This paper is not peer-reviewed or published. However, it is accurate.

United States cycling injuries, fatalities and participation in helmet law and non-helmet law age groups and states, 1995-2012

Abstract: Studies of child and teenage cyclist injury rates in the United States consistently report a downturn since mandatory bicycle helmet laws were introduced in various states and municipalities during the 1990s and progressively since. The downturn is generally attributed to improved safety through mandatory and voluntary wearing of helmets by children and teenagers. To test these conclusions against confounding factors, primarily child cycling participation, this study considers rates of cycling sourced to public and private agencies since 1995 and compares these with injury numbers sourced to the US Consumer Product Safety Commission National Electronic Injury Surveillance System and fatality numbers sourced to the National Highway Traffic Safety Administration's Fatality Analysis Reporting System. Participation is also compared with cyclist traumatic brain injury and concussion data each year since 1995, and with 2010/2011 cyclist fatalities in all US states identified with and without child helmet legislation. The study finds that 7-17yo cycling participation in the United States declined 23.1% from a 1995-2003 average of 18,593,000 to a 2004-2012 average of 14,296,889, while 7-17yo cyclist all-body injuries fell 23.7% and concussion injuries fell 2.1%. Multiple sources confirm these results as indicative of US child cycling participation and injury trends, suggesting a failure of bicycle helmet laws to improve public health and cycling safety.

Researched and written July 2013

Research highlights

• Public and private agency surveys show <18yo cycling participation in the United States declined by at least 30% from 1995 to 2012

• Public agency data show no decline in 6-17yo cyclist all-body injuries from 2006 to 2011 despite a 29.1% reduction in cycling participation

• <18yo cyclist numbers fell 37.9% from 2006 to 2012

• 6-17yo cyclist injuries increased 44.9% from 2006 to 2011 with no change in per cyclist injury rates for cyclists not subject to helmet laws

• Census Bureau and injury data show a 23.1% decline in 7-17yo cycling participation averaged 1995-2003 to 2004-2012, a 23.7% reduction in all-body injuries and a 2.1% reduction in concussion injuries

• Cyclists aged 5-15yo have a lower fatality rate per million population in non-helmet law states than 5-15yo cyclists in helmet law states

• Per million population aged 5-14, the average number of cyclist fatalities in 2011 was 1.4 in child bike helmet law states and in non-law states it was 1.6, while in 2010 it was 2.0 in child bike helmet law states and in non-law states it was 1.8

• In states without child helmet laws, fatalities among cyclists aged 0-16 fell an average 53.5% from 1994-2002 to 2003-2011 (1,162 / 540) and fatalities among 0-16yo cyclists in child helmet law states fell by 51.9% (1,230 / 592).

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Introduction

Previous studies of child cyclist injury rates in the United States have identified a significant decline since the 1990s and have generally attributed this to the introduction of mandatory bicycle helmet laws [1].

Published surveys suggest helmet wearing among 5-15yo cyclists in the United States increased from 25% in 1994 to 48% in 2001/2002 [2, 27], with various reports indicating a helmet wearing rate above 60% by 2012.

A 1998 survey published in the Injury Prevention journal [3, 6] put average probability of riders aged less than 16 always or almost always wearing a helmet at 72.3% in helmet law states and 49.6% in states without a helmet law.

However, published injury studies mostly overlook the confounding factor of child cycling participation which could mask underlying rates of injury per cyclist.

Different state and local jurisdictions mandate helmet wearing among <12, <14, <15, <16, <17 and <18 age groups, a small number of municipalities also requiring helmet use by cyclists of all-ages.

Among other sources, this study extracts <17yo cycling data 1995 to 2012 from the US Census Bureau [4, 24] and from the US Consumer Product Safety Commission National Electronic Injury Surveillance System [5, 3].

Analysis results are also categorized by states wherein child helmet laws are applied and the study assumes there is more helmet wearing among youth than adults across the United States, either by law, parental coercion or choice.

In 2012, the sum population of states with child helmet laws was 164,712,850 and 149,201,190 in states without. Aged 17 and less in 2012, there were populations of 37,457,154 in states with helmet laws and 36,270,934 in non-law states. Aged 5-14, there were populations of 20,818,369 in states with helmet laws and 20,228,760 in non-law states.

Child cyclist participation, population, cyclist number, all-body injury, head injury and fatality data from public and private agencies are compared in different age groups and American states to determine whether helmet laws have achieved better health and injury outcomes than in voluntary jurisdictions.

Material and methods

Data for this study are sourced from:

- The Centers for Disease Control and Prevention [6]
- The Outdoor Industry Association [7]
- The National Sporting Goods Administration [8]
- The US Consumer Product Safety Commission's National Electronic Injury Surveillance System [5]
- The National Highway Traffic Safety Administration Fatality Analysis Reporting System [9]
- The US Census Bureau [4]
- U.S. Department of Transportation, Federal Highway Administration, 2009 National Household Travel Survey [10]
- The US Walking and Bicycling Alliance Benchmarking Project [11]
- US single year cyclist injuries and population data from 1995-2012 [12]

A majority of the source agencies are government and their calculations of relevant data are considered accurate.

