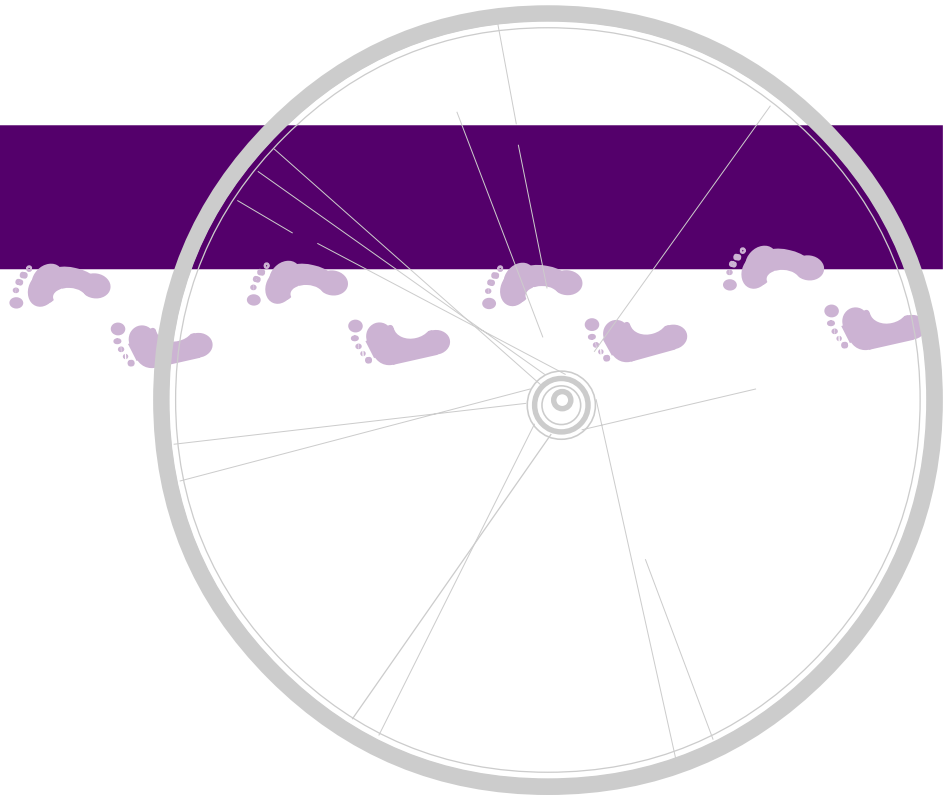

Preface

Bicycling and walking have long been popular outdoor activities in Colorado as well as throughout the United States. In the 19th Century bicycling was primarily a mode of transportation for traveling to and from work or school. During the first half of the 20th Century it became primarily a recreational activity or a way of visiting friends or relatives. As we enter the 21st Century the bicycle is once again more than a recreational conveyance. It has become an acceptable mode of transportation both within and beyond metropolitan areas. Citizens throughout Colorado are recognizing the energy efficiency, cost effectiveness, health benefits, and environmental advantages of bicycling and it has become an acceptable alternative to the automobile for commuting to work, school, and for shopping.

One important step in the development and improvement of bicycle and pedestrian facilities in Colorado is to define the policies related to their funding, planning, programming, design, maintenance, and to encourage safe travel through education and enforcement. Therefore, the Colorado Department of Transportation initiated this research to provide the agency as well as cities, towns, and counties throughout the state with baseline information from which planning and funding decisions can be made.

In the spring of 1999, 35,912 surveys were mailed to randomly selected households throughout Colorado. The survey contained 117 questions pertaining to personal and household characteristics and the travel habits of the household members. The 16% response rate was the result of 5,771 completed surveys. A complete description of the methodology, a copy of the questionnaire and a detailed analysis of the data are contained in the complete Technical Report.

Additional copies of either the Executive Summary or the complete Technical Report of *Bicycling and Walking in Colorado: The Economic Impact and Household Survey Results* may be obtained by sending your name and mailing address to the:

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Acknowledgements

This research was conducted by the Center for Research on Economic and Social Policy (CRESP) at the University of Colorado at Denver under the direction of the Bicycle/Pedestrian Program at the Colorado Department of Transportation. It was a collaborative effort with guidance from representatives from the bicycle industry, other state agencies, cities, counties, transportation professionals, citizens, and special interest groups. A number of individuals, agencies, businesses, and organizations also contributed through their participation in the development of the questionnaire, meetings, and written review comments.

Thanks, appreciation and recognition are expressed to all those who contributed to this research. A special thanks to the citizens of Colorado for completing the surveys and the numerous individuals from businesses and industry organizations throughout the state for sharing their expertise and economic information crucial to the completion of the study.

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Summary of Findings

Total economic benefit from bicycling in Colorado is over $1 billion annually

Manufacturing

Total annual revenue $763 million

513 FTEs

- Annual payroll $18.1 million
- Average salary $35,326

Retail

Total annual sales and service revenue $200 million

- $120 million on new bicycles
- $55 million on bicycling accessories
- $25 million on repair and maintenance

700 FTEs

- Annual payroll $16 million

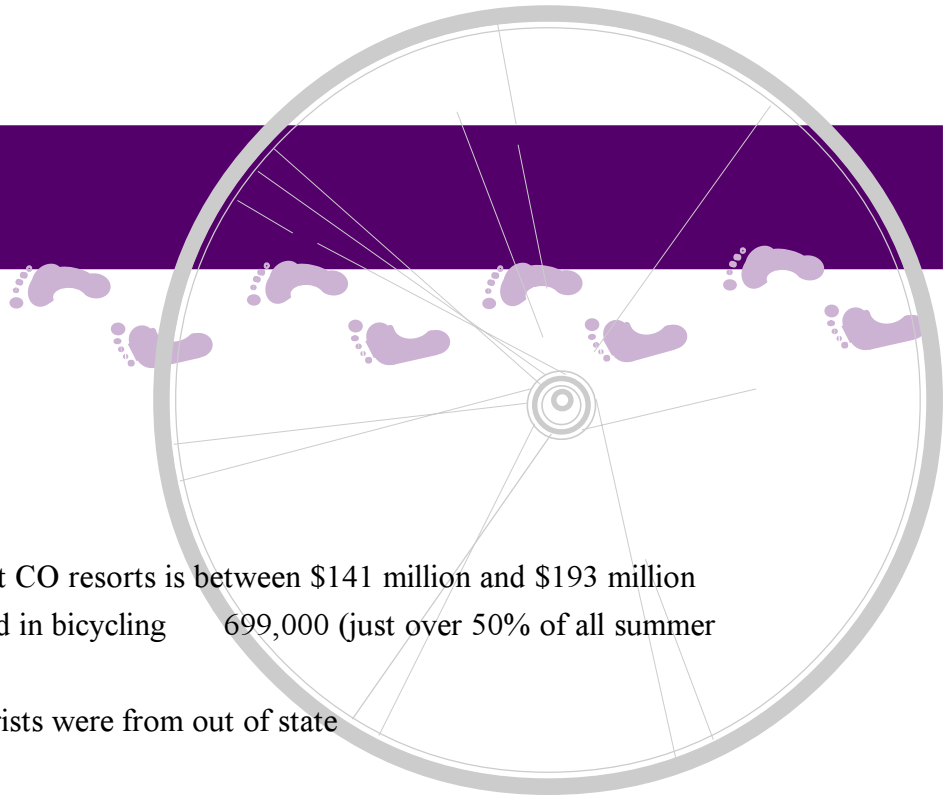
Bike Shops

Total annual sales and service revenue $80 million

Total annual bicycle rental revenue $1 million

448 FTEs

- Annual payroll $11 million
- Average salary $25,000



Tourism

Bicycling at Colorado Ski Areas

Total revenue by cycling tourists at CO resorts is between $141 million and $193 million

- Number of tourists engaged in bicycling 699,000 (just over 50% of all summer visitors)
- 70% of these bicycling tourists were from out of state

103 FTEs employed to promote bicycling and provide bicycling goods and services

- Annual payroll $3.9 million

7,500 FTEs in summer only positions

- Annual payroll $40 million

Potential loss of revenue

- Of the 699,000 tourists engaged in bicycling 276,400 indicated they would have altered their vacation destination if bicycling were not available.
- Total revenue from these bicyclists is $56 million to $76 million

Nearly 10% of Colorado households report taking a bicycle vacation in CO in the past 12 months

Total annual revenue $48 million

755 FTEs

- Annual payroll $10 million

Other Revenue Generators

Bicycle Tours	$640,000
Racing	$2 million
Charity Rides	$3.4 million

THE ECONOMIC IMPACT OF BICYCLING IN COLORADO

Introduction

This report provides statistical information regarding the economic impact of bicycling in Colorado, and documents bicycling behaviors and attitudes of residents of Colorado. This information can be used to inform policymakers of the importance of bicycling both economically and as a mode of transportation and means of recreation for Colorado residents. Analyses of these data also provide insight into the factors that prevent Coloradans from bicycling, and improvements that can be made to facilitate bicycling as a means of transportation.

Beginning in the Fall 1998, the Colorado Department of Transportation (CDOT) contracted with the Center for Research in Economic and Social Policy (CRESP) at the University of Colorado – Denver, to conduct phone and mail surveys of bicycle manufacturers, retail bicycle shops, and ski resort operators in Colorado. This information is used to summarize the impact of bicycling on the Colorado economy in the form of production, sales, jobs, income and tax revenue. In Spring 1999, CDOT and CRESP sent nearly 40,000 surveys to randomly selected Colorado households (see Appendix I of the technical report for details regarding sample selection and weighting procedures). The nearly 6,000 completed surveys provide a wide range of information regarding bicycling behavior, attitudes and preferences. (The survey instrument is included as Appendix II of the technical report.)

THE ECONOMIC IMPACT OF BICYCLING IN COLORADO

By conducting surveys of bicycle manufacturers, retails shops, ski resorts and other bicycle-related organizations and Colorado households, we have assessed the impact of bicycling in Colorado in the form of expenditures, production, employment, income and tax revenues. We highlight the economic impact of bicycle manufacturing, retail sales and tourism in this summary. There is a

brief discussion of other affects of bicycling on the Colorado economy. Additional detail is available in the technical report.

Manufacturing

In 1998, nearly thirty companies in Colorado were engaged in the production of bicycles and/or bicycle-related products such as bicycle components, accessories and clothing. These companies reported annual revenues from the sale of bicycle related products of $762.7 million in 1998. The production and sales of these products adds 513 full-time equivalent (FTE) jobs annually with a payroll of $18.1 million.

The image of Colorado as a cycling community prompted many companies to locate in the state. Over 40 percent indicated that their company had located in Colorado because of the characteristics of state residents. Specifically, firms indicated that the ”proximity to bicycle customers,” the “great cycling community,” and the “athletic lifestyle” of Colorado residents was the primary reason for their location decision.

Purchases of bicycles and bicycle-related products

Results from our household survey indicate that annual expenditures on bicycles and bicycle-related products by Coloradans totaled just over $200 million dollars. Of this total, $120 million was spent purchasing bicycles, nearly $25 million was spent on repairs and maintenance, and the remaining $55 million was spent on bicycle accessories.

Coloradans are most likely to purchase a bicycle from sporting goods and bicycle specialty shops. Nearly half of all bicycles are purchased from these stores. The average price of a bicycle purchased at a sporting goods or bicycle shop is $619, higher than those purchased from most other sources. Therefore, bicycles purchased from sporting goods and bicycle specialty shops

account for 79 percent of all bicycle expenditures. Discount stores and department stores combined sold nearly 30 percent of all bicycles bought by Colorado households, but the average price of bicycles from these outlets is significantly lower ($95 and $120 per bicycle, respectively), and as a result they received only 8 percent of the total dollars spent on bicycles. Small proportions of bicycles are purchased from toy stores (9 percent of bicycles sold, 2 percent of expenditures) and mail order sources (1 percent of bicycles representing 3.5 percent of expenditures). Five percent of bicycles are purchased from friends, at an average price of $172 per bicycle (not including any bicycles received from a friend at no cost). The remaining 4 percent of bicycles were purchased from other sources including more informal purchases such as from classified advertisements, garage sales, and second-hand stores.

These expenditures contribute to the Colorado economy by creating jobs and income. The $200 million of bicycle-related retail and product sales generates 700 FTE jobs with an annual payroll of $16 million.

Table 1. Distribution of Bicycle Purchases by Type of Retail Outlet.

Type of Retail Outlet	Fraction of Bicycles Sold	Fraction of Bicycle Expenditures	Average Bicycle Price
General Sporting Good Store/ Bicycle Specialty Shop	49.8%	79.0%	$619
Discount Store	16.6%	4.0%	$95
Department Store	13.2%	4.1%	$120
Toy Store	9.4%	1.9%	$79
Mail Order	1.4%	3.5%	$987
Friend	5.3%	2.3%	$172
Other	4.4%	5.1%	$448

Bicycle Specialty Shops

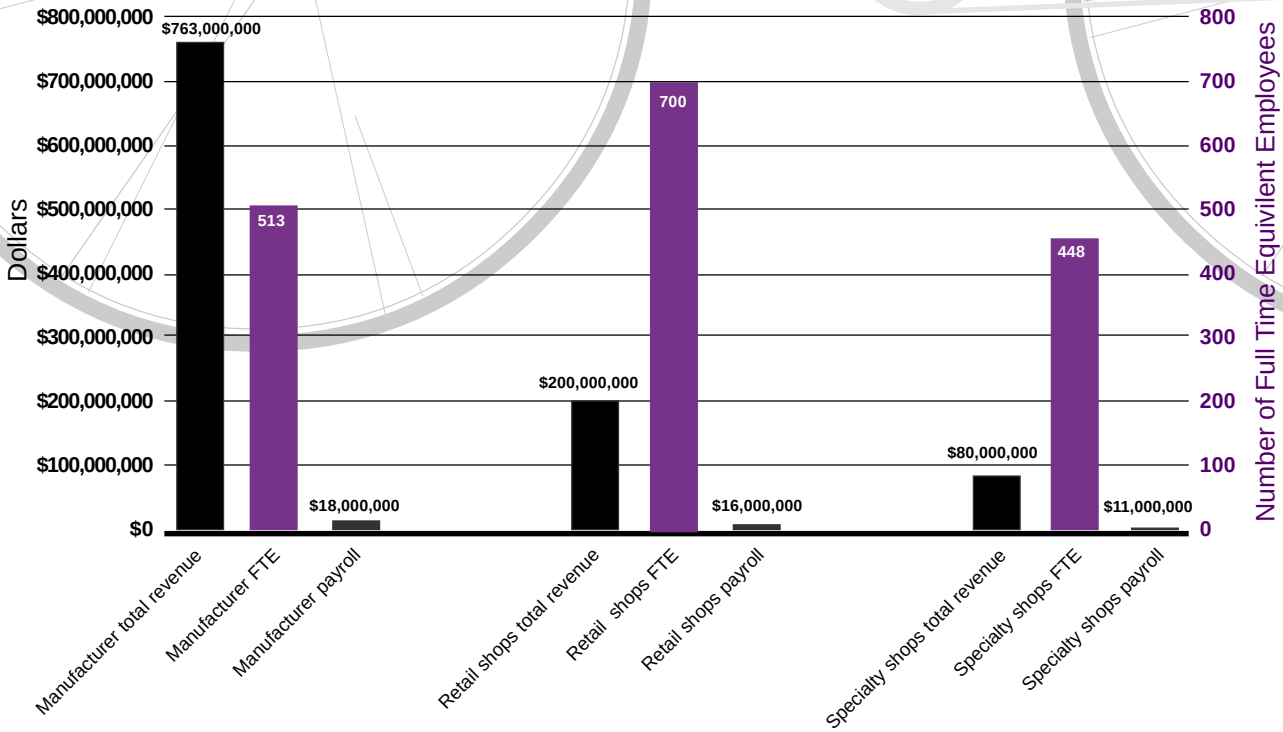
There are over 150 bicycle specialty shops located in Colorado. There are also a few large mail-order business that sell bicycles. We surveyed all of the mail-order businesses, and 40 percent of the retail shops in the state. Using these data we estimate the annual sales, employment and types of bicycle retail activity in the state of Colorado.

Of the $200 million in total expenditures on bicycles and bicycle-related products reported by Colorado households, $80 million in sales is reported by bicycle specialty shops and mail-order outlets. (It should be noted that some of the mail-order bicycles were purchased by customers outside of Colorado). These shops report selling approximately 50,000 bicycles in 1998. One million dollars in revenue was generated from bicycle rentals at these shops.

Bicycle specialty shops and mail-order bicycle companies report total annual employment of 448 FTE workers in Colorado. The total payroll for these workers is $11 million.

Figure 1 summarizes the annual revenue, and employment and payroll from the manufacturing and retail sales of bicycles and bicycle-related products in Colorado. Bicycle manufacturers in Colorado report $763 million in revenue and employ 513 FTE at a payroll of $18 million. Total retail sales in the state are $200 million annually, supporting the employment of 700 FTE earning $16 million. Of this total, bicycle specialty shops account for $80 million in revenue, 448 FTE and $11 million in payroll. $200 million in retail bicycle sales is slightly higher than the total retail sales of motorcycles in Colorado, and about 20% less than total retail sales of recreational vehicles in the state.

Figure 1
Economic Impact of Bicycle Manufacturing and Retail Sales



Bicycle-related Tourism

Tourism in an important part of the Colorado economy and outdoor activities play an important role in choosing Colorado as a tourist destination. We conducted a survey of Colorado ski area resort companies and Chambers of Commerce to assess the impact of bicycling tourists on summer revenues at the ski areas. We also obtained information from our household survey regarding bicycle-related vacations taking in and out of state.

Summer Bicycling in the Ski Areas

The ski areas have become some of the most lucrative tourist attractions in the state, accounting for over one-third of overnight tourist spending in Colorado (Longwoods International,

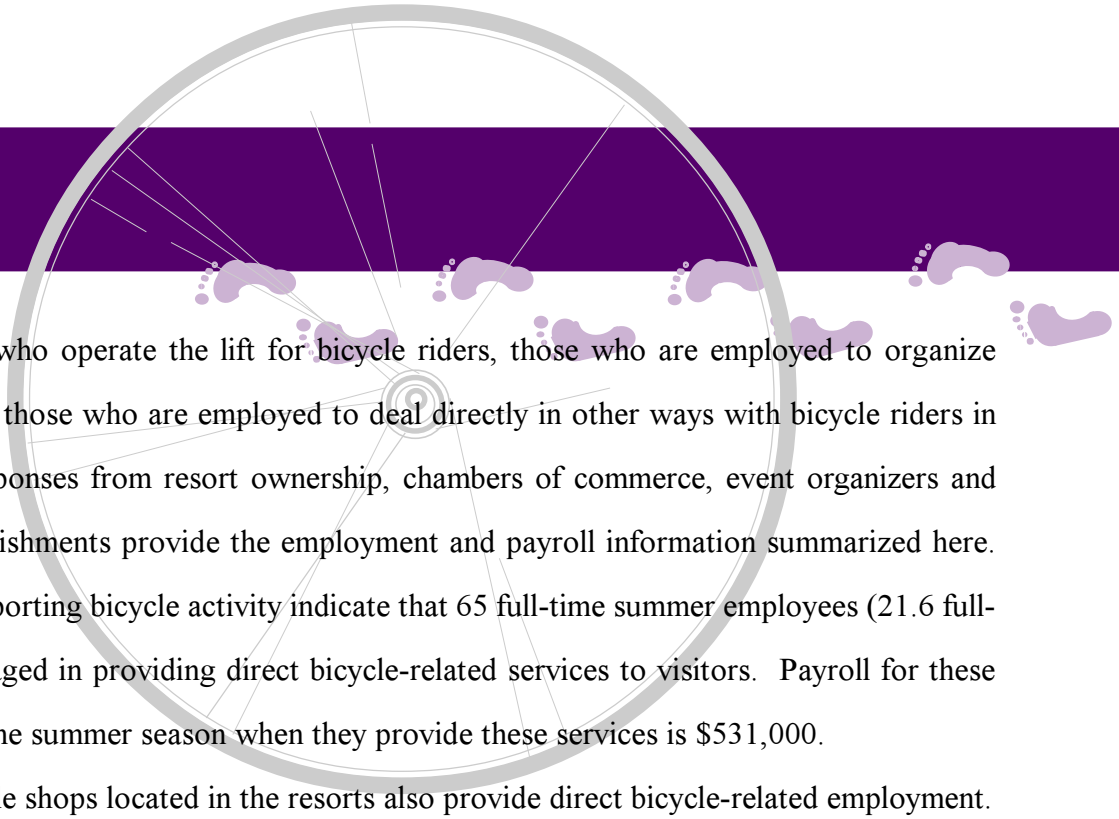
1998; Runyan and Associates 1998)[1]. To accommodate the visitors generated by this sport, many mountain areas in Colorado have invested in ski lifts, mountain maintenance, lodging, restaurants, and facilities for entertainment and other visitor activities. Heavily utilized during the ski season, these facilities were unused or underused in warm-weather months; and many resort towns have responded by promoting summer activities. A report prepared by Colorado Ski Country U.S.A. identifies the summer recreational activities provided in many of Colorado's resort towns. As the most frequently mentioned recreational activity available (along with fishing and golfing), ninety percent of the resorts surveyed by Colorado Ski Country U.S.A. indicated that visitors could engage in mountain biking in the summer. However, retail facilities are not always available to support these activities. The same report indicates that there are no bicycle rental shops in 20 percent of the resorts and only slightly over half of the resorts allow bicycles on their lifts.

Our survey of ski resort operators and towns indicated that 699,000 visitors traveled to Colorado mountain resorts in 1998 and participated in bicycling activities. Approximately 70 percent of these bicyclists came to resort towns from out-of-state. Tourists who engaged in bicycling during their vacation at a Colorado resort spent between $141 and $193 million dollars. Of the 699,000 who bicycled during their stay, 276,400 were attracted primarily by the availability of bicycling. Our estimates of the total vacation expenditures by these bicyclists range from nearly $56 million dollars to just over $76 million dollars. These estimates reflect direct expenditures only on bicycling.

These expenditures on bicycling create jobs for those who provide these goods and services. Direct bicycle-related employment consists of those individuals who provide bicycle rental, sales

[1] Longwoods International, 1998. Travel and Tourism in Colorado: A Report on the 1997 Travel Year. Prepared for the Colorado Tourism Board and the Colorado Travel and Tourism Authority.

Dean Runyan and Associates, 1998. Colorado Travel Impacts: 1997. Prepared for the Colorado Tourism Board and the Colorado Travel and Tourism Authority.



and repairs, those who operate the lift for bicycle riders, those who are employed to organize bicycle events, and those who are employed to deal directly in other ways with bicycle riders in resort towns. Responses from resort ownership, chambers of commerce, event organizers and retail bicycle establishments provide the employment and payroll information summarized here. The nine resorts reporting bicycle activity indicate that 65 full-time summer employees (21.6 full-year FTE) are engaged in providing direct bicycle-related services to visitors. Payroll for these employees during the summer season when they provide these services is $531,000.

Retail bicycle shops located in the resorts also provide direct bicycle-related employment. We surveyed 31 shops in the resort areas (both specialty shops and locations of chain sporting goods stores) that account for over 75 percent of the resort bicycle shops. We estimate that retail shops in resort towns in Colorado employ 82 FTE at a payroll of $3 million.

Visitor Expenditures and Employment in the Colorado Ski Areas

Tourists engaged in bicycling create employment not just because there are workers needed to provide bicycle-related services, but also because these tourists require other goods and services as well. This is a measure of the indirect bicycle related employment. In the section above, total spending by tourists engaged in bicycling was estimated to fall between $141 million and $193 million each summer.

The midpoint of the lower- and upper-bound expenditure estimates is $167 million. These expenditures are estimated to support the employment of 2,488 year-long (FTE) or 7,465 summer-only individuals earning a total of approximately $39.4 million.

Bicycle Advertising by Ski Resorts

Most of the resorts have recognized the importance of encouraging summer visitors and have large advertising budgets to attract these tourists. Total expenditures on advertising that specifically promoted bicycling were $316,000 for the 1998 summer season. Average spending on the promotion of bicycling per resort is slightly less than $40,000 per summer season. This includes one resort that reported no expenditures in 1998 but indicated that they were developing a campaign and budget for future years.

Bicycle-Related Vacation Spending by Colorado Residents

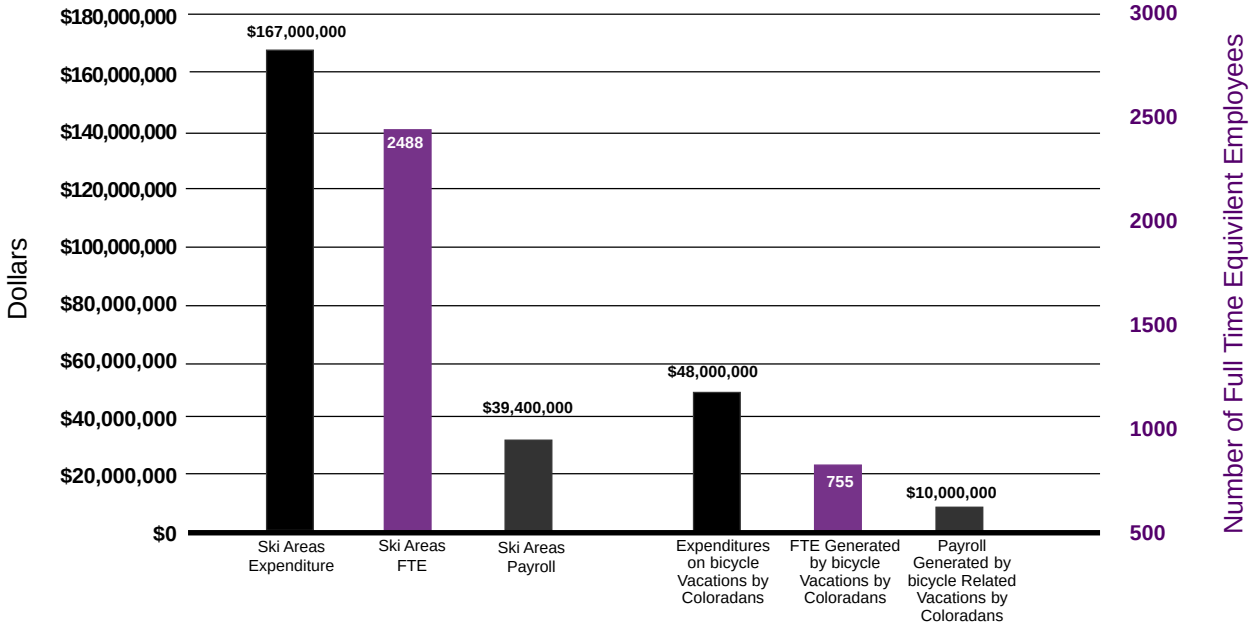
To capture bicycle-related vacation spending in areas other than ski resorts, we surveyed Colorado households to gather information on any vacations they may take (both in-state and outside of Colorado) that are related to bicycling. Nearly 10 percent of Colorado households indicated that they had taken a bicycle-related vacation within Colorado in the past 12 months. Among those households who did, the typical household spent $360 per vacation. Spending on bicycle-related vacations within Colorado totaled $48 million dollars over the past 12 months. (It should be noted that these expenditures include those that Coloradoans make on bicycle-related vacations at the ski resorts).

These vacation expenditures also generate jobs for Colorado employees. Specifically, $48 million of vacation spending creates 755 FTE jobs for workers who supply goods and services for vacationers. These 755 employees earn approximately $10 million in income as a result of these expenditures.

Though not providing a direct impact on the Colorado economy, our survey also provides information on bicycle related vacations that Colorado residents take outside the state. Just under 5 percent of Colorado households indicated that they had taken an out of state bicycle trip and on average spent $950 per trip.

Summer vacationers in Colorado often bike in the high country. As shown in figure 2, nearly $167 million is spent by vacationers who bicycle in Colorado ski areas. This spending creates over $39 million in income for 2488 FTE employees, both in the retail bicycle or bicycle service industries and in industries that provide general services to tourists. Nearly 70 percent of the visitors to these mountain towns are from out of state. Total vacation spending by Coloradans is $48 million per year. This supports 755 FTE at a payroll of $10 million. There is some bicycle-related tourism that is not included in our calculations. Specifically, out-of-state tourists who bicycle, but do not visit Colorado ski areas are not part of our vacation estimates.

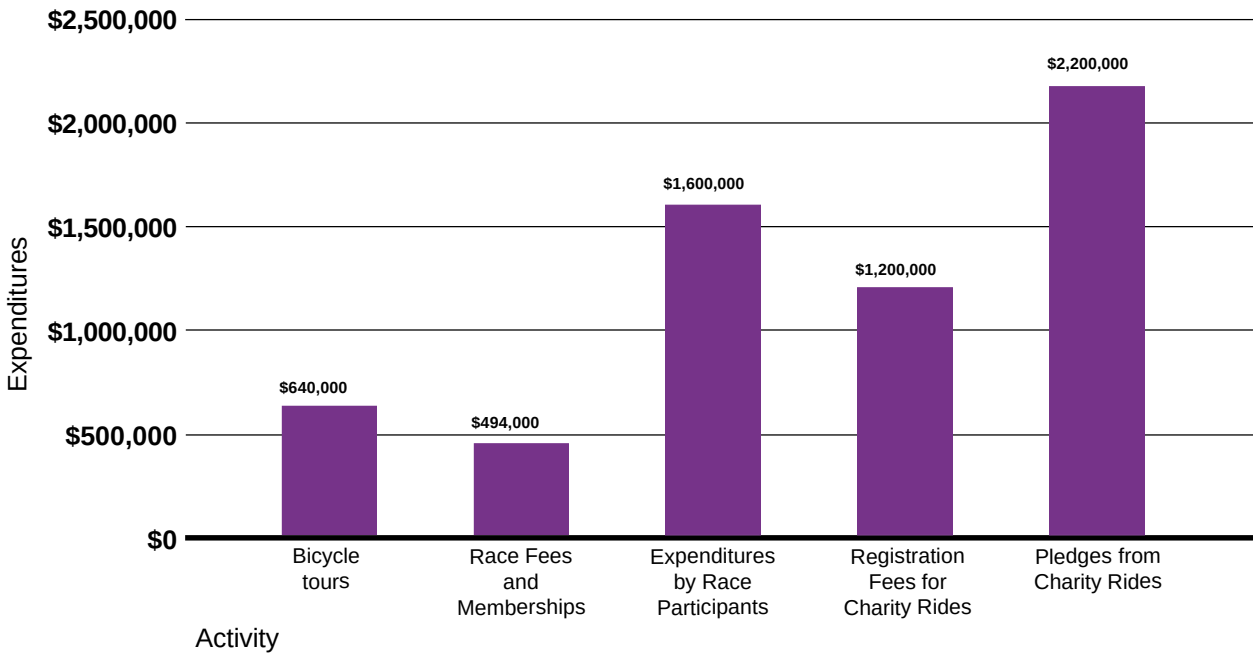
Figure 2
Economic Impact of Bicycle Related Vacations



Other Sources of Economic Impact

The presence of bicycling in Colorado is evident in other ways. Both in-state residents and out-of-state tourists participate in a variety of off-road and road and track bicycling events as well as charity rides in Colorado. Companies that book bicycle tours throughout the state report $640,000 in annual revenue from 3,400 tour participants. The majority of these riders are reported to come from out-of-state. Bicyclists spend additional revenue on off road and road and track races. Riders typically belong to a racing club and pay membership fees and must also pay race registration fees. Association officials estimate approximately 10% of race riders come from outside of Colorado. These participants are estimated to spend $1.6 million in additional spending at race locations. Coloradans also are active participants in bicycle rides that raise money for charities. Approximately 22,000 riders rode in charity events in 1999, paying $1.2 million in race fees. These races generated nearly $2.2 million in pledges and donations for the sponsoring charity.

Figure 3
Expenditures on Various Bicycle Activities



HOUSEHOLD SURVEY RESULTS

Summary of Findings

Bicycle ownership in Colorado

- 69% of Colorado households own at least one bicycle
- The average is 2.7 bicycles per household
- There are approximately 3 million bicycles in Colorado

Motor vehicles owned by the respondents

- 44% own two motor vehicles
- 23% own one motor vehicle
- 19% own three motor vehicles
- 4% own five or more motor vehicles
- 1.9% do not own a motor vehicle

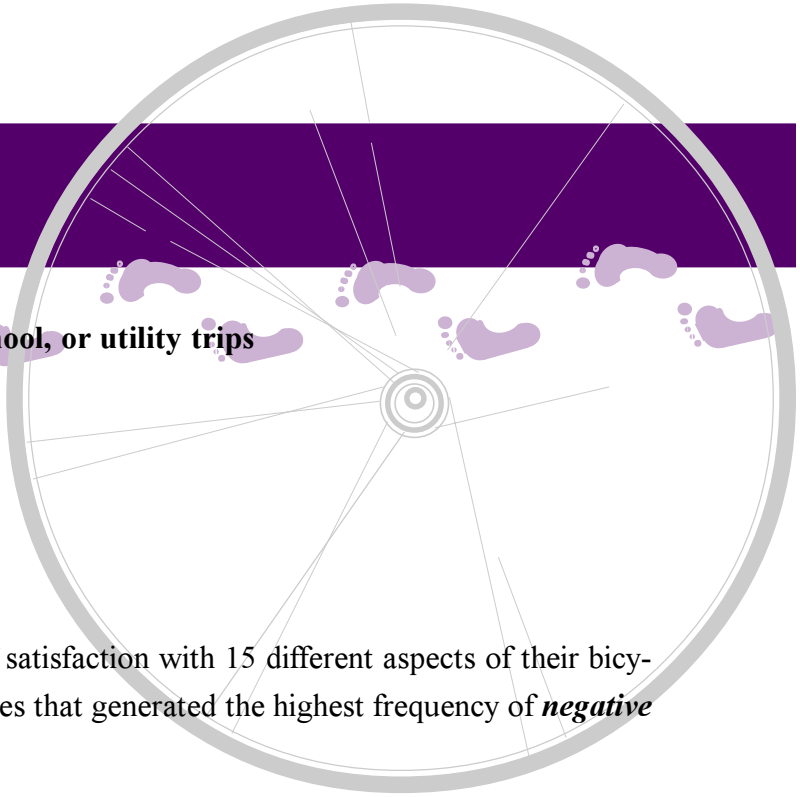
Commuting to work

Primary means of transportation:

- Drive alone in car or truck (82%)
- Carpool (7%)
- Transit (3%)
- Walk (3%)
- Bicycle (2%)

Secondary means of transportation:

- None (58%)
- Drive alone in car or truck (10%)
- Carpool (15%)
- Transit (6%)
- Walk (4%)
- Bicycle (5.3%)



Preferred surface for bicycling to work, school, or utility trips

- Paved off-street bike path (63%)
- Street with bike lane (23%)
- Unpaved off-street bike path (7%)
- Shoulder (1.9%)

Satisfaction with bicycling in Colorado

Respondents were asked to rate the degree of satisfaction with 15 different aspects of their bicycling experiences within Colorado. The features that generated the highest frequency of ***negative*** responses were the:

- Width of the shoulder of the road (29%)
- Courtesy of motorists (28%)
- Debris on the road (13%)
- Crossings at road intersections (13%)
- Lack of bicycle parking facilities at destinations (13%)

Preferences regarding bicycle-related public expenditures

Respondents were asked if they would like to see improvements in conditions to encourage bicycling as a means of transportation.

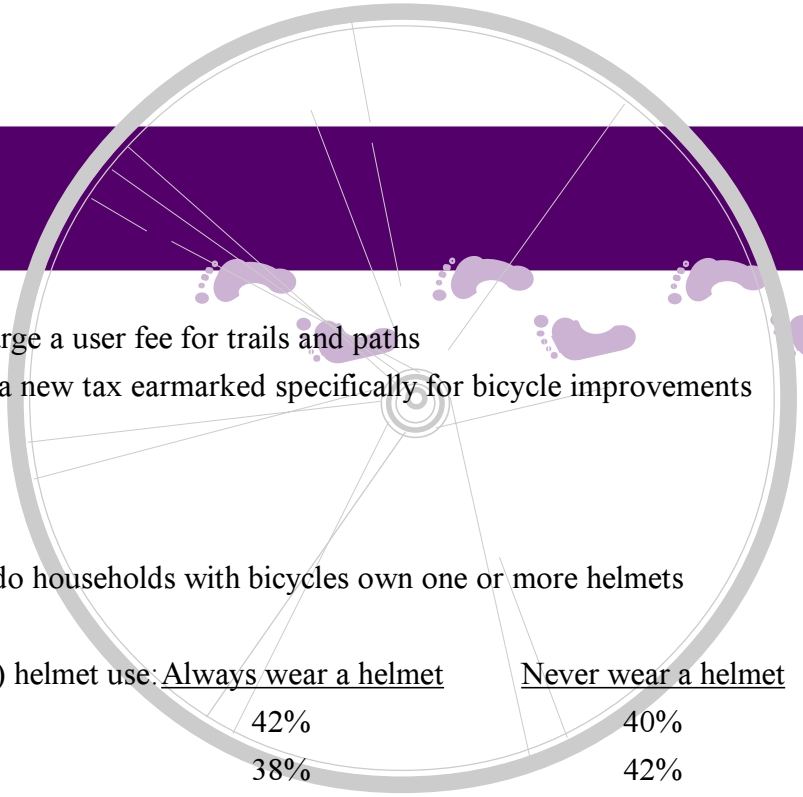
- 79% indicated they would like to see such expenditures.

When asked how they would spend $100 on transportation improvements respondents indicated the following:

- Nearly 68% would build new paved off-street bike paths
- 47% would link existing paved paths to create a statewide transportation system
- 32% would improve maintenance on the existing system
- 30% would construct new road shoulders and maintain existing shoulders

When asked how they would fund the projects:

- 51% would reallocate funds from other transportation projects
- 35% would charge a bicycle license or registration fee



- 21% would charge a user fee for trails and paths
- 6% would add a new tax earmarked specifically for bicycle improvements

Bicycle Safety

Helmet Use

- 59% of Colorado households with bicycles own one or more helmets

Adult (over age 16) helmet use:	Always wear a helmet	Never wear a helmet
Streets	42%	40%
Paved bike paths	38%	42%
Unpaved Trails	43%	39%
Mountain Terrain	51%	37%

Children using helmets:	Always wear a helmet	Never wear a helmet
Streets	61%	14%
Paved bike paths	63%	14%
Unpaved Trails	67%	15%
Mountain Terrain	70%	16%

Bicycle Safety Instruction

40% of the respondents reported receiving some type of bicycle safety instruction. Of those receiving instruction, the primary source of the training was at school.

Where should children receive bicycle safety training?

- School 45% (from police and fire professionals)
- Parents 31%
- Parks & Recreation 10%
- School Teachers 7%
- Community Organizations 5%
- Pamphlets/Brochures .96%

Bicycle Crashes

The bicyclists with the most experience and who ride more frequently are the least likely to experience a crash. For example, 38% of those who bicycle more than once per week reported a crash on an unpaved trail, while almost 60% of those bicycling less than once per month reported crashing.

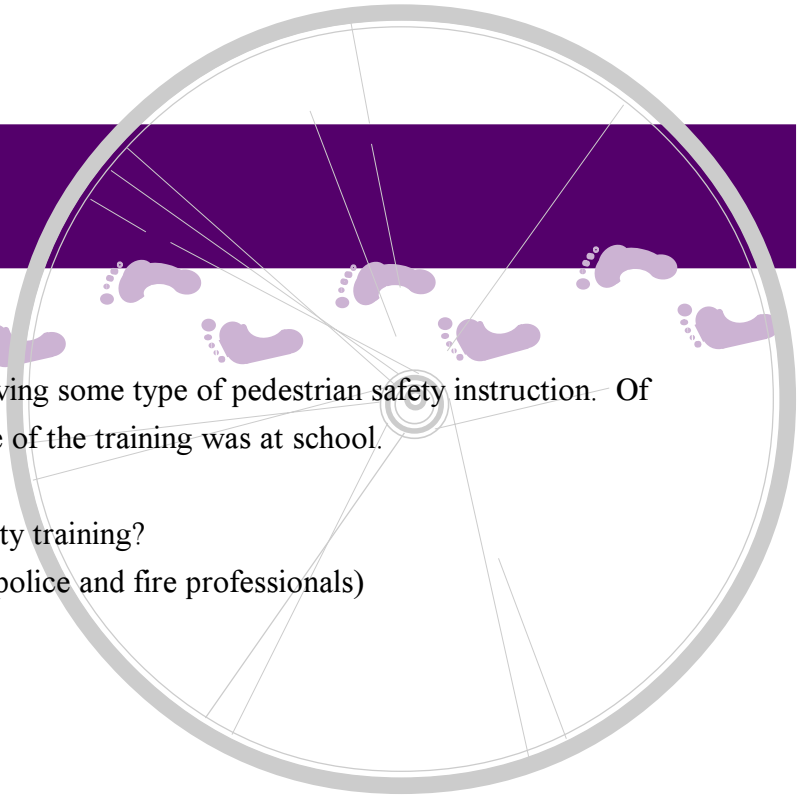
Crashes in the last 12 months:	One	More than One	Average Cost/Crash
Streets / Paved Trails	28%	10%	$123 (68% = $0 - 3% = $1,000+)
Unpaved Trails	16%	26%	$51 (75% = $0 - 5% = $100+)

Severity of Crashes:	No Injuries	Minor	Severe to Critical
Streets / Paved Trails	13%	61%	8%
Unpaved Trails	0%	.72%	93%

Pedestrian Safety

Obstacles to Walking:

- Distance 67%
- Weather 63%
- Traffic Safety Concerns 42%
- Lack of Sidewalk 38%
- Hazardous Route 35%
- Fear of Crime 32%
- Need Car for Job 30%



Pedestrian Safety Instruction

33% of the respondents reported receiving some type of pedestrian safety instruction. Of those receiving instruction, the primary source of the training was at school.