All calculations and charts in this study were performed and created within the Microsoft Excel and Apple Numbers spreadsheet applications. All data used is publicly accessible from the internet and all calculations are arithmetic, requiring no skills beyond knowledge of basic spreadsheet functions to verify data.

Child cycling participation data

The Sports Participation 2013 report published by the National Sporting Goods Administration (NSGA) and annual estimates published by the Outdoor Industry Association (OIA) provide evidence that <17yo cycling participation in the US declined between 2006 and 2012 [13, 14].

According to the NSGA, the peak year of US cycling participation was 1995 when an estimated 56,000,000 Americans rode bicycles at least six times a year. Participation dropped 15,000,000 by 2011. From 2000 to 2011, 7-11yo cycling fell 21% and 12-17yo cycling was down 15%, according to the NGSA [30].

The OIA (Figure 1) data indicate the 6-17yo proportion of all cyclists was 45.2% in 2006 (17,401,000 / 38,457,000) and 31.6% in 2012 (12,397,000 / 39,232,000). NSGA data (Figures 2 and 3) suggest the 7-17yo cycling proportion was 27.4% in 2012 (10,800,000 / 39,400,000).

Data from the US National Household Travel Survey (Figure 4) confirm a significant downturn in <30yo and particularly <18yo cycling from 1995 to 2009, with 5-15yo and 16-17yo bicycle trips falling 20.1% and 40.8% respectively.

US Census Bureau/NSGA data [4, 15] show there were 17,008,000 fewer all-age cyclists in 2012 than 1995, a 30.2% drop (Figure 5). Averaged 1995-1998, there were 21.2% fewer cyclists than 2009-2012 (49,576,000 / 39,084,750). Averaged 1995-2001 and 2003-2009, 7-17yo cycling fell 20.1% (9,673,286 / 7,730,571) and 18+ cycling fell 10.7% (4,462,405 / 3,983,405). On average, there were 1,942,715 fewer <17yo cyclists and 479,000 fewer cyclists aged 18+.

Census Bureau data show a 16.6% reduction in 7-17yo cycling from 2001 to 2006 (1,7008,000 / 1,4183,000). The OIA participation surveys suggest a 29.1% decline in 6-17yo cycling participation from 2006 to 2011 and 28.8% from 2006 to 2012. Most of the reduction has occurred in the <17yo age group (Figure 6) and these results validate findings by Pucher et al [27] of a 33% decline in youth participation per population 2001-2009 (Figure 7).

Child cycling injury data

Data from the Centers for Disease Control and Prevention (CDC) [6 16] show the 1-15yo cyclist age group enjoyed a 19.9% drop in injuries from 2001-2006 (303,852 / 243,439) (Figure 8).

The CDC and the OIA provide systemically consistent datasets since 2006 that compare age group injuries with age group participation, demonstrating that 6-17yo cyclist injuries in the US remained almost static from 2006 to 2011 despite the 29.1% drop in cycling participation within that age group (Figures 9a, 9b and 9c).

The 6-17yo injuries are mostly responsible for total all-age injury rates rising per cyclist when age group injury rates per million cyclists are adjusted for participation in each age group (Figure 10). Considered as injuries per million population rather than per million cyclists, <18yo injuries were static from 2006 to 2011 despite the 29.1% downturn in 6-17yo cycling participation (Figure 11). Injuries among 18-24yo cyclists increased in line with the rising participation in this age group although there was a sharp increase in 2011.

NSGA data for 2012 suggest cyclist numbers aged 7-17 fell 37.9% from 2006, an increase on the OIA estimate of a 28.2% reduction among 6-17yo from 2006 to 2012 (Figures 1, 2 and 3). Data for ages 6-17 and for 6+ allow a comparison of 6-17yo and 18yo+ injury rates per million cyclists from 2006 to 2011, showing a 44.9% increase in 6-17yo total injuries but a static injury trend among cyclists aged 18+ (Figure 12).

US Census Bureau data for 7-17yo cycling participation can be compared annually with total 7-17yo cyclist injury data from the US Consumer Product Safety Commission's National Electronic Injury Surveillance System (NEISS) (Figure 13). These show that 7-17yo cycling participation in the US declined from a 1995-2003 average of 18,593,000 to a 2004-2012 average of 14,296,889, or 23.1%. At the same time, 7-17yo cyclist all-body injuries in the US declined from a 1995-2003 average of 291,970 to a 2004-2012 average of 222,869, or 23.7%.

Department of Transportation National Highway Traffic Safety Administration (NHTSA) [20] data for 2011 show <=20yo cyclists had an injury rate of 194 per million population compared to a 21yo+ injury rate of 138 per million (Table 3).

US population <=15yo was 21% and cyclists <=15yo represented 18.75% of all cyclist injuries. Cyclists <=15yo had an injury rate of 138 per million population compared to a 16yo+ injury rate of 158 per million population.