Where should children receive pedestrian safety training?

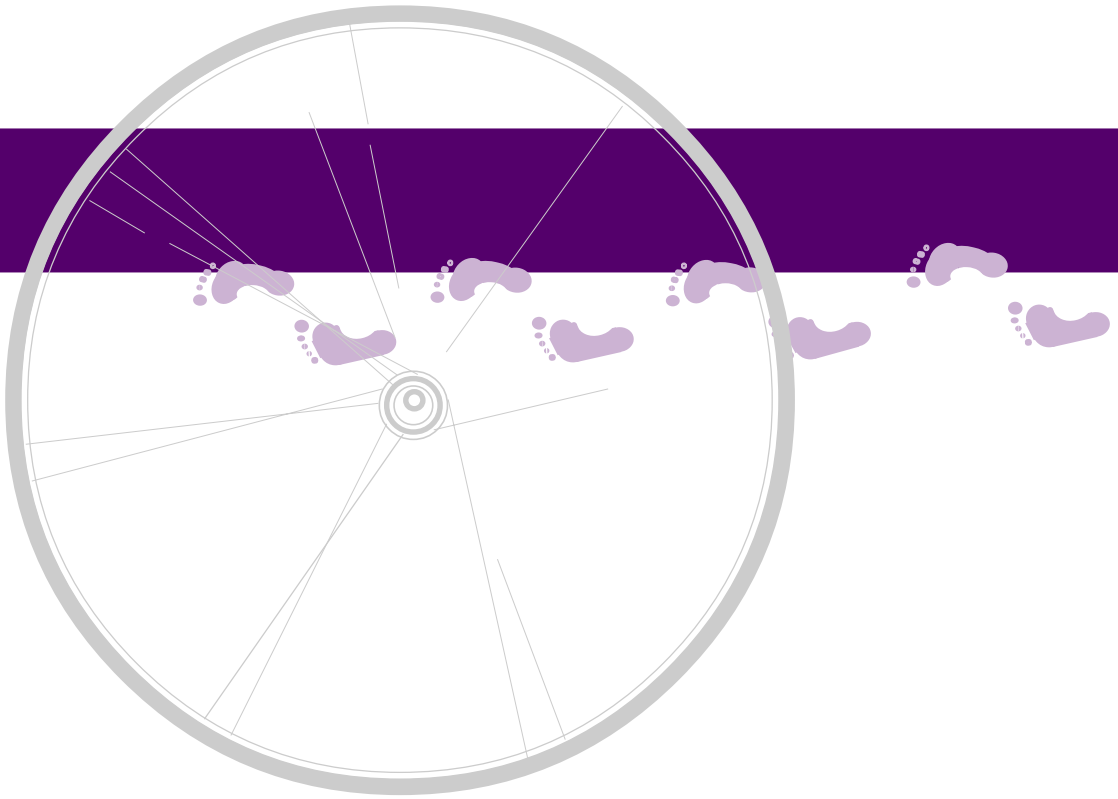
- School 47% (from police and fire professionals)
- Parents 30%
- School Teachers 16%
- Parks & Recreation 4%
- Community Organizations 2%
- Pamphlets/Brochures .82%

Pedestrian Crashes

Nearly 12% of Coloradans have ever been involved in a crash as a pedestrian. Among those involved in a pedestrian crash, over 14% sustained no injuries and 58% incurred only minor injuries.

Crashes in the last 12 months:	One	More than One	Average Cost/Crash
	2%	1%	$149
			(71% = $0 - 7% = $1,000+)

Severity of Crashes:	No Injuries	Minor	Severe to Critical
	14%	58%	10%



HOUSEHOLD SURVEY RESULTS

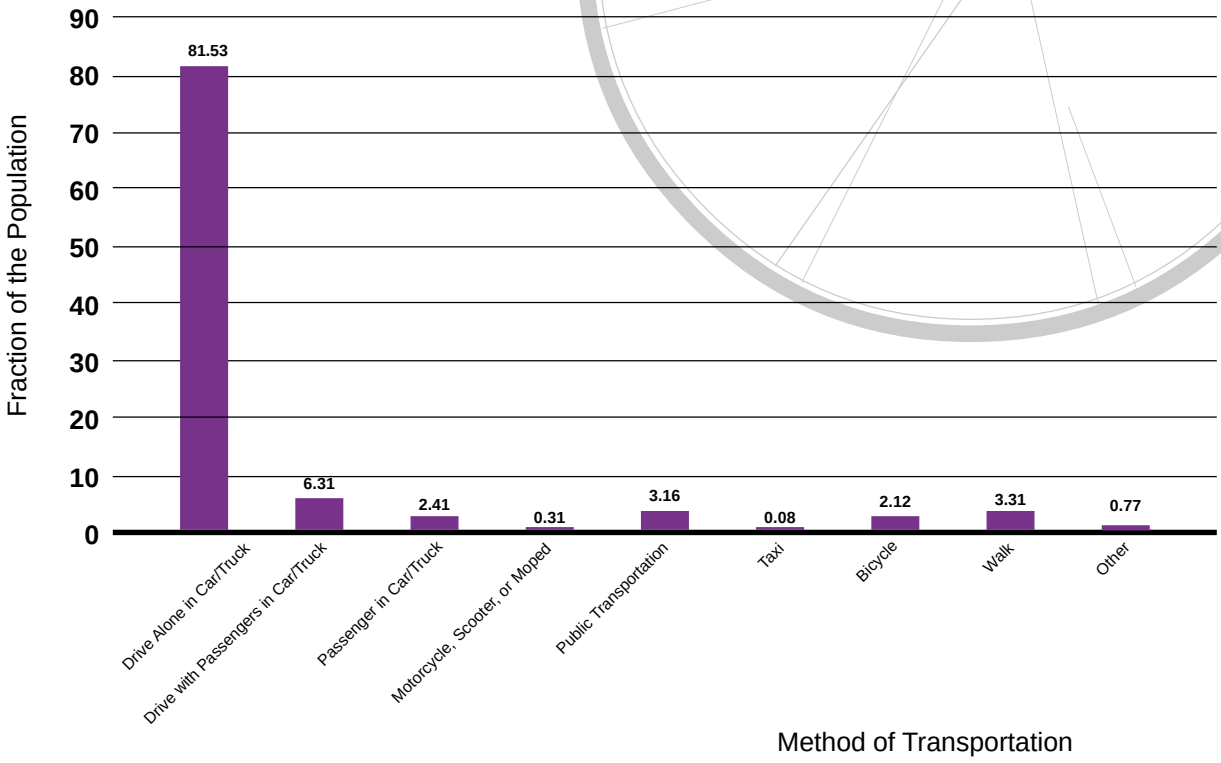
Bicycle and Automobile Ownership in Colorado

Ninety-eight percent of the respondents indicated that there was at least one motor vehicle owned by someone in their household. Twenty-three percent reported owning one vehicle, 44 percent own two motor vehicles and the remaining 31 percent own more than three. There are approximately 3 million bicycles in the state of Colorado. 1.1 million Colorado households (69 percent) own at least one bicycle, and the average household owns 2.7 bicycles. Among those who own bicycles, 59 percent report also owning at least one bicycle helmet. 1.8 million adults (over the age of 16) reported ever having ridden a bicycle in Colorado. Some use their bicycles as a means of transportation to work, school or for errands, while other use them solely for recreation and exercise.

Commuting to Work

2.26 million Colorado residents between the ages of 16 and 55 are employed. In a typical good-weather month, 82 percent indicate that their primary method of commuting to work is to drive alone in a car or truck. Almost nine percent use a carpool arrangement, either as a driver or passenger. Although nearly thirty-five percent live within two blocks of public transportation, only three percent use this as their primary means of commuting to work. Two percent ride a bicycle to work as their primary method. Three percent report that they primarily walk to work. Less than one percent drive a motorcycle or take a taxi. Data from the 1990 Census indicates that 73 percent of Americans drive alone to work, and 0.4 percent bicycle. As is typical in the western United States, driving alone to work is more common among Coloradoans than among all Americans, but the likelihood of bicycling is five times the national average.

Figure 4
Primary Means of Transportation to Work



An additional 5.3 percent of workers in Colorado report that riding a bicycle to work is their secondary method of commuting to work, so over 7 percent of Colorado workers sometimes ride their bicycle to work.

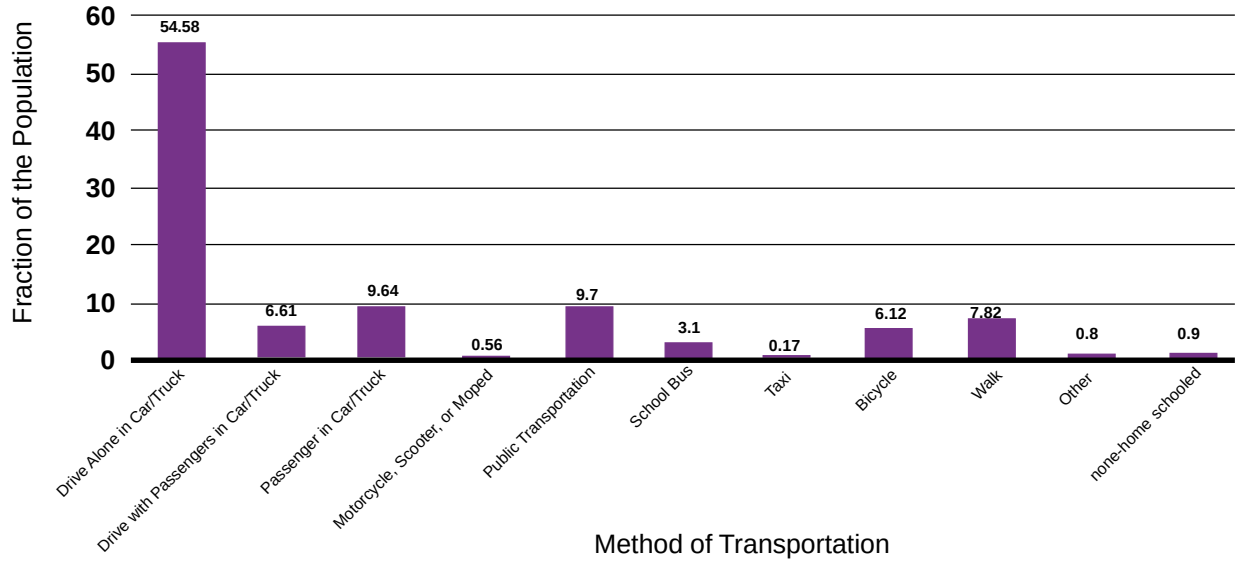
Distance and weather are the factors most frequently mentioned as obstacles to riding to work. Over 30 percent of those who have considered riding their bicycle to work indicated that distance and weather sometimes prevented them from riding. Other frequently mentioned concerns included concerns about traffic safety (mentioned by 31 percent), lack of road shoulders (27 percent) and off-road bike paths (25 percent).

Transportation to School

There are approximately 350,000 students over the age of 16 in Colorado. A much smaller majority of students than workers ride alone in a car or truck as their primary method of commuting to school (55 percent of students). Sixteen percent carpool, and nearly 10 percent use public transportation. Just over 6 percent ride their bicycles to school as their primary method, and 8 percent walk. An additional 6 percent of students report that bicycling is their secondary method of commuting to school.

Students reveal concerns about bicycling to school similar to those expressed by bicyclists commuting to work. Weather and distance are the factors most frequently mentioned as obstacles to riding a bicycle to school (35 percent of students and 21 percent, respectively.) Other factors that appear to substantially affect the likelihood that students will ride to school include traffic safety concerns (20 percent), route hazards (16 percent), crime (14 percent) and the time of day (20 percent).

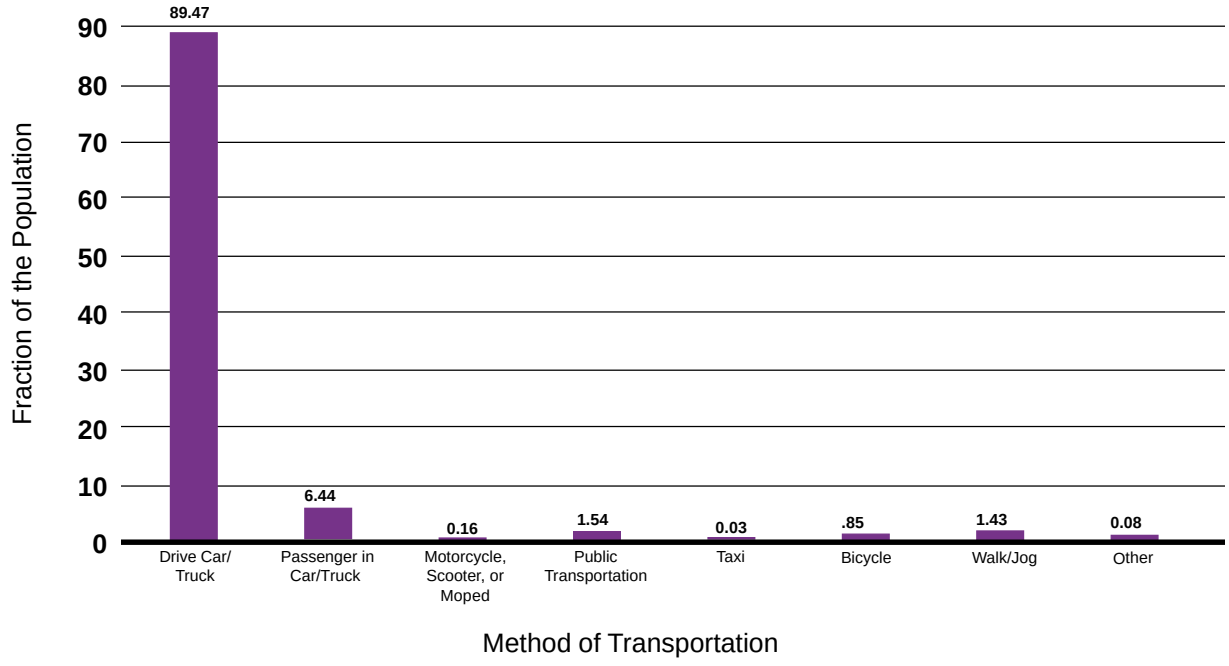
Figure 5
Primary Transportation Method for School Commute (16 years and older)



Transportation for Running Errands

Ninety-six percent of Coloradoans use an automobile, either alone or carpooling, when running errands. Less than one percent report riding a bicycle is their primary method of transportation for these utility trips, but another 8 percent report using a bicycle as their secondary method. Among the reasons given for not using a bicycle, about 24 percent of those surveyed indicated that they did not use a bicycle for errands because a car was needed for the purpose of the trip.

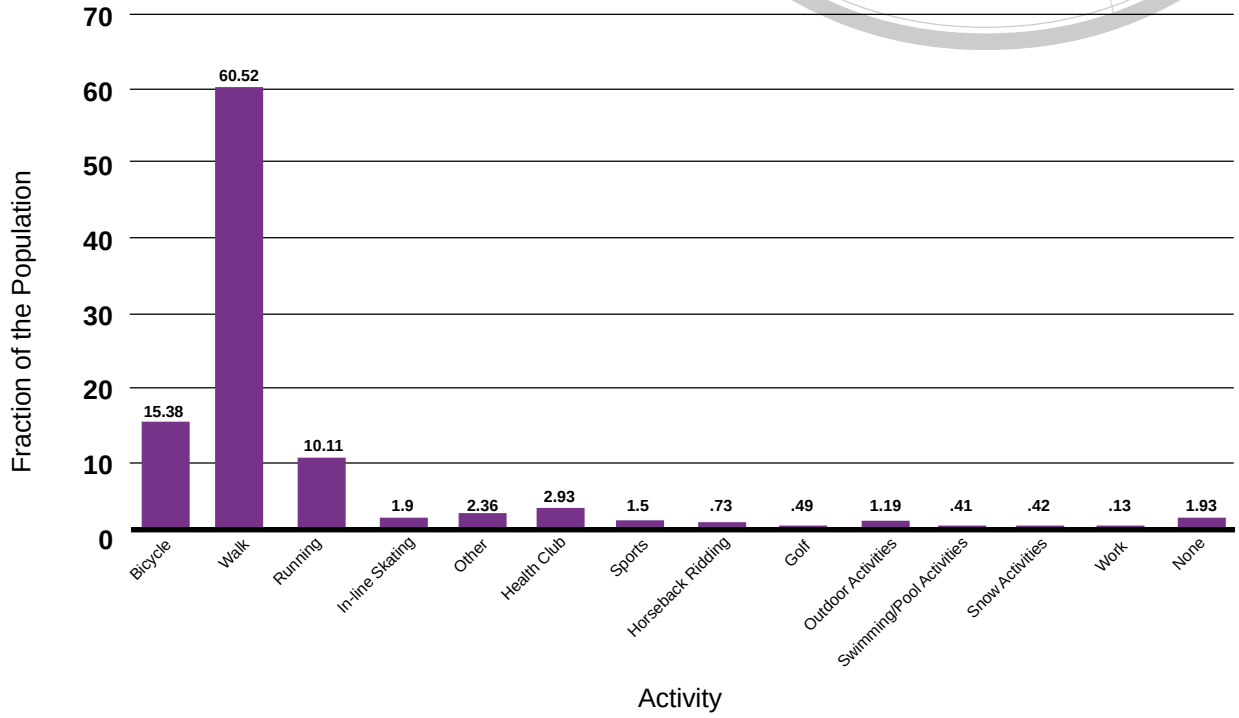
Figure 6
Primary Method of Transportation for Most Utility Trips in Good Weather



Bicycling and Walking for Exercise and Recreation

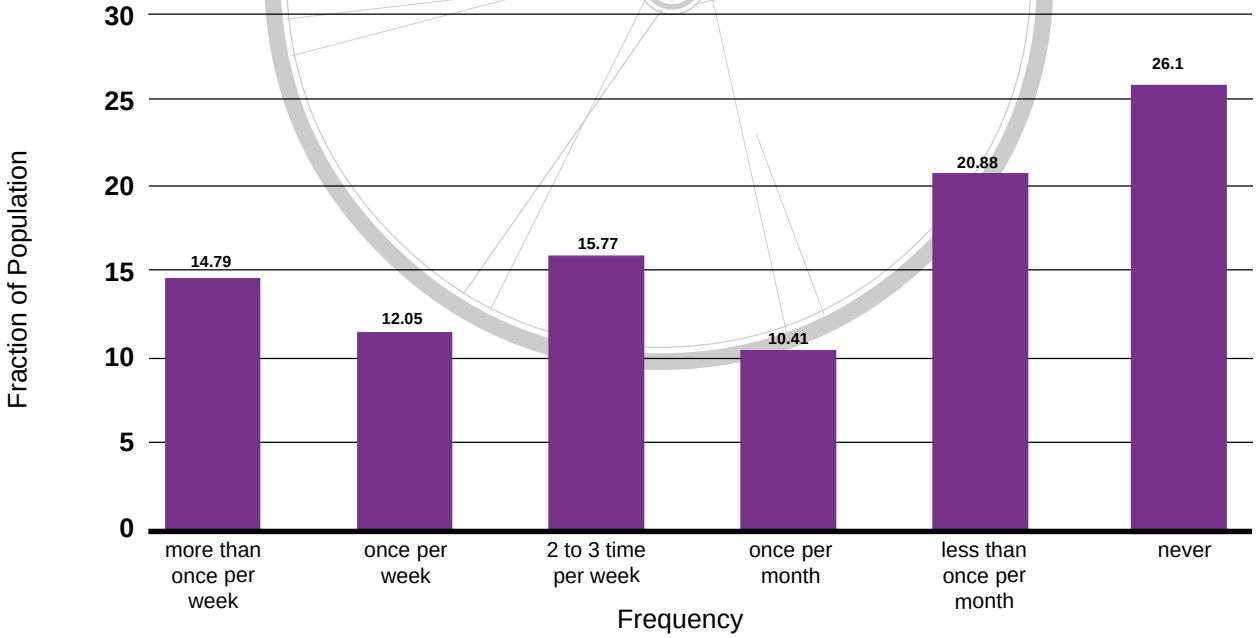
Sixty-one percent of Coloradans over the age of sixteen, indicated that walking was their primary recreation or exercise activity. Bicycling was the primary recreation or exercise activity of 15 percent of Colorado residents.