In this NHTSA data for 2011, there were less than 500 injuries among the <5yo age group but these are included in the comparison with <=15yo population of 20,162,000. Excluding that age group entirely, 5-15yo had an injury rate of 199 per million population compared to a 16yo> injury rate of 158 per million population.

Census Bureau data [15] show 17,008,000 cyclists aged 7-17 in 2001 and 13,196,000 in 2009. CDC data [6] show 259,193 injuries for 7-17yo cyclists in 2001 and 215,947 in 2009. Participation fell 22.4% and injuries fell 16.7%.

NSGA data show 2012 participation among 7-17yo cyclists at 10,800,000, down 36.5% on 2001 participation data from the Census Bureau. Injury data for 2012 are not available but CDC data show 214,333 for 7-17yo in 2011, down 17.3% from 2001. The participation level fell at more than twice the rate of all-body injury reduction, with a crude rate of 1,524 per 100,000 participants in 2001 and 1,985 in 2011/12.

Census Bureau data show 21,996,000 cyclists aged 18yo+ in 2001 and 24,942,000 in 2009. CDC data show 192,712 all-body injuries for 18yo+ cyclists in 2001 and 247,359 in 2009. Participation rose 13.4% and injuries rose 28.4%.

NSGA data show 2012 participation at 24,640,000 cyclists aged 18+, up 12% on 2001 participation data from the Census Bureau. Injury data for 2012 are not available but CDC data show 268,459 for 18yo+ in 2011, up 39.3% from 2001. The all-body injury level increased at more than three times the rate of participation, with a crude rate of 876 per 100,000 participants in 2001 and 1,090 in 2011/12.

Child cycling head injury data

Compared annually with the 7-17yo decline in cycling participation of 23.1%, NEISS data for 7-17yo cyclists show that 7-17yo cyclist concussion injuries in the US dropped from a 1995-2003 average of 6,555 to a 2004-2012 average of 6,420, down 2.1% (Figure 14).

Surveillance for Traumatic Brain Injury Related Death - United States, 1997-2007 [17] shows that, on average, head trauma deaths fell less for cyclists than for vehicle occupants (Table 1). *Traumatic Brain Injury* [18] suggests riders aged 5-19 represented 49.2% of total pedal cyclist traumatic brain injury hospitalisations from 2002-2006 (750 / 1,524) and cyclists aged 5-14 represented 33% (507 / 1,524). (Table 2).

Comparative NEISS data [19] show average 5yo+ cyclist injuries 2005-2012 were 6.2% less than 1996-2003 (487,924 / 520,306). Average total injuries aged 5-15yo in 2005-2012 were 29.3% less than 1996-2003 (227,440 / 321,793) and concussions in this age group were 14.8% less (6,204 / 7,279) (Figure 15).

Average 16yo+ injuries 2005-2012 were 31.2% more than 1996-2003 (260,484 / 198,513) and concussions in this age group were 87.6% more (6,717 / 3,580). Concussions altogether represented an average 1.2% of average 5yo+ injuries (5,935 / 503,418) from 1996 to 2012. Average annual 5yo+ injuries fell 32,382 from 1996-2003 to 2005-2012 while concussions fell 1,075.

Concussions represented an average 1.04% of total cyclist injuries in 1996-2003 (5,430 / 520,306) and 1.32% in 2005-2012 (6,461 / 487,924). The number of 16yo+ concussions rose 29.5% averaged 2006-2008 to 2009-2011, compared to 17.4% growth in 16yo+ cycling participation.

If concussions are indicative of head injury, this data suggests the reduction in total injuries was caused by reduced 5-15yo cycling participation rather than reduced head injuries.

Child cycling fatality data

Census Bureau data [15] show 18,089,000 cyclists aged 7-17yo in 1999 and 13,196,000 in 2009. CDC data [6] show 172 fatalities for 7-17yo cyclists in 2001 and 69 in 2009. Participation fell 27% and fatalities fell 59.9%.

NSGA data show 7-17yo participation at 10,800,000 in 2012, down 40.3% from the Census Bureau's 1999 estimate. Fatality records for 2012 are unavailable but CDC data show 67 fatalities for 7-17yo in 2010, down 61% from 2001.

Census Bureau data show 24,316,000 cyclists aged 18yo+ in 1999 and 24,942,000 in 2009. CDC data show 425 fatalities for 18yo+ cyclists in 1999 and 451 in 2009. Participation increased 2.6% and fatalities increased 6.1%.

NSGA data show 18yo+ participation at 24,640,000 in 2012, up 1.3% on 1999 participation data from the Census Bureau. Fatality data for 2012 are not available but CDC data show 478 for 18yo+ in 2010, up 12.5% from 1999.

NHTSA Traffic Safety Facts [21] shows that pedal cyclist fatalities worsened as a proportion of all traffic deaths in the US from 2002 to 2011 (Table 4). Out of 51 jurisdiction in the NHTSA dataset for 2011, 23 or 45.1% had some form of helmet law for child cyclists, some up to 17yo.