Figure 7
Primary Recreation/Exercise Activity



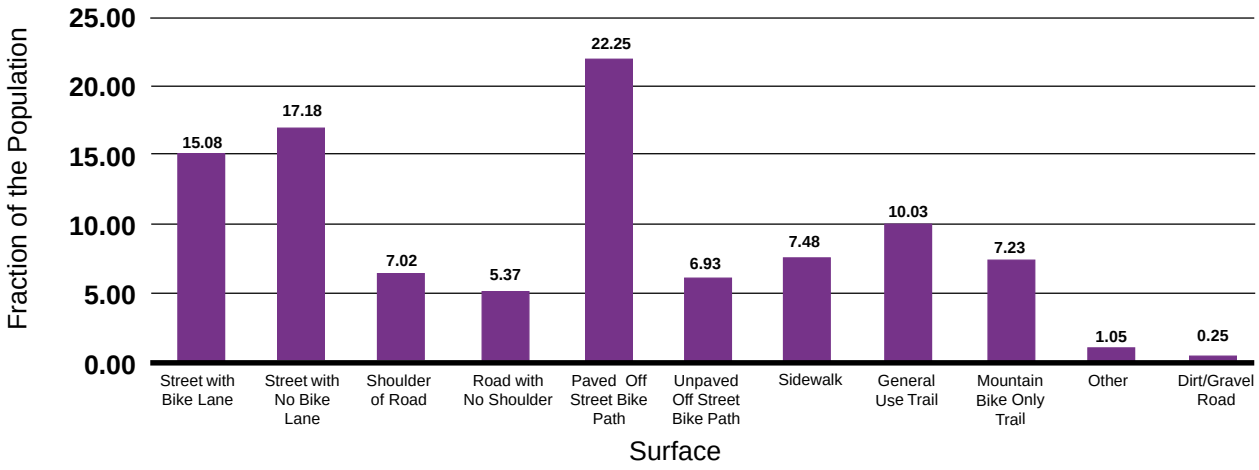
Though bicycling is not the primary recreation choice of many Coloradans, 74 percent report that they sometimes bicycle for exercise or recreation. Fifteen percent of these make recreation or exercise trips by bicycle more than once a week, 12 percent do so once a week. Twenty-one percent make this type of trip less than once per month.

Figure 8
Frequency of Bicycle Use for Recreation/Exercise Trip



Paved off-street bike paths are most commonly used for recreation and exercise related bicycle trips, followed by city streets with no bicycle shoulders. Streets with bicycle lanes are the third-most used surface for recreation bicycle and general use trails are fourth.

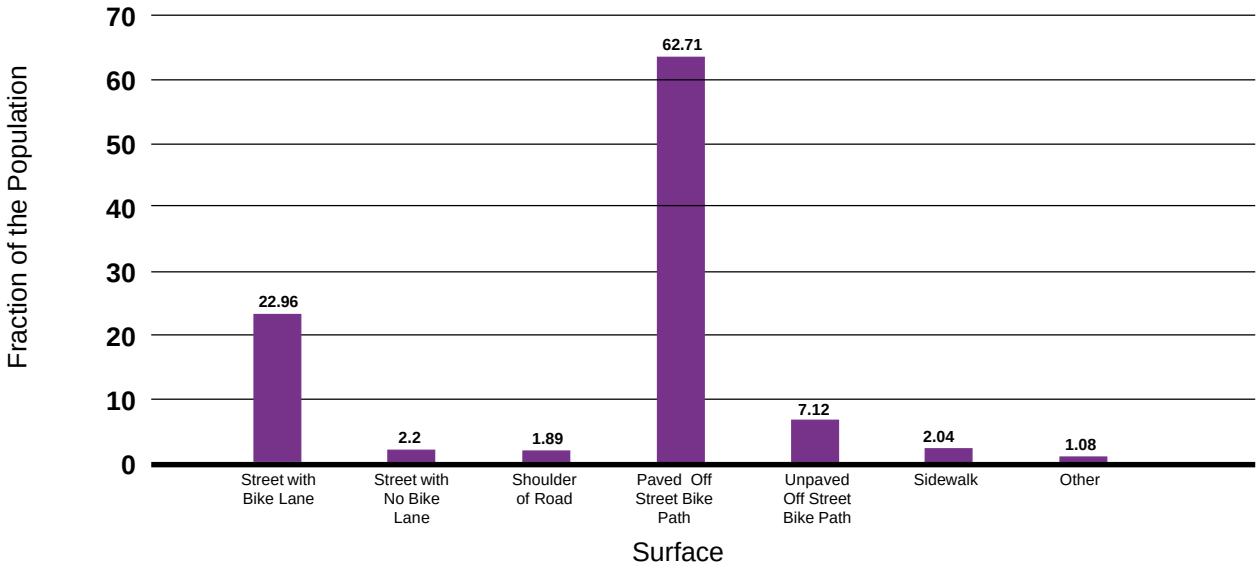
Figure 9
Average Amount of Recreation/Exercise Ride on Specific Surfaces



Preferred Surfaces for Bicycling

When asked about the riding surfaces they most preferred, bicyclists in Colorado left no doubt: paved off-street bicycle paths. Especially for transportation purposes, survey respondents overwhelmingly preferred this surface. Nearly two-thirds (63 percent) of Colorado bicyclists prefer to ride on an off-street bike path when they are riding to work, school or for a utility trip. Twenty-three percent prefer riding on the street with a bike lane. An unpaved off-street bike path was the choice of 7 percent of bike riders, and only a few indicated that they preferred to ride on a street with no bike lane, the shoulder of a road or a sidewalk.

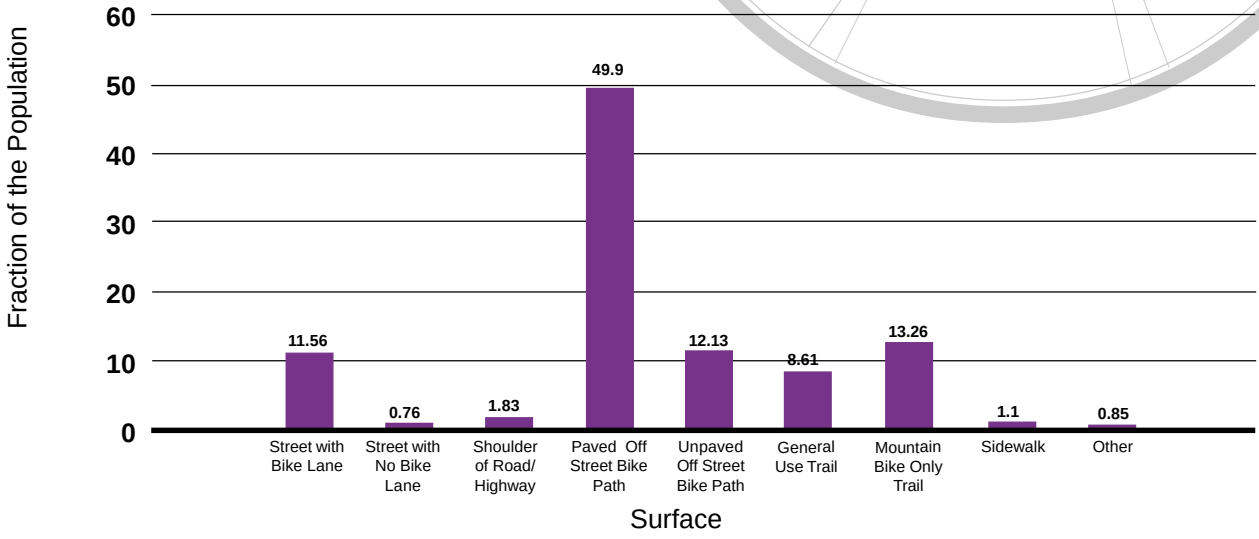
Figure 10
Prefered Surface for Work, School or Utility Trip



Respondents were also asked about the surface they preferred when riding for recreation and exercise, and the results are slightly different from the surfaces that they preferred for commuting purposes. Although the most popular surface was again paved off-street bike paths, other surfaces were viewed more favorably when riding for recreation. Half of the bicyclists indicated that they preferred paved bike paths. Thirteen percent preferred riding on a mountain bike trail, 12 percent preferred an unpaved off-

street bike path and 12 percent most enjoyed riding on a street with a bike lane. A general use trail was preferred by 9 percent of the respondents. Less than 2 percent each indicated that they preferred to ride for recreational purposes on a street, road shoulder or sidewalk.

Figure 11
Preferred Surface for Recreation or Exercise Trip



Satisfaction with Bicycling

Respondents who bicycle in Colorado were asked to rate their satisfaction with 15 different aspects of their bicycling experiences in the state. These aspects include the courtesy of others, bicycle parking, and the physical condition of the surfaces on which they ride. They were to indicate their satisfaction on a scale from one to five, with five representing "very satisfied" and one representing "not satisfied". The features that generated the highest frequency of negative responses were: the courtesy of motorists, debris on the roads, conditions at road intersections and the condition and width of road shoulders. Over 60 percent were dissatisfied (either very or somewhat dissatisfied) with the width of road shoulders. Above, few people reported a preference for riding

on the shoulder of a road, but those who ride on road shoulders are clearly not satisfied with either their width or condition. Only 2 percent indicated they were very satisfied with the condition of road shoulder surfaces, while 19 percent indicated that they were very unsatisfied.

Table 2. Satisfaction with Aspects of Bicycling in Colorado

	Percent Very Satisfied	Percent Somewhat Satisfied	Percent Somewhat Unsatisfied	Percent Not Satisfied
Bicycle Parking at Work	12%	9%	7%	11%
Bicycle Parking at School	8%	8%	4%	4%
Bicycle Parking at Other Locations	3%	9%	22%	13%
Courtesy of Motorists	1%	7%	28%	28%
Courtesy of Other Cyclists	12%	12%	12%	5%
Courtesy of Walkers, Runners and Skaters	7%	7%	12%	6%
Crossings at Road Intersections	2%	2%	25%	13%
Railroad Crossings	5%	15%	11%	7%
Debris on Roads/Paths	4%	19%	22%	13%
Speed Bumps and Drainage Grates on Roads	3%	15%	19%	10%
Road Surface Conditions	3%	18%	22%	10%
Bike Path Surface Conditions	12%	37%	9%	3%
Road Shoulder Surface Conditions	2%	7%	33%	19%
Road Shoulder Widths	1%	6%	33%	29%
Signs/Travel Markers	4%	19%	18%	11%

Preferences Regarding Bicycle-Related Public Expenditures

Respondents from Colorado households were asked if they would like to see improvements in conditions to encourage bicycling as a means of transportation. An overwhelming majority (79 percent) indicated that they would like to see such expenditures. Respondents then indicated their preferred funding method(s). Respondents could select from among the options presented in Table

3, and could select as many sources as they liked. Twelve percent did not indicate any preference. Clearly, the use of new taxes is not an attractive funding source. Only 6 percent indicated that they would like to use this funding option. The majority of survey respondents preferred to reallocate funds from other transportation projects. There was some support for using fees for trails and path use and bicycle registration and licensing revenue.

Table 3. Preferred Funding Sources for Improvement of Bicycling Conditions

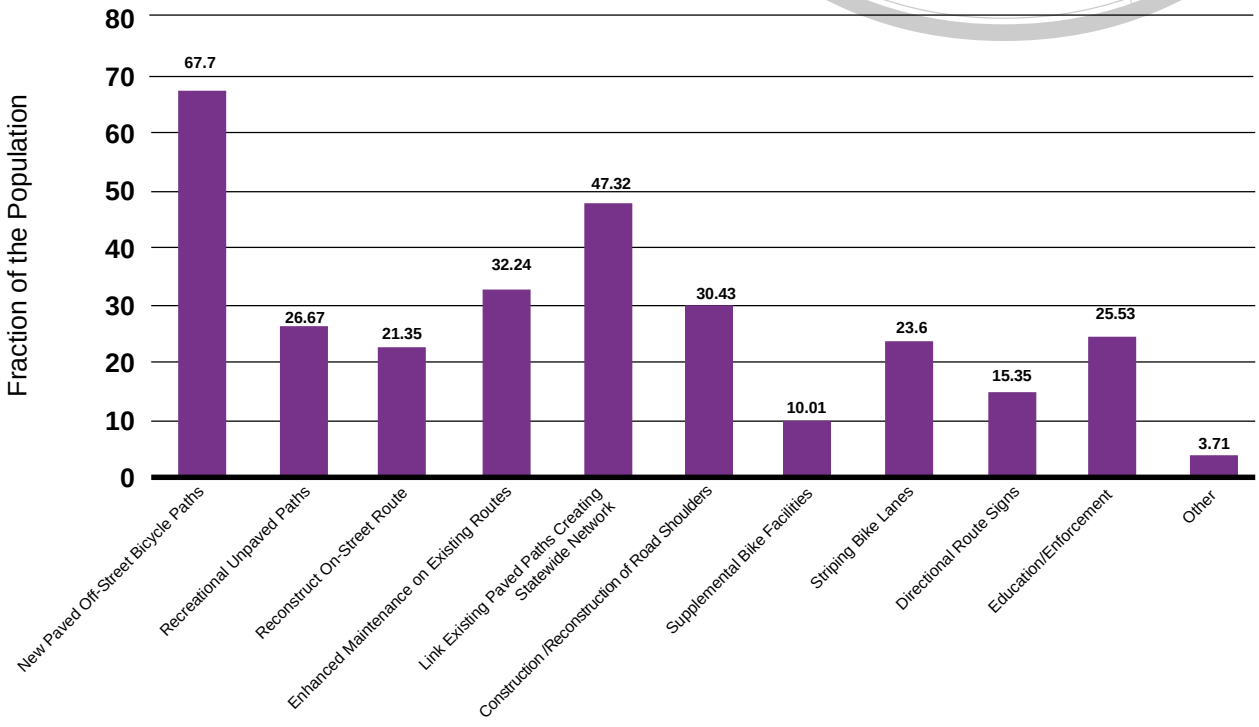
Funding Source	Percent of Households
New Tax	6.2%
User Fees for Trails and Paths	20.9%
Bicycle Registration and Licensing Fees	35.5%
Reallocating Funds from Other Transportation Projects	51.3%

Note: Percentages sum to more than 100% since respondents can select more than one funding source.

Respondents who bicycle in Colorado were also asked about how they would allocate $100 among various uses to improve their experiences when bicycling to work or for a utility trip. The questions listed ten possible uses for the money. Figure 12 below illustrates the projects that were most frequently mentioned by survey respondents. (It should be noted that the question did not ask if they would like to see any money spent on improving bicycling, but rather, if $100 were to be spent, where they would like to see the improvements.) Not surprisingly, given the fact that most bicycle riders indicated that they preferred riding on paved off-street bike paths, the most popular expenditure was to create new paved off-street bicycle paths. Just over two-thirds of the bike riders (68 percent) would choose to allocate some money for this use. The second most frequently mentioned project was to link existing paved paths. Forty-seven percent of respondents also chose this project. Other projects receiving support include spending to create recreational unpaved

paths, to better maintain existing routes and t[illegible]nstruct and im[illegible]e road shoulde[illegible]. Bicyclists were less enthusiastic regarding expenditures on [illegible]ducation and enforcement, constructing on-street routes, and striping bike lanes. Supplemental b[illegible]e facilities and improving signs were mentioned by the fewest riders.

Figure 12
Public Bicycling Expenditure Preference



The Determinants of Bicycling

The household survey asks respondents to indicate the degree to which a variety of factors affect their decision to ride to work, school or for a utility trip. For each factor, the individual may indicate that it is not a factor, is a minor factor, is a major factor, or prevents them from bicycling

altogether. We use the responses to these questions to investigate the impact these factors have on the likelihood and amount of bicycling.

An investigation of the determinants of bicycling for work, school and utility trips reveals that concerns with traffic safety, the lack of off-street bike paths and lack of shower and dressing facilities at the destination influence the propensity to bicycle to work. Concern about traffic safety is the only significant factor that impacts the decision to bicycle to school; and road hazards (e.g., potholes and gravel) and lack of off-street bike paths are the factors that influence the decision to use a bicycle for utility trips.

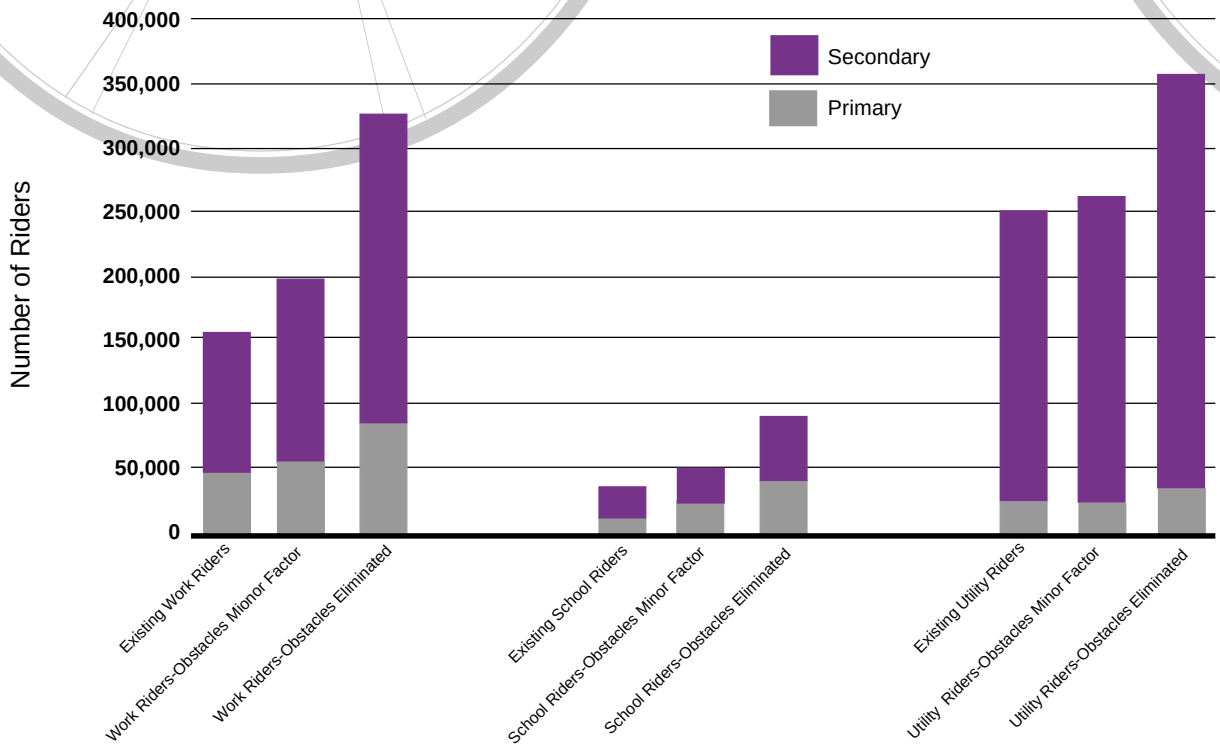
It is estimated that in Colorado there are 155,000 individuals who use a bicycle as their primary or secondary method of transportation to work. There are 41,500 students who use a bicycle for school trips as their primary or secondary method, and 241,000 individuals who bicycle for utility trips. The monthly number of miles bicycled by these riders are 5.6 million miles for work trips, 1.5 million miles for school trips, and 5.4 million miles for utility trips, generating a total of 12.5 million miles per month.

For those who bicycle to work, the satisfaction with the availability of bicycle parking is the only important factor that determines the frequency of bicycling. The satisfaction with the courtesy of other bicyclists, the availability of bike paths and signs and markers impact the frequency of utility trips.

Figure 13 displays the information on the number of current riders in each category (work, school and utility trips) by whether bicycling is their primary or secondary method of transportation. The middle bars in each category represent the number of bicyclists one would observe if the factors that matter in bicycling decisions were reduced to being a "minor factor" in each commute category. For example, if traffic safety concerns, the availability of bike paths and shower facilities were only a minor concern for workers, this would increase the number of individuals who bicycle

to work to 191,000 individuals. If these obstacles were eliminated entirely, the number of individuals who bicycle to work would go up to 319,000.

Figure 13
Number of New Riders



The reduction of the traffic safety concerns to a "minor factor" would increase the number of students who bicycle to school by 7,700 to 49,200 students. Elimination of traffic safety concerns entirely would increase the number of students who bicycle to work to 84,500.

The reduction in road hazards and the lack of off-street bike paths increases the number of individuals who bicycle for utility trips to 248,000. The elimination of these obstacles increases this number to 352,000.

Figure 14
Monthly Miles Commuted by Current and New Bicyclists Due to Factors Becoming "Not a Factor" and Satisfaction Raised to 4 on Five Point Scale

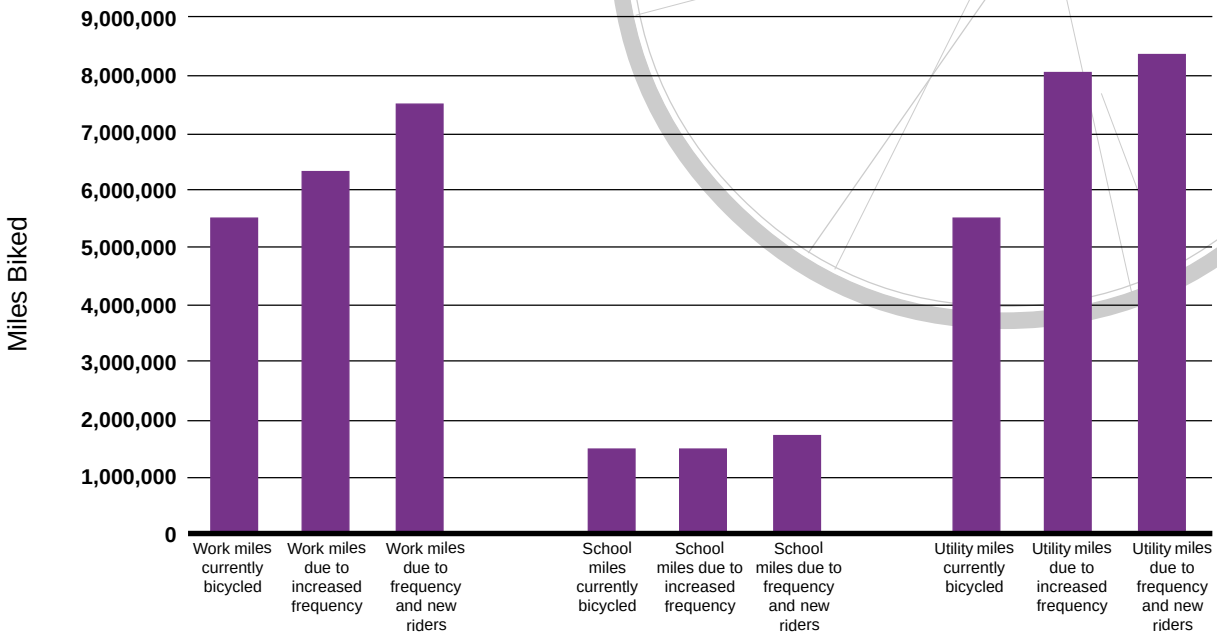


Figure 14 displays the number of miles bicycled per month for each category (work, school or utility trip), along with the number of miles that would be observed due to increased frequency of riding by current users, as well as the miles that would be observed due to increased frequency and the entrance of new riders following a change in bicycling environment.

The questions used in the analysis ask respondents to indicate their satisfaction with certain factors, on a scale from 0 (very unsatisfied) to 5 (very satisfied). For example, if parking satisfaction increases to 4.0 on a scale from 0 to 5 (where the current average is 3.1 for individuals who bicycle to work), this would increase the number of miles bicycled to work by almost 12 percent to approximately 6.3 million miles per month. If the obstacles were improved such that they are only a minor concern, this would add an additional 1.3 million miles ridden by the workers who would start bicycling to work.

An improvement in the bicycling environment so that the obstacles become a minor concern, coupled with an improvement in satisfaction of various bicycling conditions to 4.0 (on a scale from 0 to 5, where the current satisfaction averages are around 3) would generate a total of 1.7 million miles bicycled to school per month, and 8 million miles for utility trips.

In the extreme scenario where all obstacles are eliminated and the satisfaction with bicycling conditions is at the maximum, the total number of monthly miles traveled for work would be 13 million miles for work trips, 3 million miles for school trips, and almost 15 million miles for utility trips. These values can be considered as the upper limits. Figure 15 summarizes the total miles traveled currently and its breakdown into work, school and utility trips, along with the miles that would be traveled if obstacles are reduced to a "minor concern" and satisfaction with bicycling conditions were raised to 4 (the middle bar). The bar on the right displays the upper-limit miles: the miles that would be traveled under the elimination of all obstacles, and all bicyclists being very satisfied with all bicycling conditions. The total miles bicycled currently are around 12 million per month. The total miles bicycled would go up to 17 million with obstacles improved to be a minor concern and satisfaction average being 4.0, and the upper limit of total miles bicycled is 31 million miles per month.

Figure 15
Total Monthly Miles Bicycled Under Various Conditions

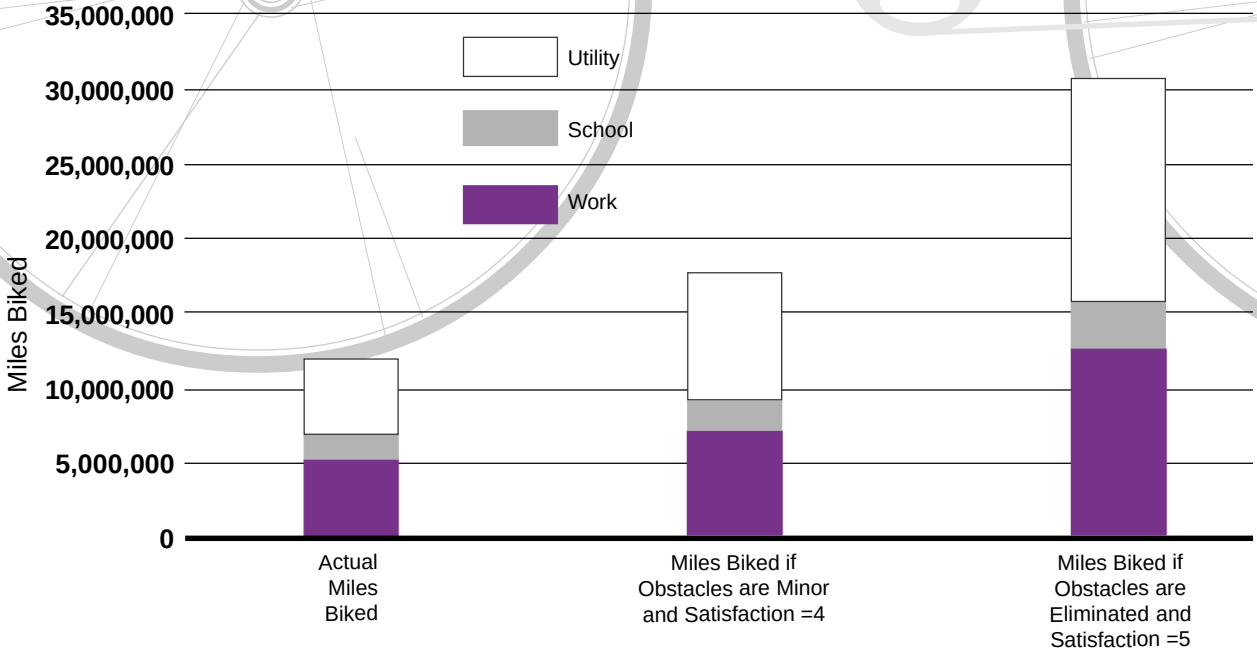
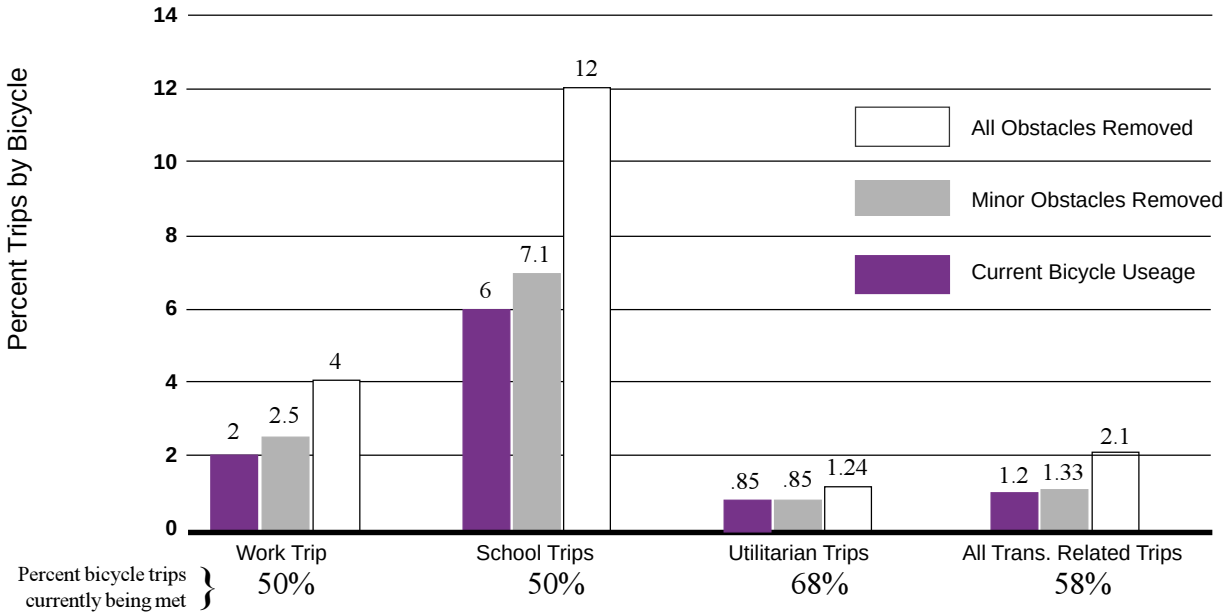


Figure 16
Statewide Bicycling Potential Without Obstacles



BICYCLE SAFETY

Helmet Use.

Fifty-nine percent of Colorado households with bicycles report owning bicycle helmets. The use of these helmets varies depending on the age of the cyclist and the type of surface. Survey respondents were asked to indicate the frequency of helmet use when riding on various surfaces. The frequency is indicated by selecting from a five point scale with one indicating that the rider "never wears a helmet" and five indicating that the rider "always wears a helmet."

Adult riders (over the age of 16) are most likely to either always wear a helmet or never wear a helmet as shown in Figures 17 - 20 Helmet use by this group is most common on mountain terrain (Figure 20). Just over half (51%) report that they always wear a helmet when riding in the mountains, but 37 percent report that they never do. Similar patterns of helmet use by adults (although at slightly lower levels) are reported for those riding on unpaved trails, streets and paved bike paths. Adult riders are least likely to wear helmets on paved paths where 38 percent report that they always wear a helmet and 42 percent never wear one (Figure 17).

Figure 17
Frequency of Helmet Use by Adults when Riding on a Paved Bicycle Path

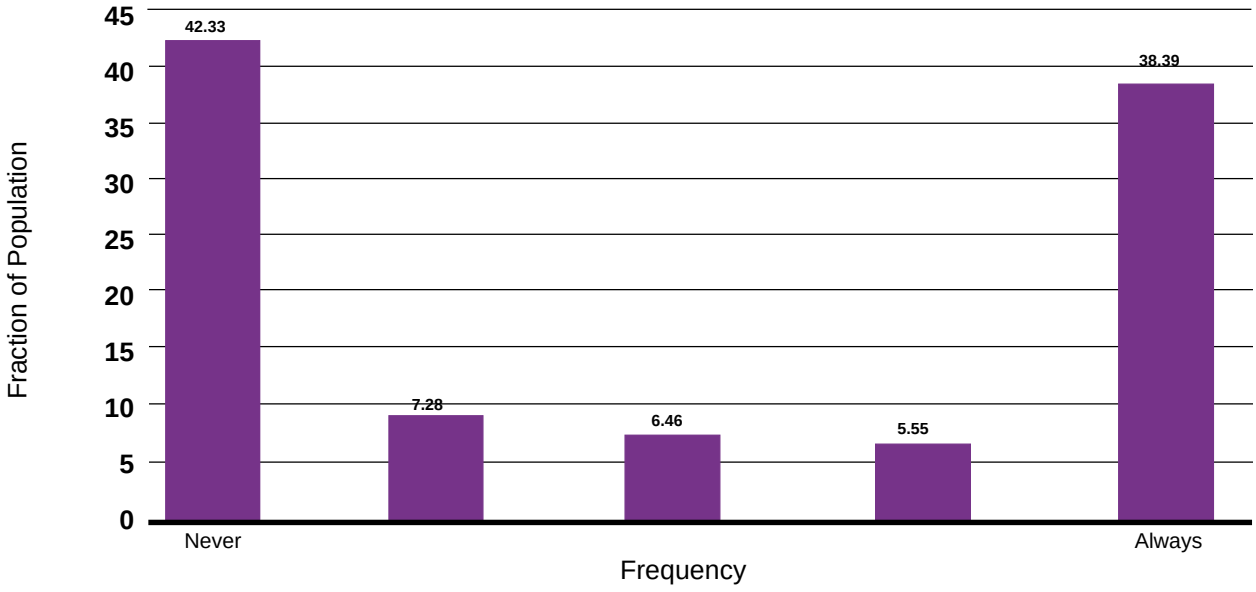


Figure 18
Frequency of Helmet Use by Adults when Riding on a Street

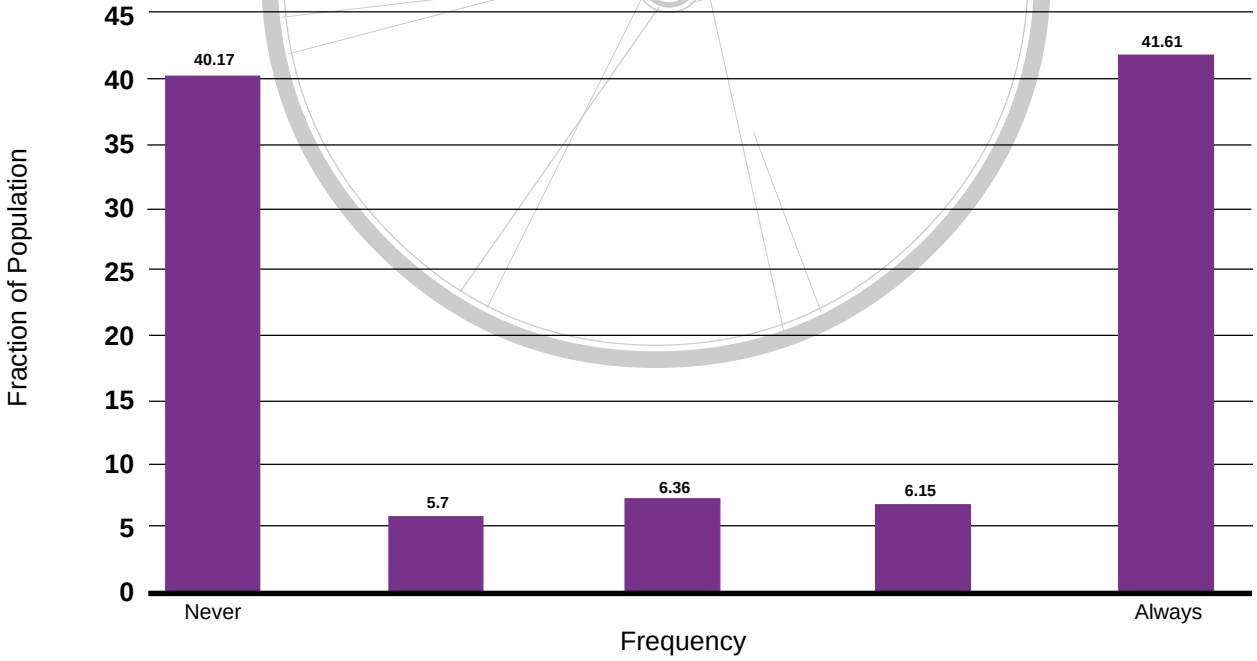


Figure 19
Frequency of Helmet Use by Adults when Riding on an Unpaved Trail

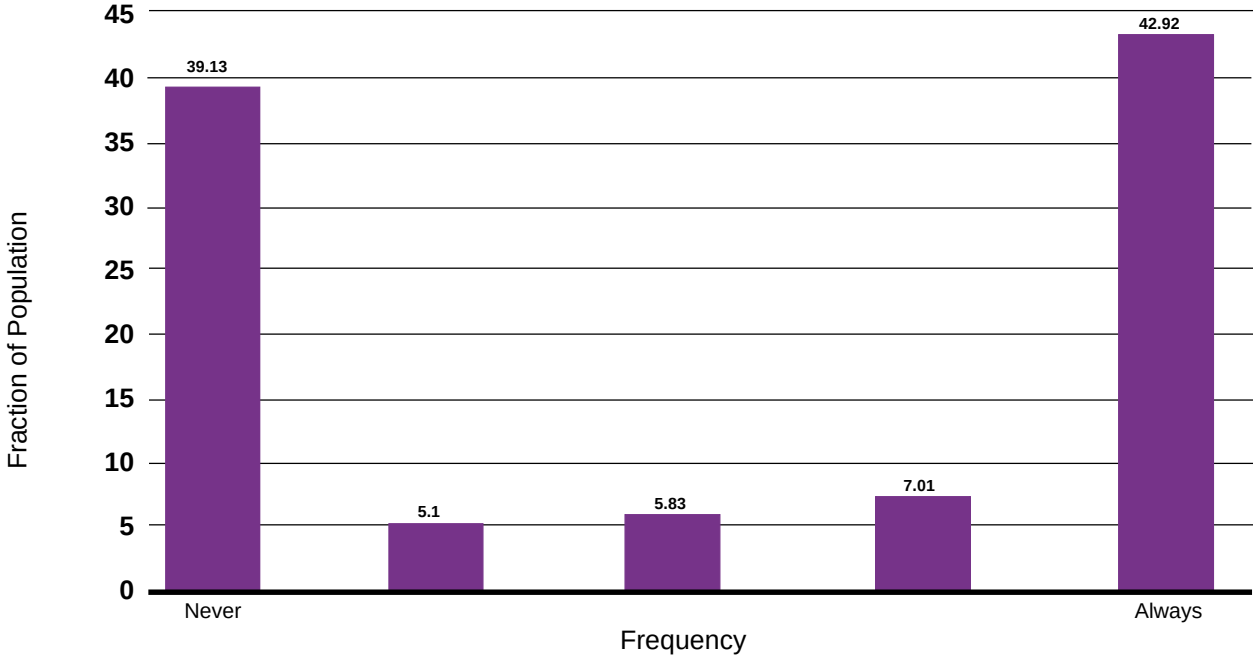
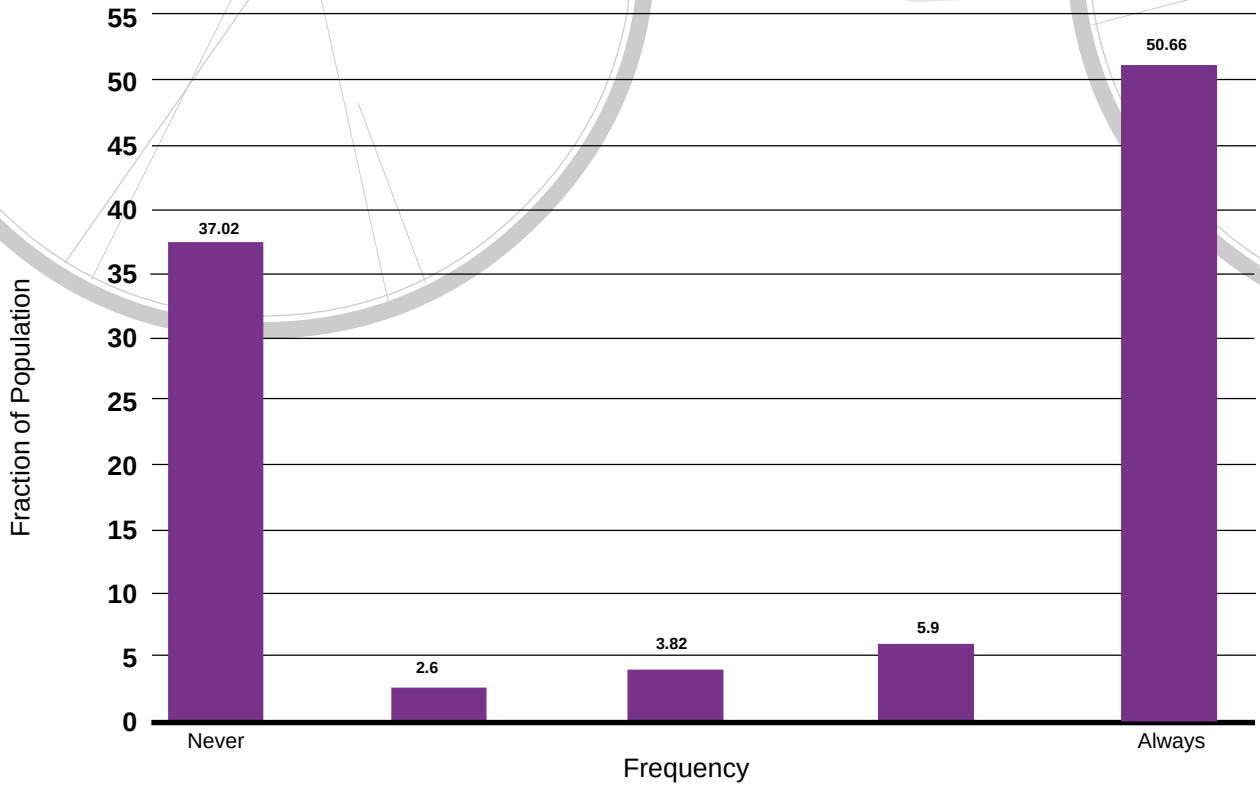


Figure 20
Frequency of Helmet Use by Adults when Riding on Mountain Terrain



Helmet Use By Children.