NHTSA Traffic Safety Facts 2011 allows comparison of cyclist and other road user death and injury rates from 2002 to 2011 (Tables 5 and 6). Police reported injuries are always less than hospitalised injuries but the NHTSA data suggest US cyclist death and injury trends are worse than for most other road users with the exception of motorcyclists.

Child cycling fatality data in different states

	Child helmet law states	No-helmet law states	Data source	Figures/ Tables
% change 0-16yo cyclist fatalities average 1994-2002 / 2003-2011	-51.9%	-53.5%	FARS [9]	Figure 19
% change all-age cyclist fatalities average 1994-2002 / 2003-2011	-3.3%	-15.3%	FARS [9]	Figure 19
All age cyclist fatality change average 1998-2004 to 2005-2011	1.5%	-4.9%	FARS [9]	Figure 16
All age pedestrian fatalities change average 1998-2004 to 2005-2011	-5.4%	-10.1%	FARS [9]	Figure 16
% <16yo cyclist fatalities per million population average 1998-2011	2.2%	2.5%	FARS/USCB [9]	Figure 18
% 16yo+ cyclist fatalities per million population average 1998-2011	2.4%	2%	FARS/USCB [9]	Figure 18
% All-age cyclist fatalities per million population average 1998-2011	2.4%	2.1%	FARS/USCB [9]	Figure 18
Average annual all-age pedestrian fatalities per 10,000 population in 2005-2009	8.7	5.2	FARS [9]	-
Average percentage <16yo pedestrian fatalities per 10,000 population in 2005-2009	6.6%	9.1%	FARS [9]	-
% change <16yo cyclist fatalities per million population average 1999-2004 / 2006-2011	-53.3%	-54.5%	FARS [9]	-
% change 16yo+ cyclist fatalities per million population average 1999-2004 / 2006-2011	+4.3%	-5%	FARS [9]	-
% change all-age cyclist fatalities per million population average 1999-2004 / 2006-2011	-8.3%	-21.3%	FARS [9]	-
Average number of 5-16yo cyclist fatalities 2010	1.8	1.4	FARS [28]	Table 8
Average number of all-age cyclist fatalities 2010	17.1	9.2	FARS [28]	Table 8
Average number of 5-16yo cyclist fatalities per million population 2010	2	1.8	FARS/USCB [28]	Table 8
All-age cyclist percentage of traffic fatalities in 2011	2.75%	1.46%	FARS [20]	-
Average number of all-age cyclist fatalities in 2011	19.77	8.34	FARS [20]	Table 3
Average number of all-age cyclist fatalities per million population in 2011	1.85	1.49	FARS/USCB [20]	Table 3
All road traffic fatalities in 2011	15,817	16,550	FARS [20]	-
All road traffic fatalities per million population in 2011	96.8	111.7	FARS/USCB [20]	-
Average number of 5-14yo cyclist fatalities in 2011	1.7	1	FARS [28]	Table 7
Average number of all-age cyclist fatalities in 2011	20.5	8.9	FARS [28]	Table 7
Average number of 5-14yo cyclist fatalities per million population 2011	1.4	1.6	FARS/USCB [28]	Table 7

FARS = United States Department of Transportation National Highway Traffic Safety Administration Fatality Analysis Reporting System

USCB = United States Census Bureau

Discussion

Multiple data sources have been used to compare child, teenage and adult cyclist participation, all-body injuries, head injuries and fatalities from 1995 to 2012, during which time various American states introduced child helmet laws for different age groups less than 18, concluding with 22 states and districts enacting such legislation.

Nationwide, 51.1% of Americans aged 17 and less lived in bike helmet jurisdictions in 2012 (37,457,154 / 36,270,934).

Census Bureau data show 7-17yo cycling across the US was 22,948,000 in 1995 and reliable NSGA survey data show numbers had dropped to 10,800,000 in 2012. This is a 52.9% reduction or 12,148,000 fewer cyclists aged 7-17, impacting regular recreational exercise among American youth with future public health implications.

Participation surveys by the OIA show 6-17yo cyclist numbers fell 28.8% from 2006 to 2012 and survey data compiled by the NSGA suggest the reduction was 37.9% by 2012.

In response to such significant falls in child and teenage cycling participation, and with about 60% of 5-15yo cyclists wearing helmets that are claimed to reduce head injury risk by up to 85% [23], a commensurate reduction in accidents and injured cyclists should be expected at hospital emergency departments.

Although <18yo cyclist injuries decreased in number, they increased 44.9% from 12,755 per million cyclists aged 6-17yo in 2006 to 18,515 per million in 2011. These results should be considered in the context of US population growth among children and teenagers. The 0-17yo population increased 7.5% from 68,560,913 in 1995 to 73,728,088 in 2012.

In non-helmet law states, the population of 0-17yo increased 9.7% from 33,061,027 in 1995 to 36,270,934 in 2012. In helmet law states, the population of 0-17yo increased 5.5% from 35,493,663 in 1995 to 37,457,154 in 2012.

The proportionally larger youth population growth in non-law states should result in proportionally greater numbers of participants and injuries, but it does not. The confounding factor of cycling participation masks assumptions drawn from total injury numbers.

Census Bureau and NEISS injury data show a 23.1% decline in 7-17yo cycling participation averaged 1995-2003 to 2004-2012, a 23.7% reduction in all-body injuries and a 2.1% reduction in concussion injuries. Analysis of 5-15yo cyclist fatalities through FARS shows a lower rate per million population in non-helmet law states than in helmet law states.

Among 0-16yo cyclists and averaged 1994-2002 to 2003-2011, fatalities fell 55.2% in states without child helmet laws and 50.0% in states with such laws. Fatality numbers in most states are small and volatile but in 2010 the rate per million was less in non-law states than in helmet law states, while in 2011 the rate was higher.

Analysis of all 1,740 bicyclists aged 0-16 years in FARS [9] who died or suffered an incapacitating injury from a motor vehicle collision between January 1999 and December 2009 allows a per million population comparison between states with child helmet laws and those without. Averaged, there were 2.4 fatalities/incapacitating injuries per million in helmet law states and 2.6 per million in states without. From 1999 to 2011, there were an average 2.2 per million in helmet law states and 2.4 per million in states without. The per million population rate of <=16yo death and serious injury decline from 1999 to 2011 was lower in states with child helmet laws (average 2.9 in 1999-2004 to 1.5 in 2006-2011) than in states without (average 3.2 in 1999-2004 to 1.4 in 2006-2011) (Figures 20-21).

There is no significant difference in child cyclist fatality rates per million population in states that enforce mandatory child helmet legislation. Various US local municipalities have enforced helmet laws for different ages, primarily children, regardless of state legislation and it is likely that voluntary helmet wearing also increased in states without helmet laws through parental or school coercion.

If concussion is considered indicative of head injury frequency, US Government data suggest the significant increase in child and teenage mandatory/voluntary helmet wearing since 1995 has failed to reduce injuries per cyclist, including head injuries, despite a substantial decline in recreational cycling exercise among American youth.

Census Bureau, NSGA, OIA and NEISS data allow a direct comparison of US cycling participation rates and different injuries including head, lower and upper body within matched 7-17 and 18+ age brackets, and suggest head and consussion rates have had the greatest increase from 1997 to 2012 relative to increased participation among adults and reduced participation among children (Figures 22-49).

Limitations

This study is limited in scope by different age group parameters defined in the source datasets published by public and private agencies, at times requiring comparison between slightly different age groups (e.g. 6-17yo and 7-17yo).

No attempt has been made to adjust state data according to different variables such as speed limits, drink driving laws and driver age limitations in the 51 state jurisdictions. These confounding factors are numerous and all have a debatable influence on child cyclist injury and fatality rates.

Raw participation and fatality data are compared between 29 states without helmet laws and 22 states/districts with helmet laws, each with unique and countervailing variables such as population, demographics, wealth, infrastructure and geography that create an unbiased average.

US Census Bureau data on cycling participation since 1995 is only available to 2009. This study uses survey findings from the Outdoor Industry Association for 2010 and 2011, and from the National Sporting Goods Association for 2012.

Census Bureau/NSGA data from 1995 to 2009 and NSGA data for 2012 are for cyclist ages 7-17 but the OIA data from 2006 to 2012 are for cyclist ages 6-17. This inflates 2010 and 2011 child cyclist participation data relative to other years.

A comparison of participation surveys from the three sources in overlapping years from 2003 to 2009 shows similar annual numbers with lower NSGA figures that more accurately reflect the 7-17yo age criteria.

Albeit using different survey methods, NSGA and OIA all-age cycling participation results are similar (2006 - 38,457,000 / 35,600,000; 2007 - 38,940,000 / 37,400,000 / 2008 - 38,114,000 / 38,700,000; 2009 - 40,140,000 / 38,100,000 / 2010 - 39,320,000 / 39,800,000; 2011 - 40,348,000 / 39,300,000; 2012 - 39,232,000 / 39,300,000).

The NSGA annual numbers are generally lower than OIA surveys because they estimate 7-17yo rather than 6-17yo participation. The NSGA participation survey result is used for 2012 and is consistent with Census Bureau data trends from 1995 to 2009.

Some timescale calculations include data for states that were voluntary at first but have since enacted child helmet laws, with no adjustment for their early absence of law so as to maintain a consistent baseline. Due to different and at times large state populations, adjustments distort trends and normally exaggerate fatality and injury rates in states that now have child helmet laws.

Census Bureau participation data for 2008 is significantly above trend. Assuming the bureau is consistent and accurate in its survey methodology, the 2008 spike may be related to cycling interest generated by the Beijing Olympics, consecutive Tour de France victories by Lance Armstrong, above average summer temperatures across the US [24] and/or record high gasoline prices above US$4 per gallon [29].

Conclusion

All public and private data sources confirm that child and teenage cycling participation in the United States has fallen by at least a third since the 1990s with latest surveys suggesting the decline continued in 2012. The reduction in cycling is maintained in older age groups but at a progressively smaller rate, with an increase in cyclist numbers since 1995 among people aged 45-64.