As reported in Figures 21 - 24, young children who ride bikes are much more likely than adults to wear helmets. Just under 70 percent of young children always wear helmets when riding on mountain terrain, although 16 percent never do. Fewer, 61 percent, of young children always wear a helmet when riding on the street. Just over 13 percent of children never wear a helmet when bicycling on streets.

Figure 21
Frequency of Helmet Use by Children when Riding on a Paved Bike Path

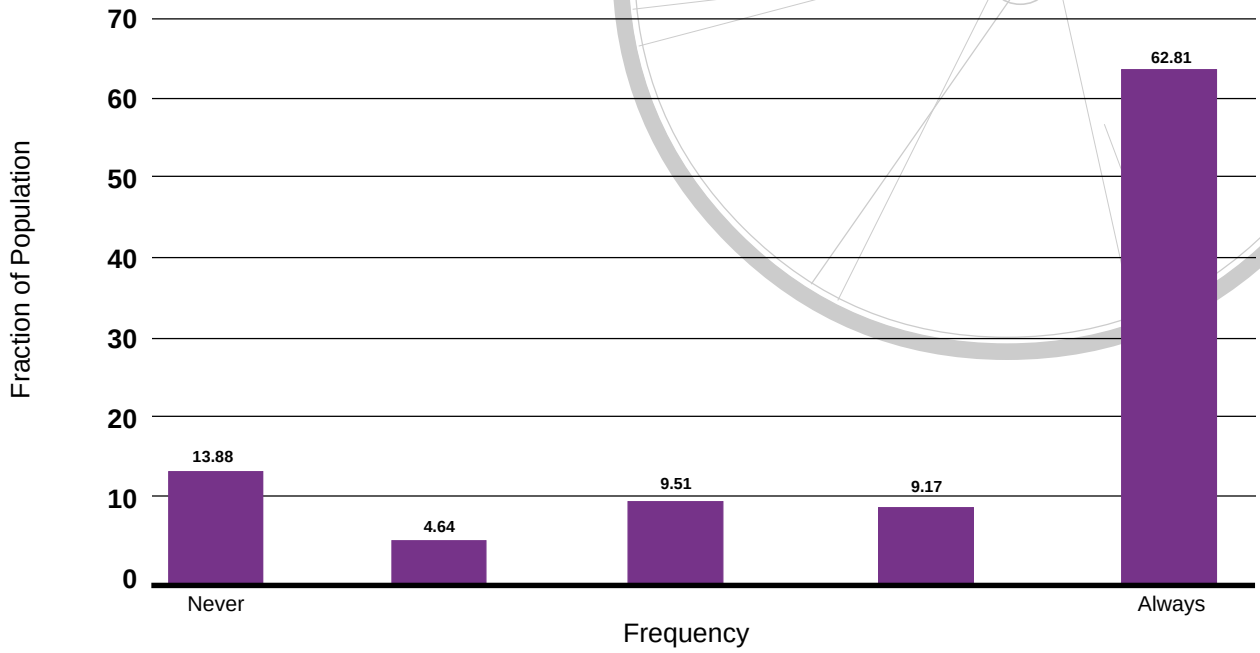


Figure 22
Frequency of Helmet Use by Children when Riding on Street

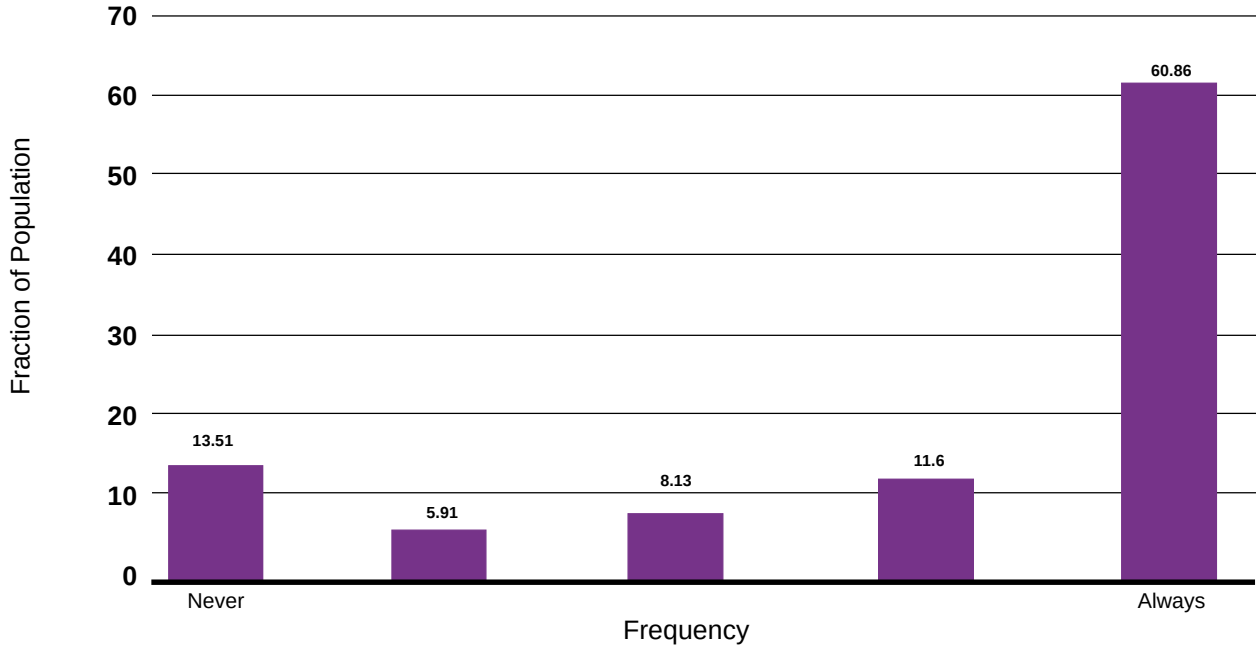


Figure 23
Frequency of Helmet Use by Children when Riding on Unpaved Trails

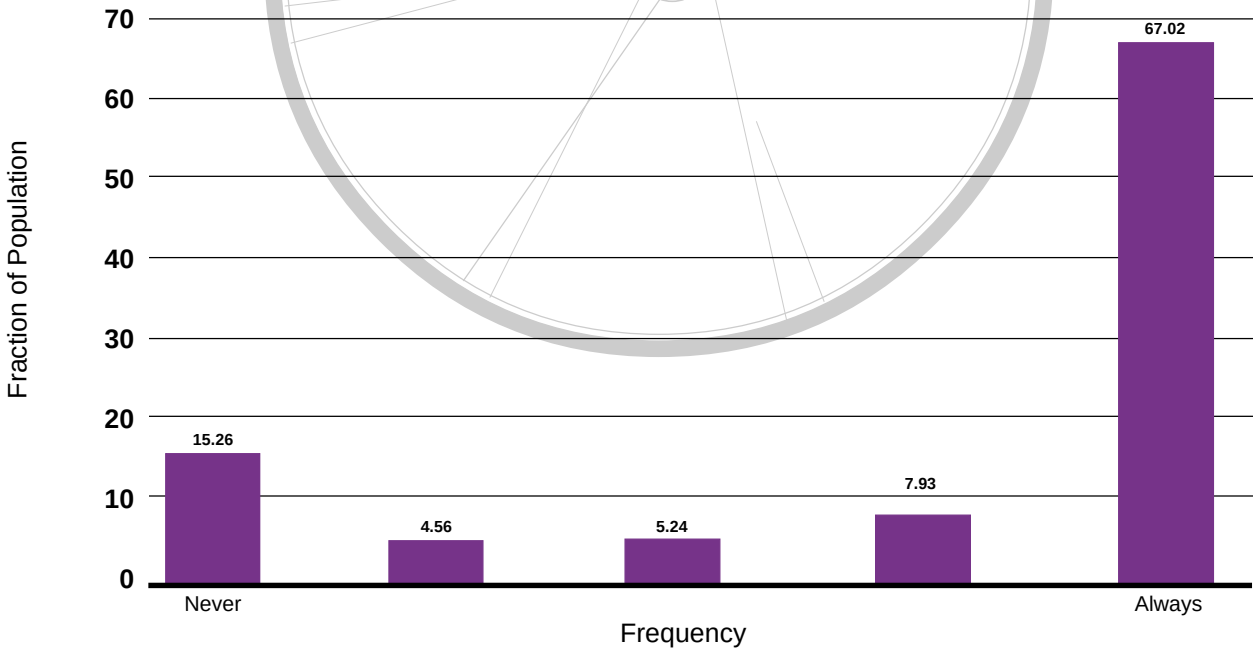
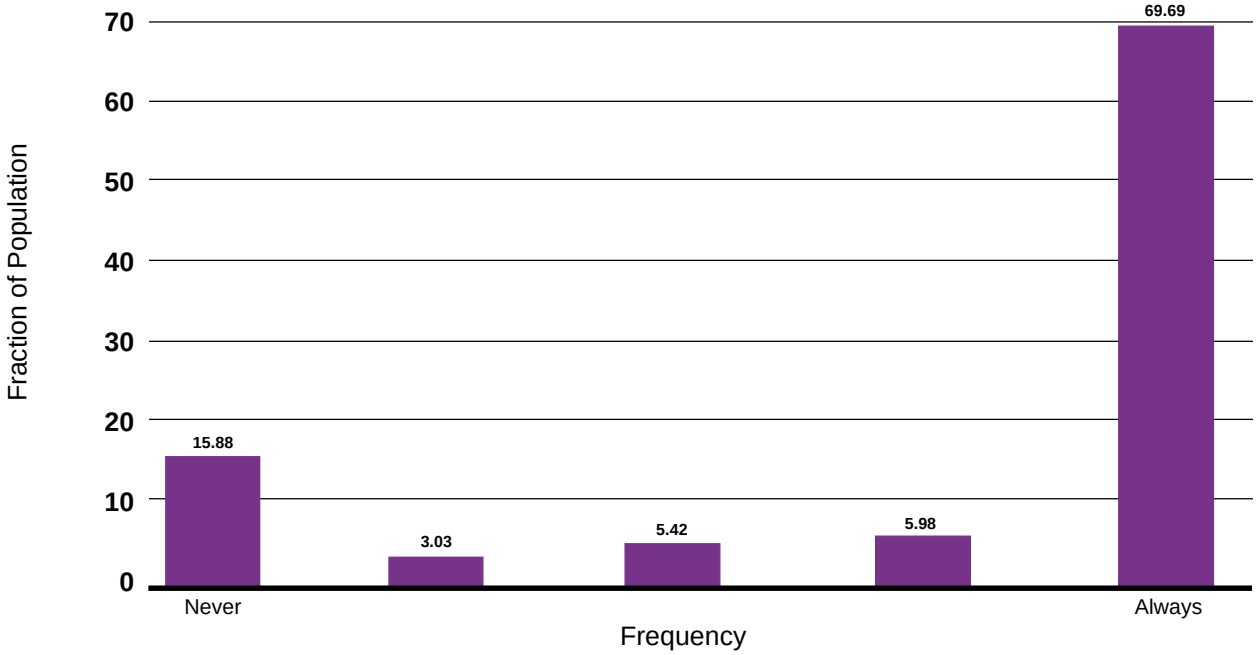


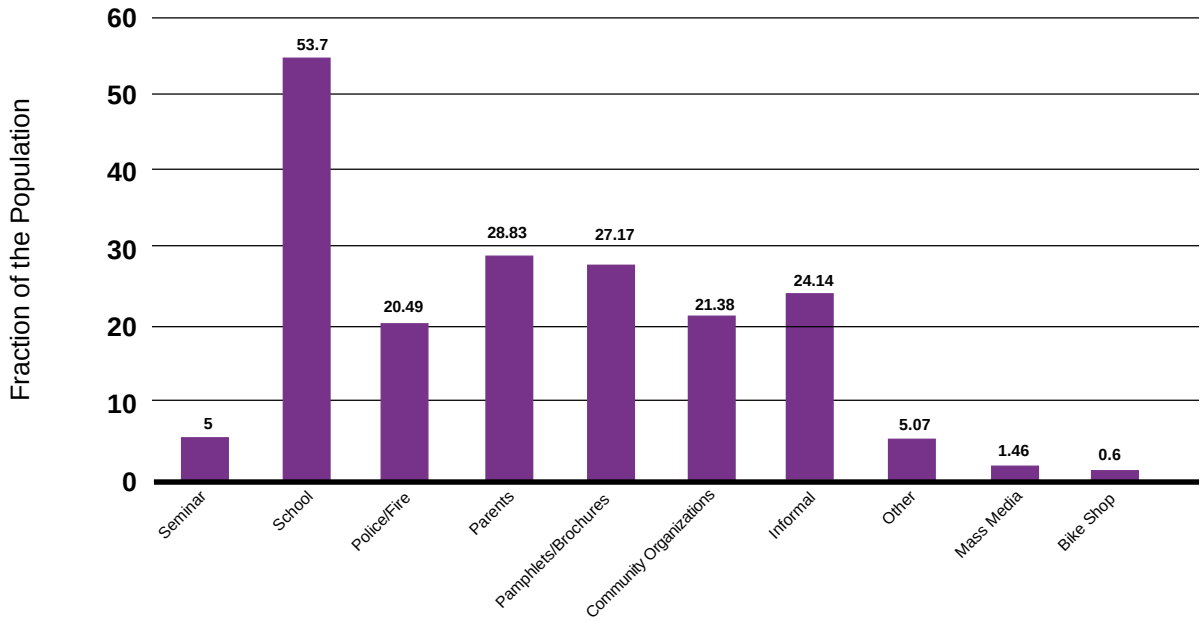
Figure 24
Frequency of Helmet Use by Children when Riding on Mountain Terrain



Bicycle Safety Instruction.

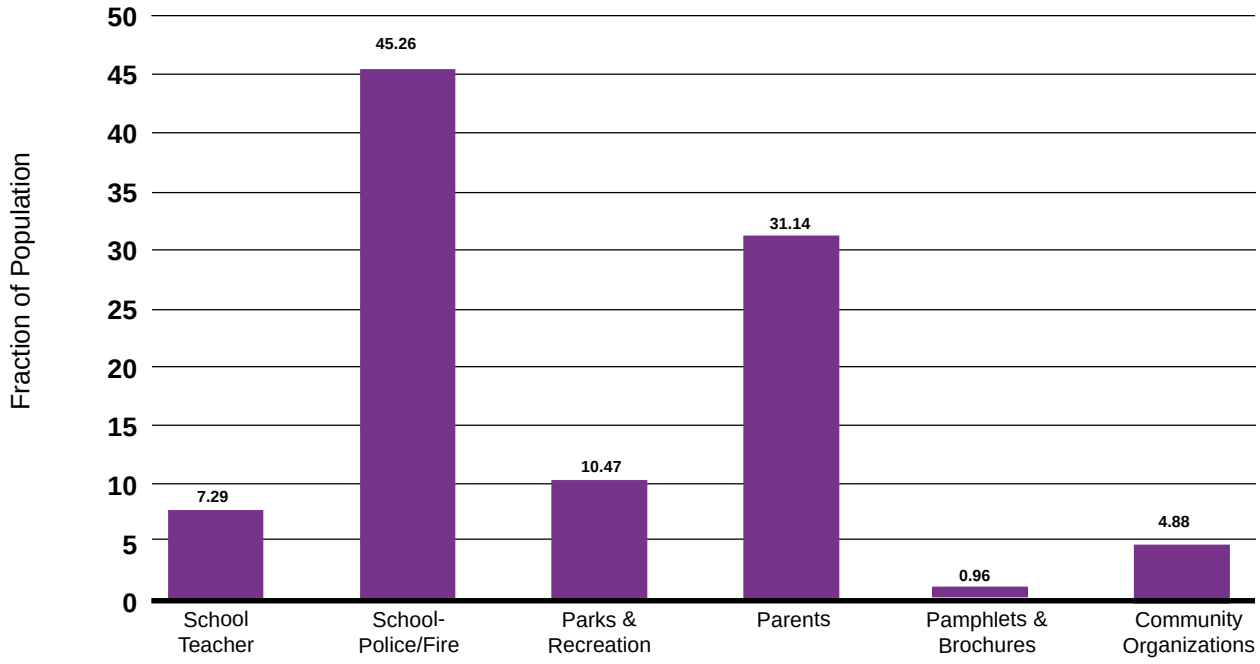
Just over 40 percent of Coloradans report having received some type of bicycle safety instruction. Respondents were asked to indicate all of the types of bicycle safety instruction they have received (many mentioned more than one type). Of those who received instruction, Figure 25 shows that more than half (54%) received some training at school. Other frequent sources of bicycle training instruction included parents, police and fire departments, community organizations, pamphlets and brochures and other informal sources.

Figure 25
Where Colorado Residents Received Bicycle Safety Instruction



The majority of Coloradans believe that the best place for children to receive bicycle safety training is in school (Figure 26). Forty-five percent think that the instruction should be provided by police or fire department personnel, and 7 percent believe that teachers should be providing safety information at schools. Almost a third (31%) think that parents should provide safety information. Smaller percentages feel that bicycle safety instruction should be provided by other organizations in the community—10 percent think that parks and recreation district personnel are best equipped to provide training to children and 5 percent think that it should be provided by community organizations. Although 27 percent of adults indicated that they had received some of their training from pamphlets and brochures, less than 1 percent of residents believe that this is the best way for children to learn about bicycle safety.

Figure 26
Where Colorado Residents Prefer Children Receive Bicycle Safety Instruction

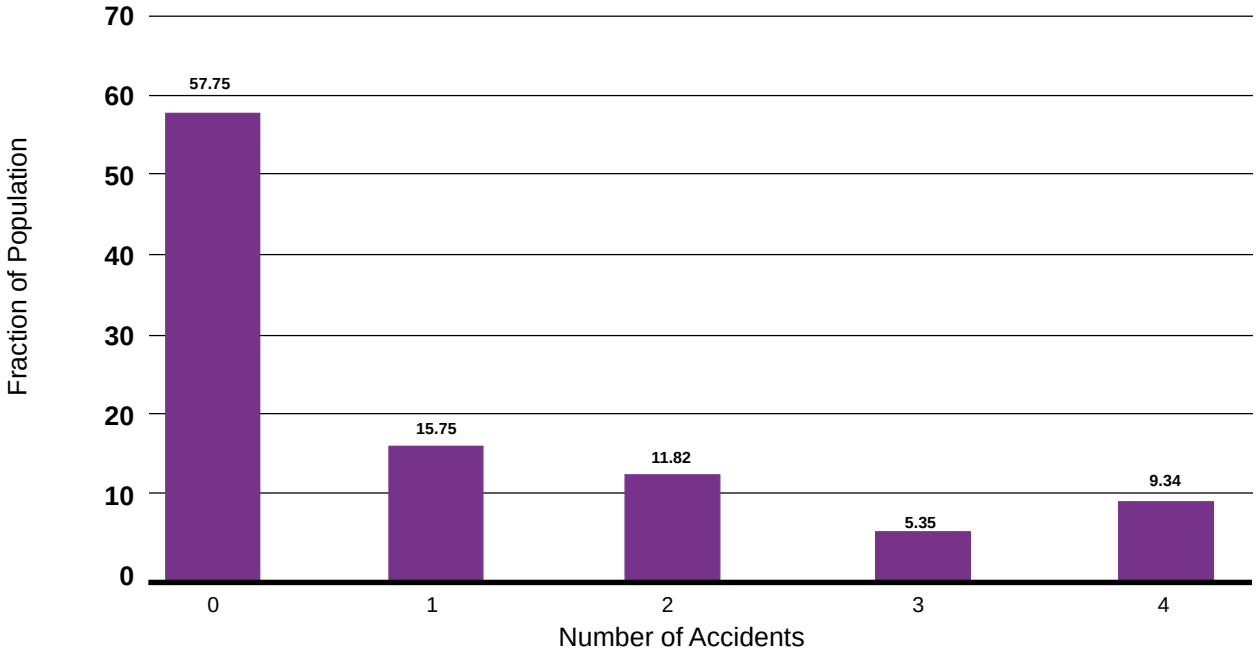


Bicycle Crashes on Unpaved Trails.