A reduction of more than 17,000,000 cyclists aged <17yo from 1995 to 2012, ignoring population growth over that period, signals a substantial decline in recreational exercise among American youth.

The rate of all-body injury to <17yo cyclists has increased per million cyclists and per million population during this time, despite the participation downturn, and public agency data suggest concussion injuries have increased per cyclist in this age group.

If concussion injuries are indicative of head injury, these data show the significant increase in child and teenage mandatory/voluntary helmet wearing since 1995 has failed to reduce injuries per cyclist including head injuries.

Although youth cycling participation rates in each state are unknown, childhood disdain for helmet wearing is a likely cause of the decline in cycling participation, coupled with increased parental safety fears.

Child cycling participation rates in all American states warrant further study to determine if the reduction is related to helmet laws. A breakdown of child cyclist fatalities per million population in states with and without laws shows little difference, which conflicts with expectations that rates should be lower in states where more children wear helmets.

The counterintuitive conclusion that accident/injury rates per child cyclist are greater in helmet law states may be explained by influences such as risk compensation [25] and safety in numbers [26, 27].

Consistent data from public and private agencies suggest reduced recreational cycling among children and teenagers with potential future health implications. Increased per cyclist injury rates and similar state fatality rates point to a failure in public policy for cycling safety in the United States.

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http://s3.amazonaws.com/totem_production/assets/other/3874/Siva_Stats_7_1_12_Bicycle_Retailer.p?1366390177

Charts and Tables

Figure 1

	2006 in 000's	% of Pop.	2007 in 000's	% of Pop.	2008 in 000's	% of Pop.	2009 in 000's	% of Pop.	2010 in 000's	% of Pop.	2011 in 000's	% of Pop.	2012 in 000's	% of Pop.
Bicycling (Road/Paved Surface)	17,401	34.7%	14,336	28.5%	13,325	26.8%	13,652	27.3%	12,442	24.7%	12,330	24.3%	12,397	24.5%

Youth Participation in Outdoor Activities, Ages 6 to 17

Bicycling (Road/Paved Surface)	38,457	14.0%	38,940	14.1%	38,114	13.6%	40,140	14.3%	39,320	13.9%	40,348	14.1%	39,232	13.7%

All Americans Participation in Outdoor Activities, Ages 6 and Older

Source: Outdoor Recreation Participation Report 2013, Outdoor Foundation

Figure 2

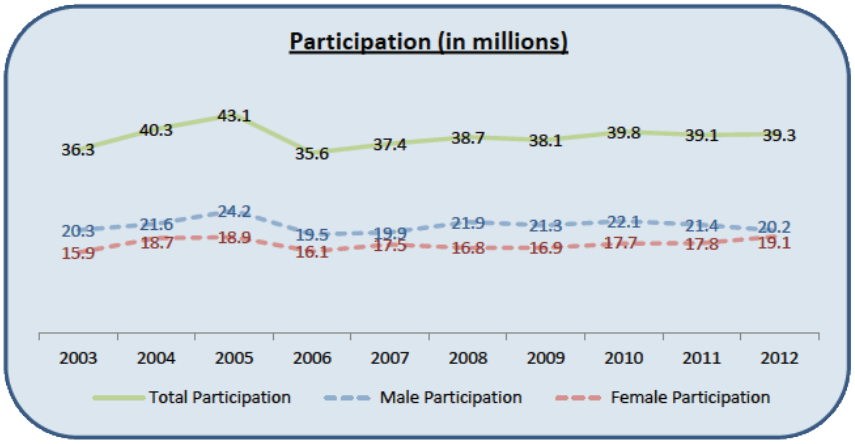
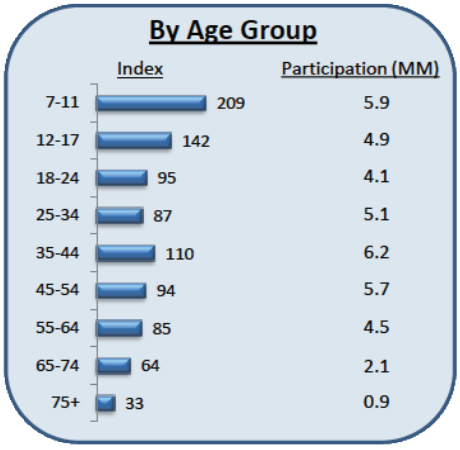


Figure 3



Source: Sports Participation in the United States 2013, National Sporting Goods Administration

Figure 4

Person trips															
	5-15	16-17	18-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	Total
1995	2,012.85	133.96	329.98	168.56	179.58	136.30	130.14	76.79	63.98	35.22	14.72	26.46	23.89	0.36	9.00	3,341.79
2001	1,681.94	83.12	168.95	211.61	149.58	184.53	170.00	143.38	96.45	72.23	62.79	54.59	51.62	28.36	5.55	3,164.70
2009	1,607.84	79.21	360.68	113.33	205.48	304.84	310.61	268.66	224.27	250.96	94.65	100.66	77.83	69.46	9.52	4,078.00
Change 1995-2009	-20.1%	-40.8%	9.3%	-32.8%	14.4%	123.7%	138.7%	249.9%	250.5%	612.5%	543%	280.4%	225.8%	19,194.4%	5.8%	22%
Person miles																
	5-15	16-17	18-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	Total
1995	1,539.44	180.45	655.90	495.87	429.56	422.46	263.93	224.10	190.42	69.19	16.25	58.99	30.14	2.29	6.62	4,585.61
2001	1,564.31	171.70	357.78	543.17	532.30	457.28	516.16	722.46	333.73	301.79	185.72	142.25	155.67	55.29	8.18	6,047.79
2009	1,249.91	122.80	1,127.20	314.48	534.39	1,006.37	949.23	970.88	966.97	801.17	285.69	278.49	160.77	160.94	19.90	8,949.19
Change 1995-2009	-18.8%	-31.9%	71.9%	-36.6%	24.4%	138.2%	259.7%	333.2%	407.8%	1,057.9%	1,658.1%	372.1%	433.4%	6,927.9%	200.6%	95.2%

Source: National Household Travel Survey, US Department of Transportation Federal Highway Administration

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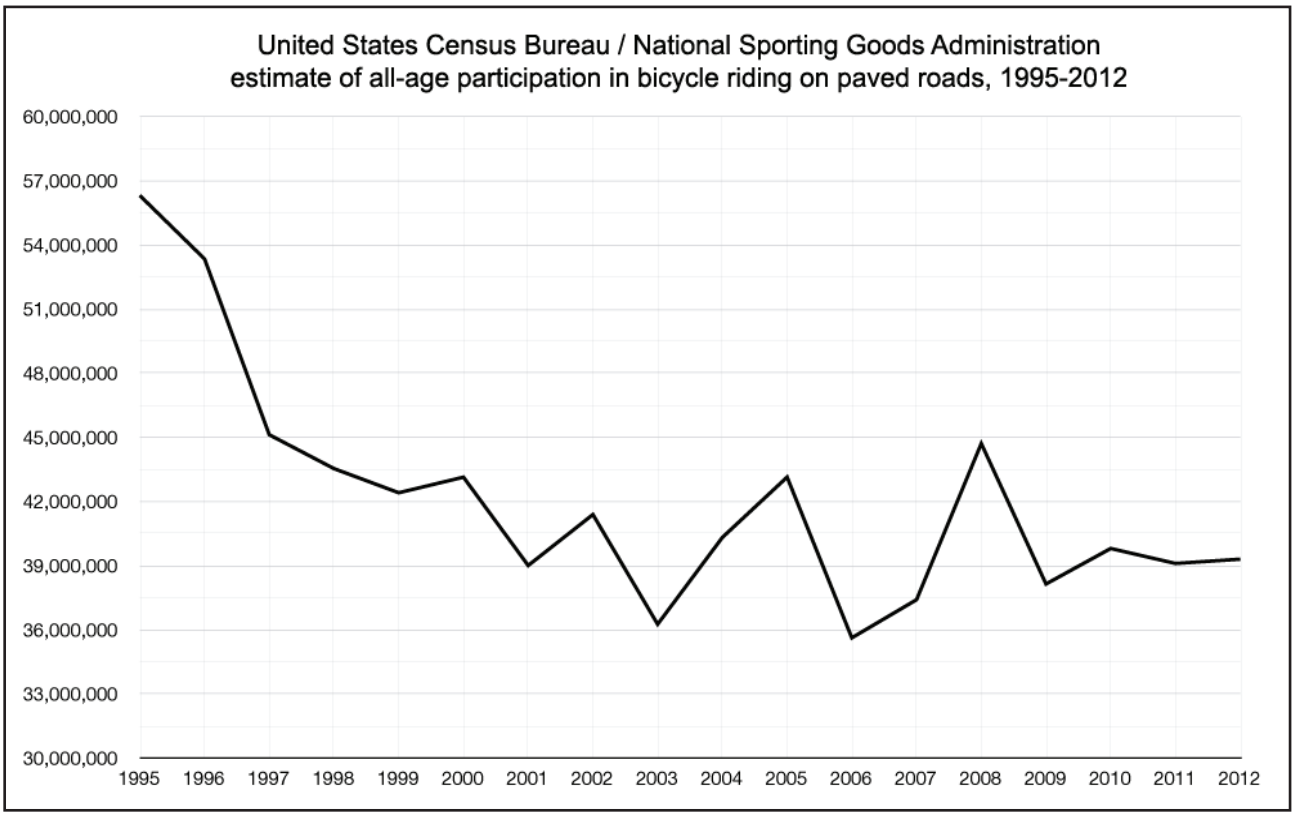
Figure 5