In addition to their attitudes and expectations about bicycle crashes, survey respondents were asked about crashes that they have been involved in while riding a bicycle. Nearly half (46%) of all Colorado bicycle riders report having ever had a crash on an unpaved trail, and many riders (27%) have experienced more than one in the last twelve months (Figure 27).

The riders with the most experience, who ride most frequently are least likely to experience a crash. For example, 38 percent of those who bicycle more than once per week reported a crash on an unpaved trail, while almost 60 percent of those who bicycle less than once per month were in a crash.

Figure 27
Number of Bicycle Crashes in the last 12 Months on an Unpaved Trail Among Bicycle Riders



Though many Coloradans have experienced a crash on an unpaved trail, the consequences typically are not severe. As shown in Figure 28, less than five percent indicated that their crash resulted in severe or worse injuries. Fourteen percent indicated that they received no injuries at all,

and 67 percent reported only minor injuries. These reports are consistent with the expenses involved in a bicycle crash on an unpaved trail reported in Figure 29. Three-quarters of the riders who were involved in this type of crash incurred no expenses as a result. Only 5 percent incurred expenses greater than $100. The average amount spent per crash was $51.

Figure 28
Severity of Injury in Last Bicycle Crash on an Unpaved Trail

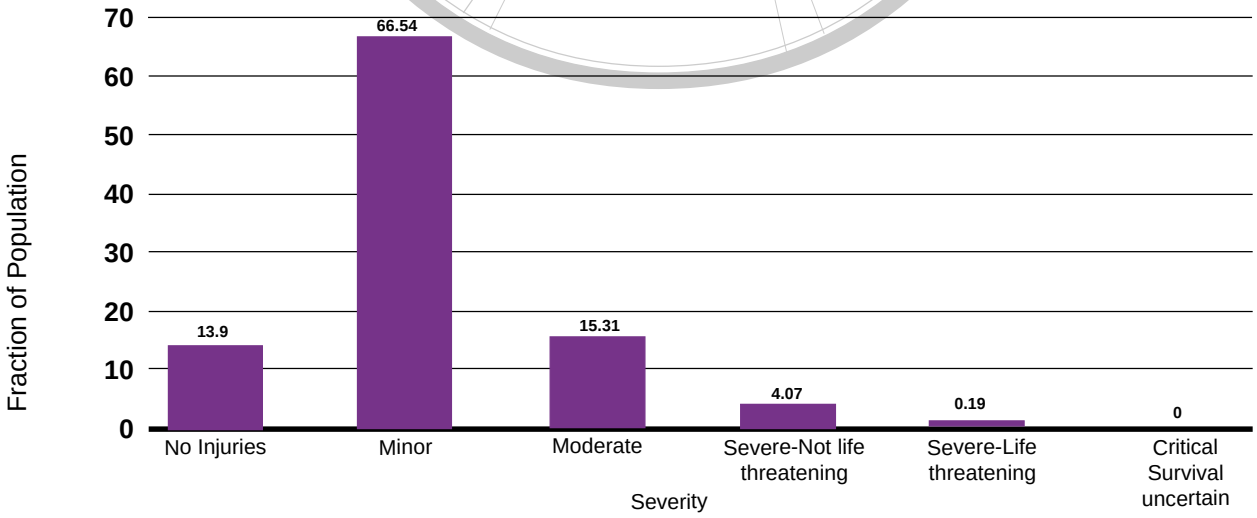
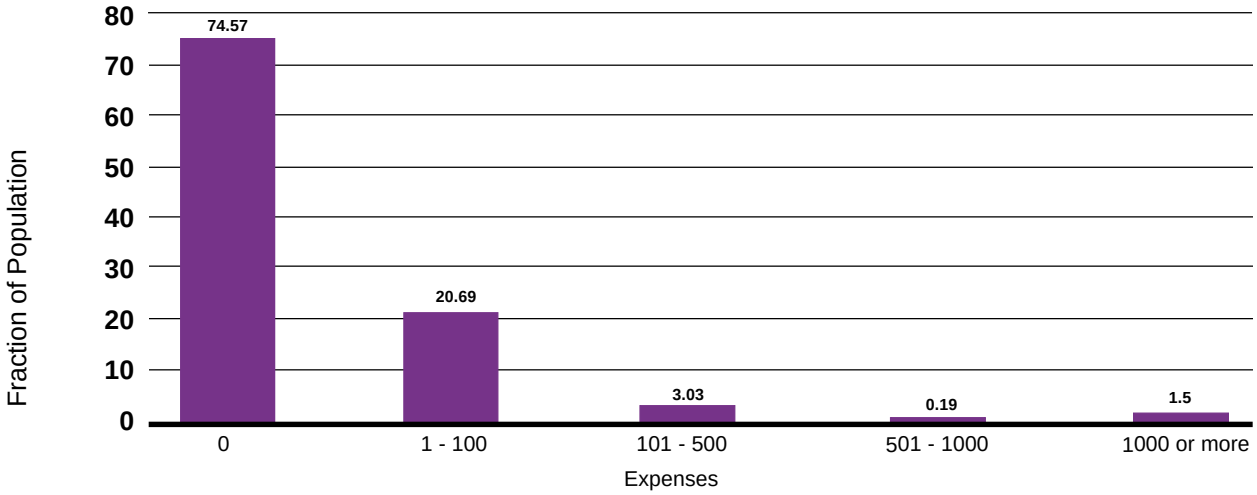


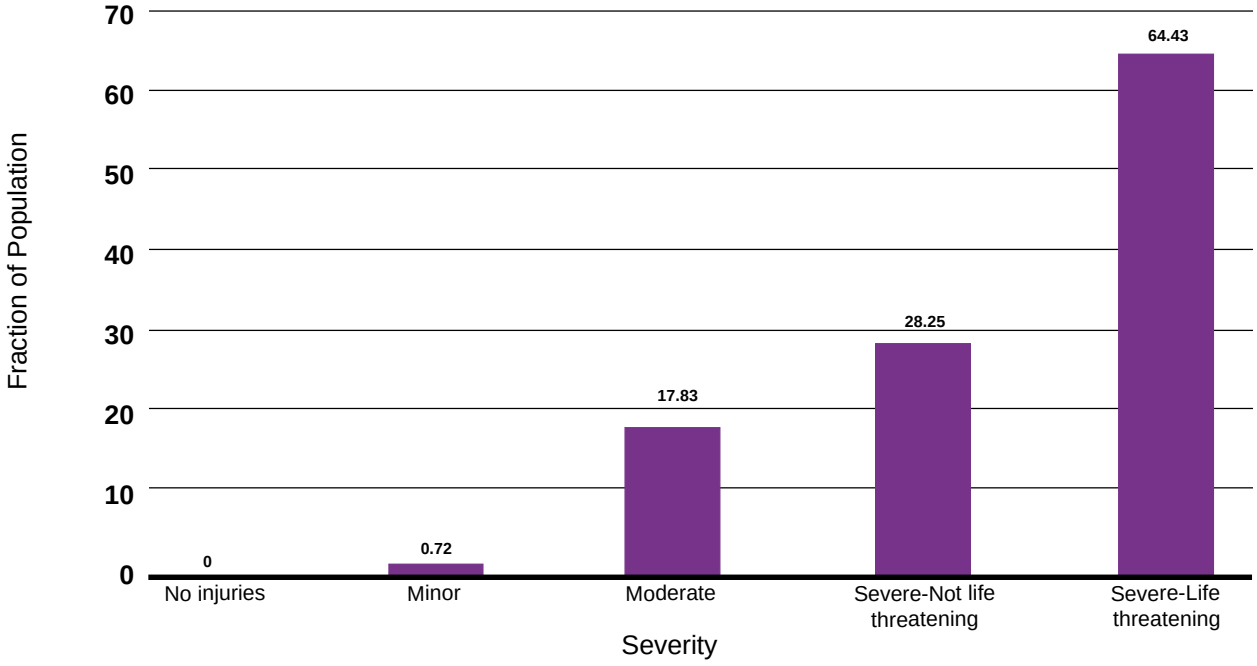
Figure 29
Total Expenses Incurred in Most Recent Bicycle Crash on Unpaved Trail



Crash Reporting.

Bicyclists who experienced a crash on an unpaved trail were asked if they reported it to the authorities, including the police, park rangers and medical personnel. Predictably, the fraction of crash victims reporting their crash increased with the severity of the crash. As Figure 30 indicates, no one reported a crash on an unpaved trail that resulted in no injuries. One percent of those who had minor injuries reported their crash. Among those with moderate and severe, non-life-threatening-injuries, the reporting rates were 18% and 28% respectively. The highest reporting rates were for those who had severe life-threatening injuries. Responses to this question are not available for those with critical injuries because the sample size is too small to report reliable estimates.

Figure 30
Fraction Reporting the Most Recent Bicycle Crash on an Unpaved Trail by Severity of Injuries



Bicycle Crashes on Paved Roads and Trails

Respondents were asked similar questions to those just above regarding crashes that occurred on a paved road or trail. Half of respondents reported that they had ever crashed on a paved road or trail. Within the last 12 months, 28 percent have experienced such a crash, with 10 percent involved in more than one crash (Figure 31). As detailed in Figure 32, most of these crashes were not serious, 74 percent resulted in either no injuries or only minor injuries. Less than one percent resulted in life-threatening or worse injuries. The average expense of the crash, among those involved in an accident on a paved surface was $123. However, as Figure 33 illustrates, 68 percent incurred no expenses, while 3 percent incurred expenses that exceeded $1000. As with crashes on unpaved surfaces, the fraction reporting their injuries is low. Nine percent of respondents experiencing a bicycle crash indicated that it was reported to authorities. Figure 34 demonstrates the same pattern that we found earlier, the more severe the injuries, the more likely that a report is made. Three percent of those with no injuries or only minor injuries are reported, but nearly all, 91 percent, of crashes with severe-life threatening injuries are reported. (Again, there were too few individuals with critical injuries to calculate a reporting percentage for this group).

Figure 31
Number of Bicycle Crashes on a Paved Road Among Bicycle Riders Within the Last 12 Months

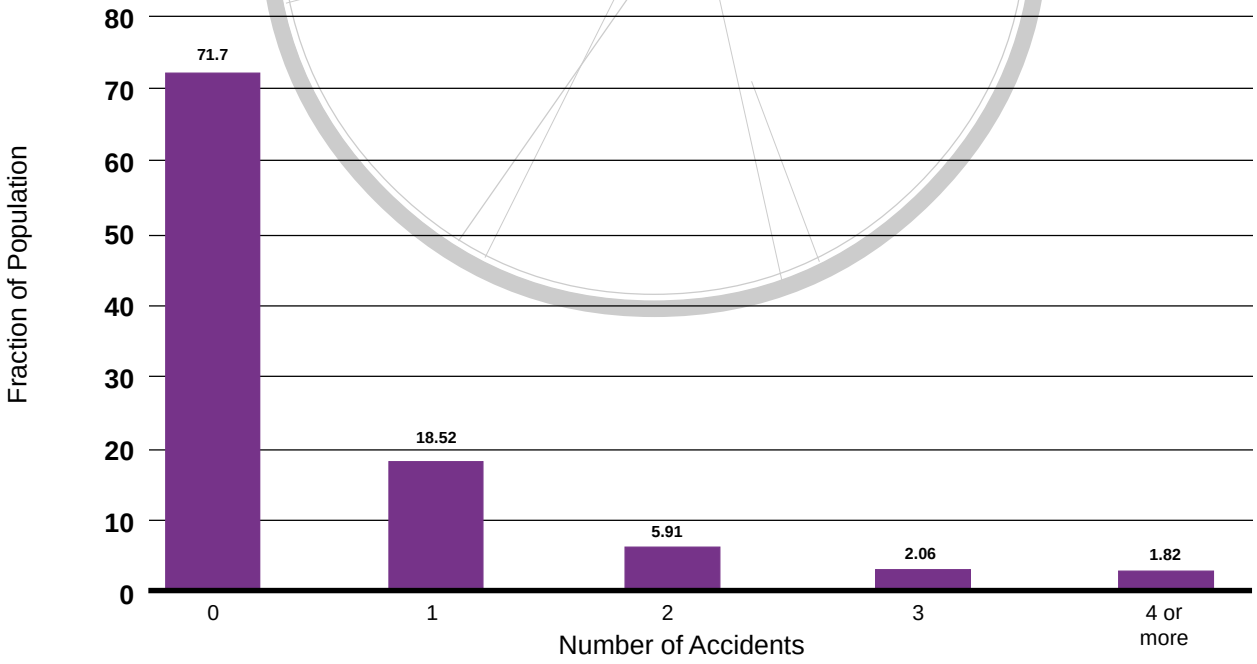


Figure 32
Severity of Injury in Last Bicycle Crash on a Paved Road

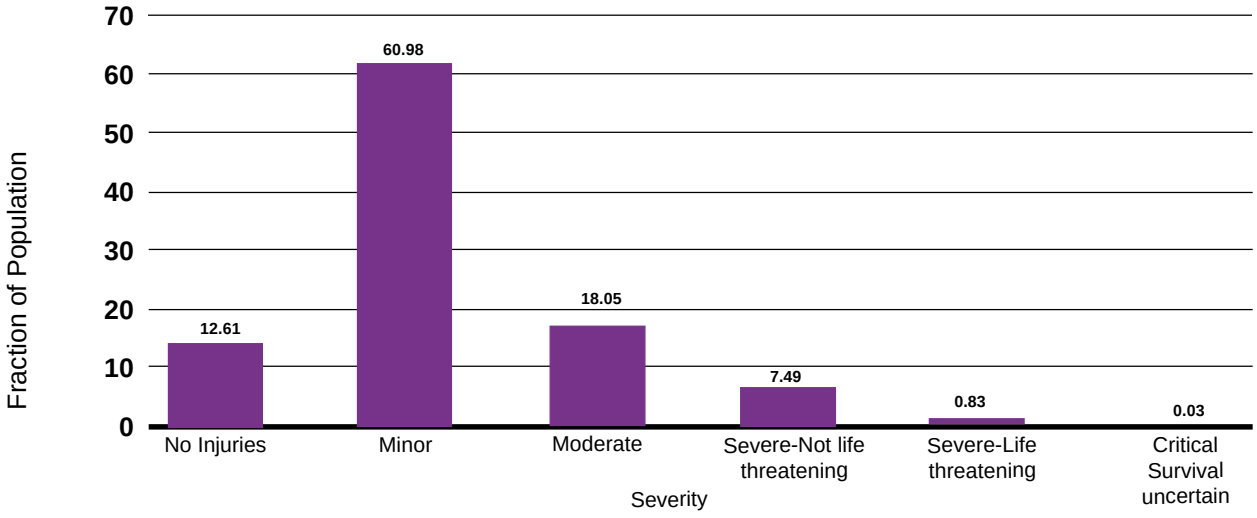


Figure 33
Total Expenses Incurred in Most Recent Bicycle Crash on Paved Road

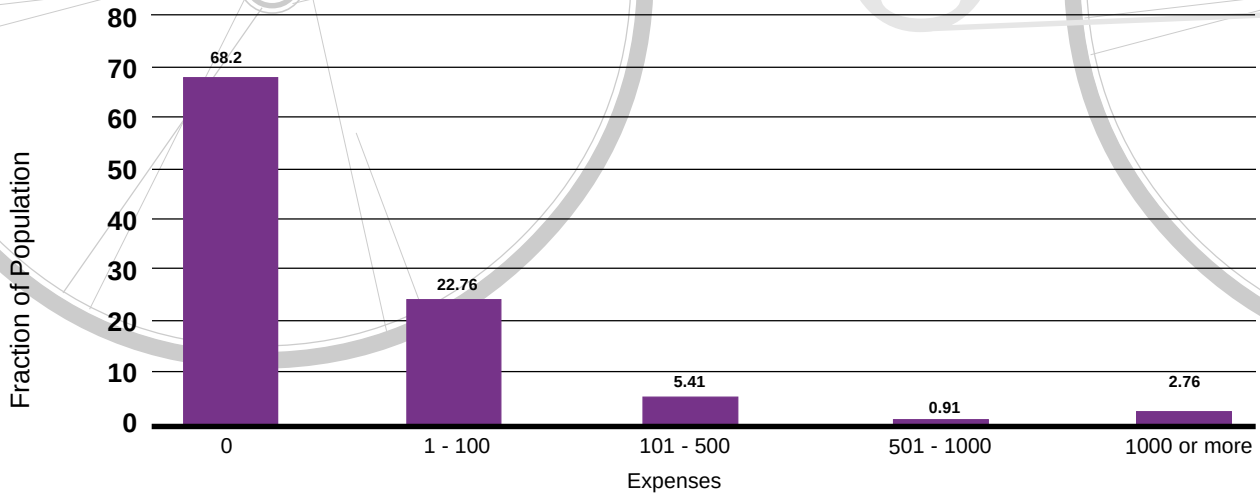
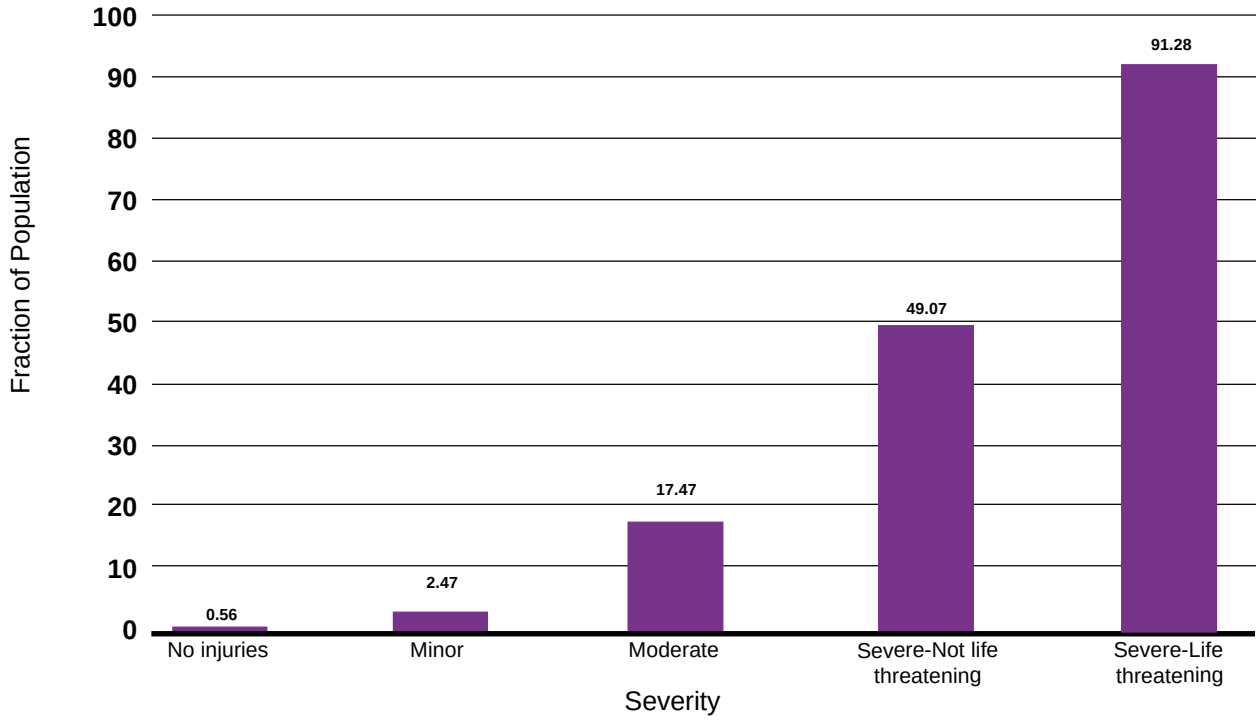


Figure 34
Fraction Reporting the Most Recent Bicycle Crash on a Paved Road by Severity of Injuries



PEDESTRIAN SAFETY

Obstacles to walking.

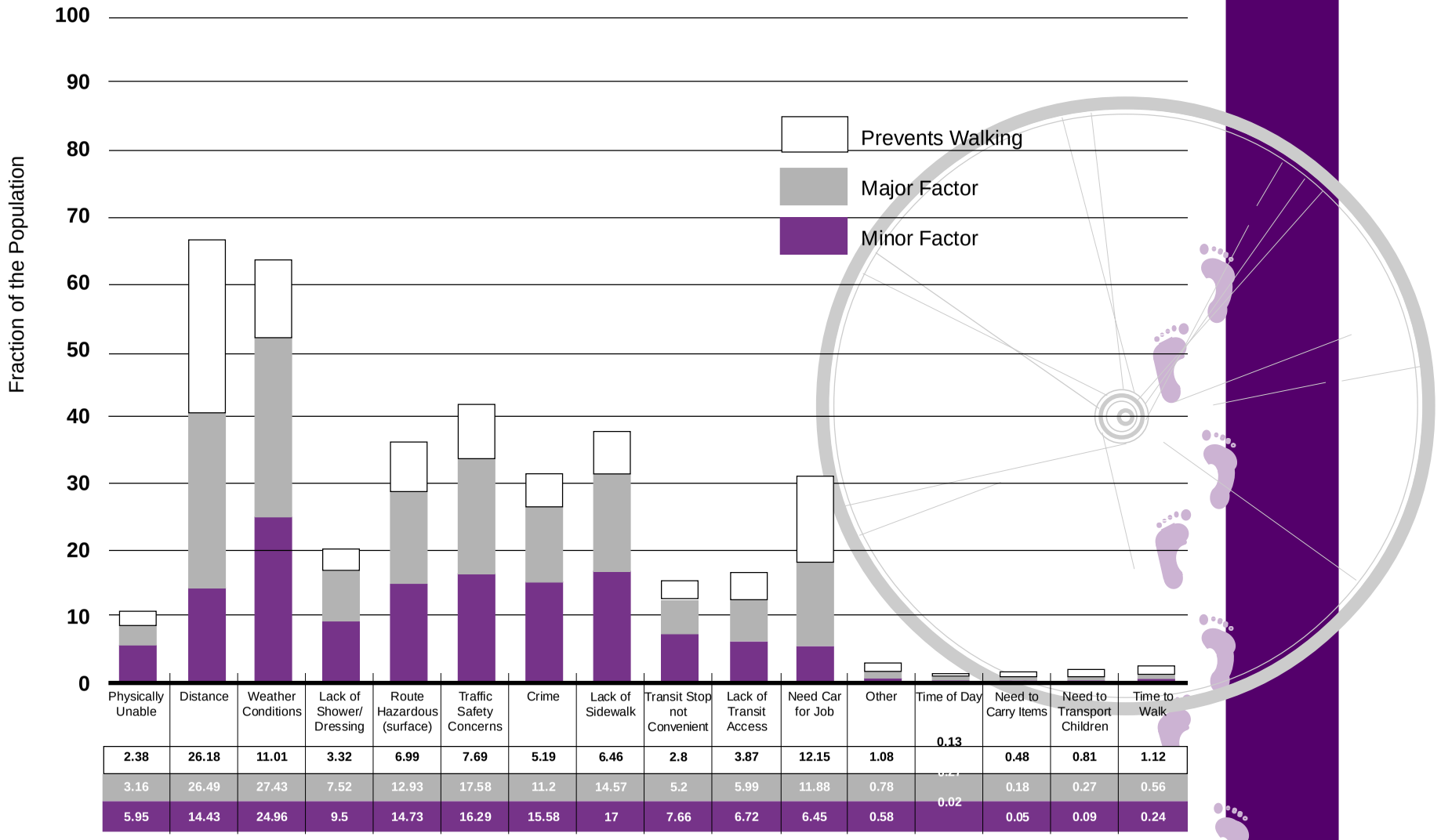
Respondents were asked if they ever considered walking for transportation to work or school, or for recreational purposes. Just under one-third (32 percent) indicated that they had never considered walking for these purposes. The remaining survey respondents who indicated that they would consider walking for transportation or recreation purposes were asked to indicate the factors that deter them from walking to work, school, for utility trips or as a recreational activity. Each factor could be identified as being one that either prevents the respondent from walking or is a major or minor factor in the decision not to walk. The responses to this question are illustrated in Figure 35.

Of those who would consider walking, just about two-thirds noted that the distance of the trip was a factor in their choosing not to walk. Twenty-six percent indicated that it prevented them from walking, another 26 percent said that it was a major factor and 14 percent indicated that it was a minor factor in their transportation choice. Sixty-three percent of respondents indicated that the weather conditions were an important factor in their decision not to walk. Although only 11 percent indicated that it prevented them from walking, over 50 percent said that it was either a major or minor factor in their decision not to walk.

Safety concerns were the next most important factors preventing pedestrian transportation. In order of the frequency that they were mentioned, traffic safety concerns (42 percent), lack of sidewalk (38 percent), hazardous route (35 percent) and fear of crime (32 percent) prevent Coloradans from walking as often as they might like.

For some respondents (30 percent) walking to work is difficult since they need a car to perform some of the duties required at their job. An additional 11 percent are physically unable to walk (or to walk the necessary distances). About five percent cited other factors as preventing them from walking. These other factors include such considerations as: the time of day, the need to carry items or transport children or the length of time necessary to walk as affecting this transportation choice.

Figure 35
Obstacles to Walking as Transportation



	Physically Unable	Distance	Weather Conditions	Lack of Shower/ Dressing	Route Hazardous (surface)	Traffic Safety Concerns	Crime	Lack of Sidewalk	Transit Stop not Convenient	Lack of Transit Access	Need Car for Job	Other	Time of Day	Need to Carry Items	Need to Transport Children	Time to Walk
Prevents Walking	2.38	26.18	11.01	3.32	6.99	7.69	5.19	6.46	2.8	3.87	12.15	1.08	0.13	0.48	0.81	1.12
Major Factor	3.16	26.49	27.43	7.52	12.93	17.58	11.2	14.57	5.2	5.99	11.88	0.78	[illegible]	0.18	0.27	0.56
Minor Factor	5.95	14.43	24.96	9.5	14.73	16.29	15.58	17	7.66	6.72	6.45	0.58	0.02	0.05	0.09	0.24

Pedestrian Safety Instruction.

Only one third of Coloradans over the age of 16 reports having received any instruction regarding pedestrian safety. Of those who did, Figure 36 indicates all of the sources of pedestrian safety information. Most respondents received instruction at school (66%) and from their parents (42%). Other sources of information regarding pedestrian safety included police and fire departments, community organizations, pamphlets and brochures, and other informal sources.

Figure IIIB.3 illustrates where survey respondents think that children *should* receive such safety information. The majority of Coloradans preferred that this instruction take place at school. They also strongly believe that the information should be taught by police and fire department personnel (47 percent) rather than by teachers (16 percent). Nearly 30 percent indicated that parents should be the primary source of pedestrian safety information.

Figure 36
Where Coloradans Receive Pedestrian Safety Instruction

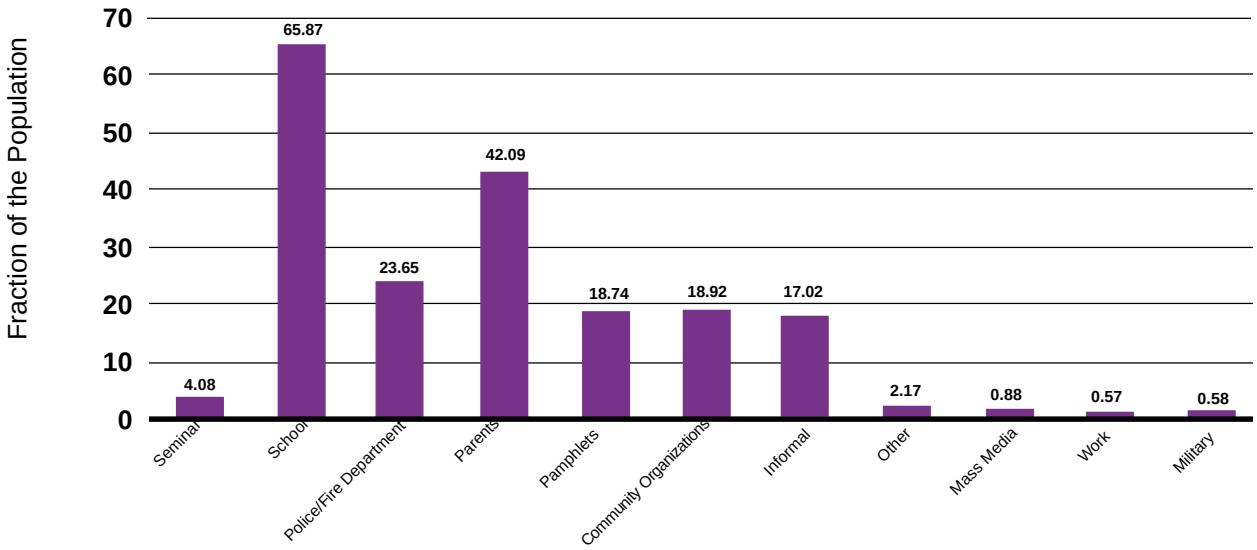
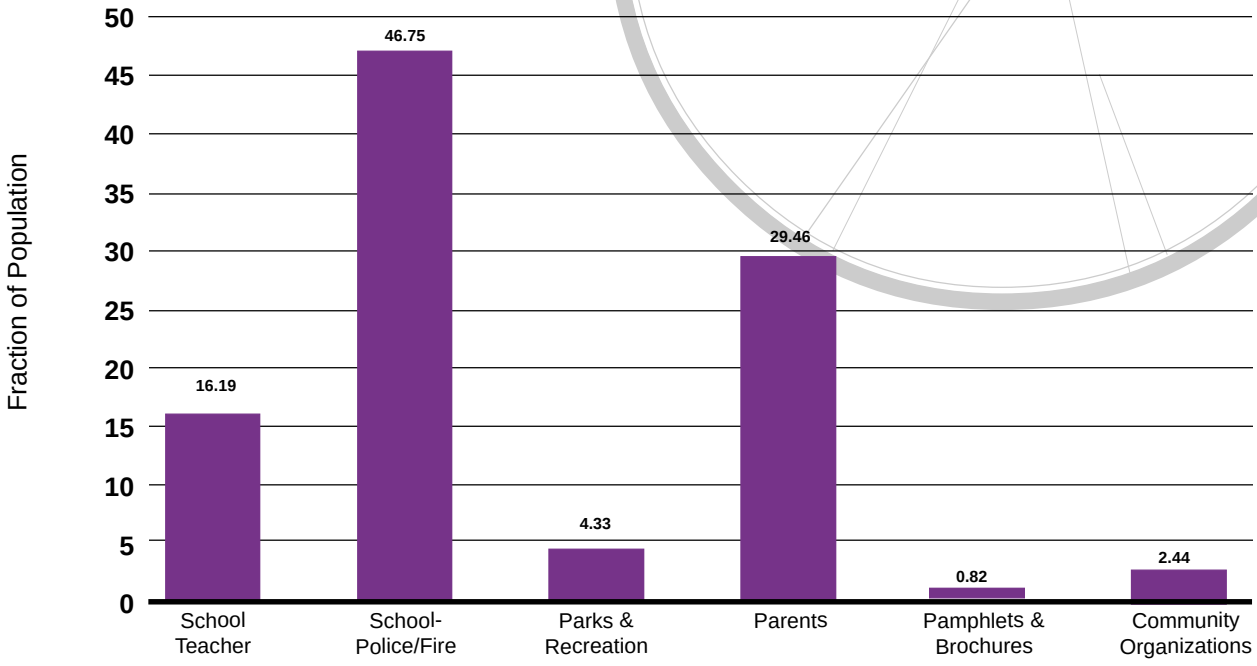


Figure 37
Where Colorado Residents Prefer Children Receive Pedestrian Safety Instruction



Pedestrian Crashes.

Three percent of Coloradans reported having been involved in a crash as a pedestrian in the last 12 months (about 1% more than once). Very few have had more than one pedestrian crash in the last year (Figure 38). Nearly 12 percent of Coloradans indicated that they had *ever* been involved in an crash as a pedestrian. Among those who had ever been in a pedestrian crash, over 14 percent sustained no injuries in their last crash and 58 percent incurred only minor injuries as shown in Figure 39. The remainder sustained injuries that ranged from moderate to critical (obviously we are unable to capture fatalities in these data).

Figure 38
Frequency of Pedestrian Crashes in the Previous 12 Months

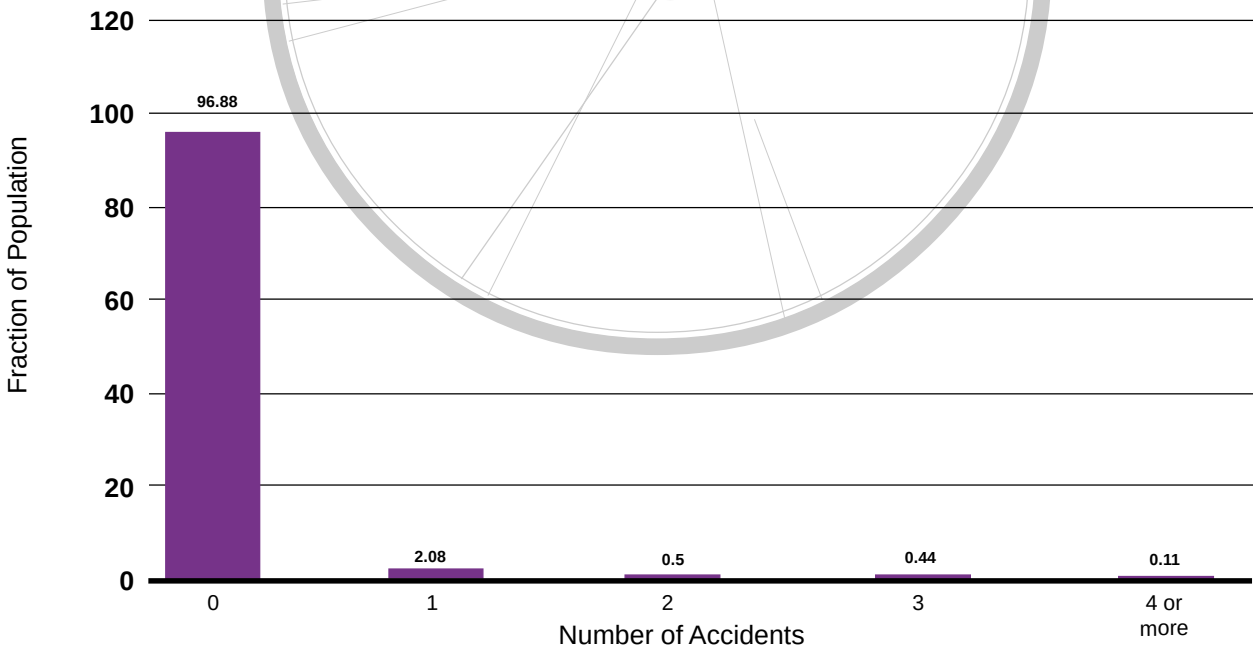
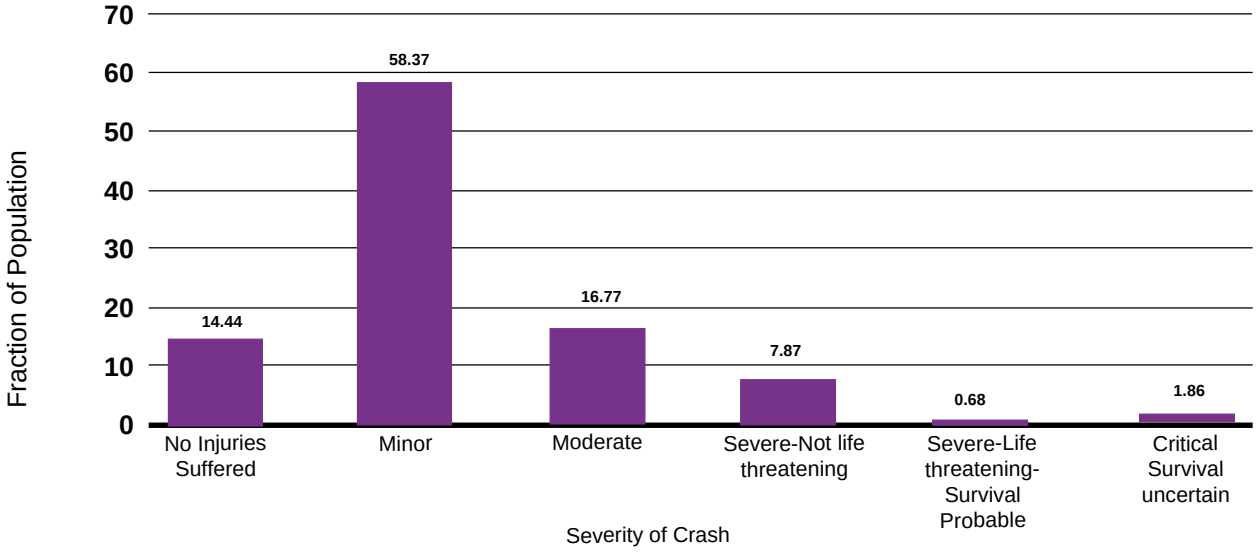


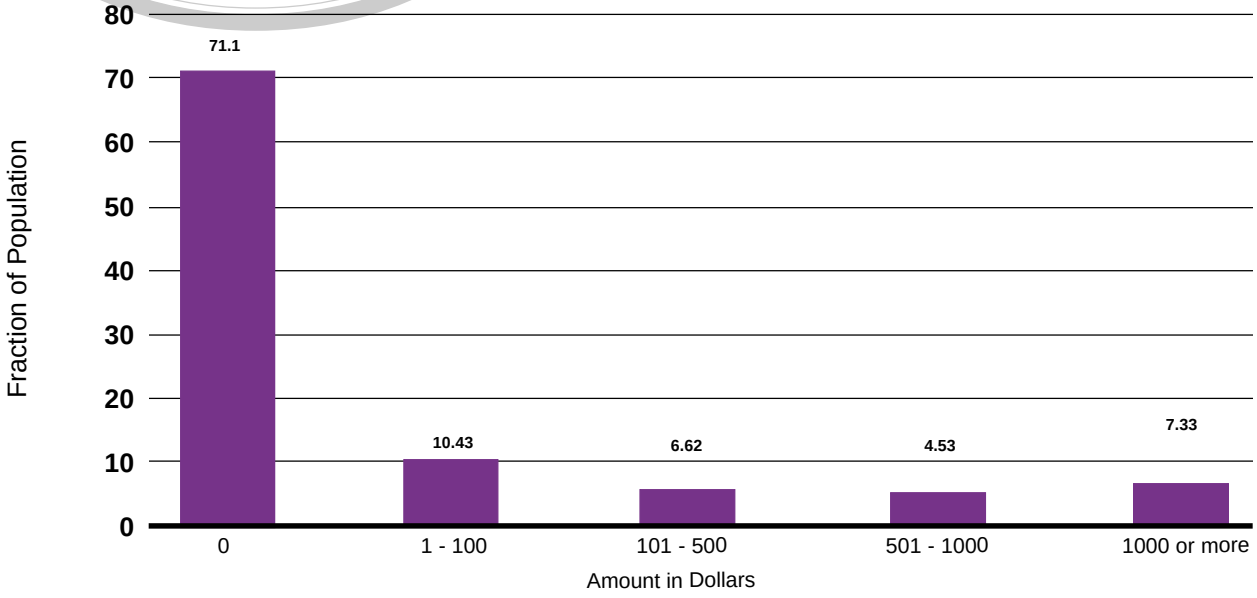
Figure 39
Severity of Most Recent Pedestrian Crash



Cost of Pedestrian Crashes.

The average expense as a result of the most recent pedestrian crash within the last year was reported to be $149. As shown in Figure 40, 71 percent of all pedestrian crashes resulted in no expense. Just over 10 percent incurred costs of less than $100. Seven percent of those involved in a pedestrian crash incurred costs of over $1000.

Figure 40
Total Expenses Incurred in Most Recent Bicycle Crash on Paved Road



Reporting Pedestrian Crashes.

Most (81%) non-fatal pedestrian crashes were not reported to authorities (e.g. police, park rangers, medical personnel). The likelihood that a crash is reported varies substantially by the severity of the crash as shown in Figure 41. Pedestrian crashes with no injuries and those with only minor injuries are most likely to go unreported. Only 5.5 percent and 14.8 percent, respectively, were reported. Pedestrian crashes with moderate injuries were reported nearly forty percent of the

time. The more severe the injuries, the more likely it is that the crash is reported. All crashes in which the victim suffered severe life threatening or critical injuries are reported to authorities.

In order to attempt to identify the frequency of severe pedestrian crashes we asked respondents if anyone in their household had ever suffered a severe or worse crash as a pedestrian. Severe accidents were reported by 4.4 percent of households.

Figure 41
Fraction Reporting the Most Recent Pedestrian Crash by Severity of Injuries