Source: US Census Bureau bike riding participation data

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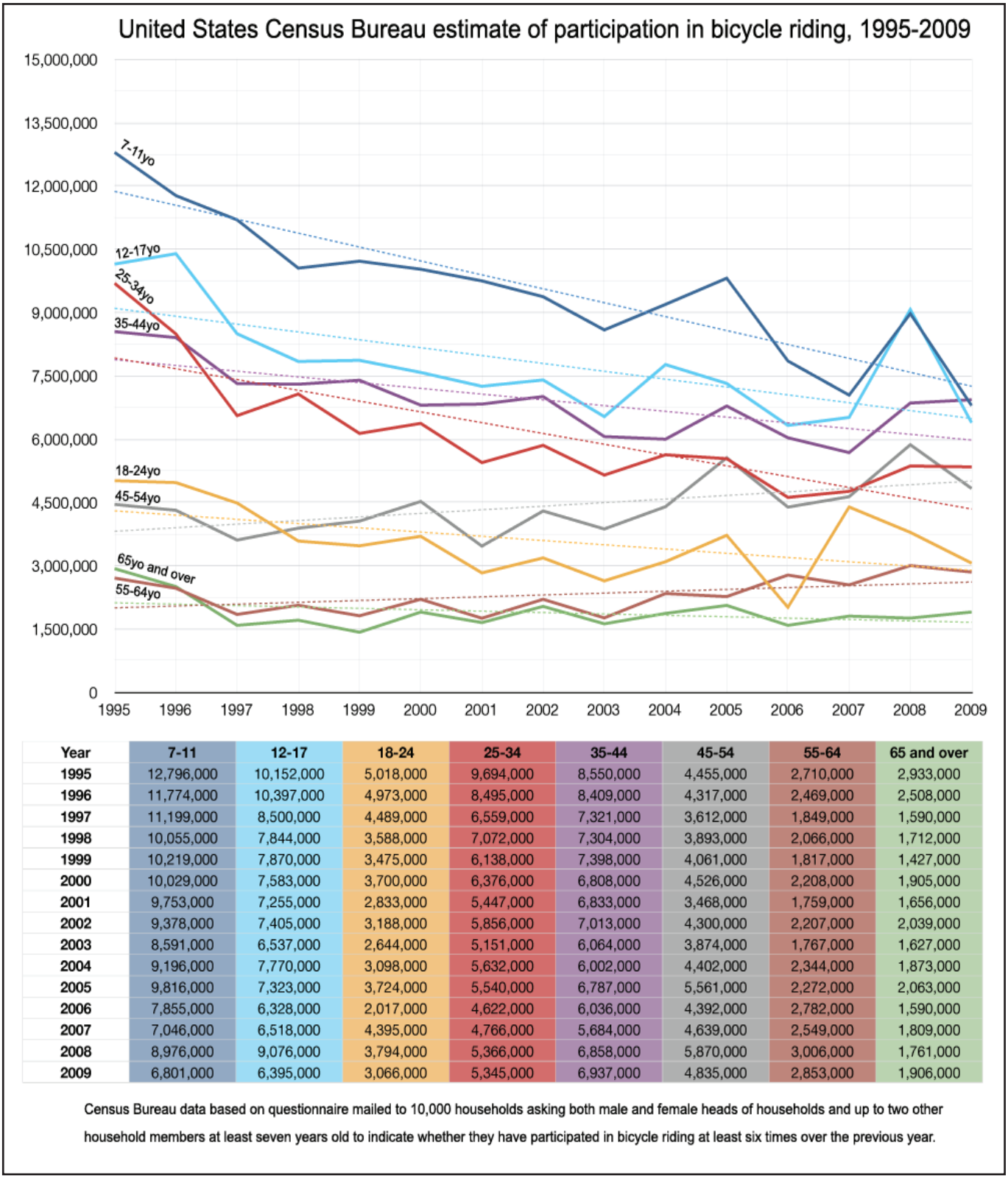
Figure 6



Year	7-11	12-17	18-24	25-34	35-44	45-54	55-64	65 and over
1995	12,796,000	10,152,000	5,018,000	9,694,000	8,550,000	4,455,000	2,710,000	2,933,000
1996	11,774,000	10,397,000	4,973,000	8,495,000	8,409,000	4,317,000	2,469,000	2,508,000
1997	11,199,000	8,500,000	4,489,000	6,559,000	7,321,000	3,612,000	1,849,000	1,590,000
1998	10,055,000	7,844,000	3,588,000	7,072,000	7,304,000	3,893,000	2,066,000	1,712,000
1999	10,219,000	7,870,000	3,475,000	6,138,000	7,398,000	4,061,000	1,817,000	1,427,000
2000	10,029,000	7,583,000	3,700,000	6,376,000	6,808,000	4,526,000	2,208,000	1,905,000
2001	9,753,000	7,255,000	2,833,000	5,447,000	6,833,000	3,468,000	1,759,000	1,656,000
2002	9,378,000	7,405,000	3,188,000	5,856,000	7,013,000	4,300,000	2,207,000	2,039,000
2003	8,591,000	6,537,000	2,644,000	5,151,000	6,064,000	3,874,000	1,767,000	1,627,000
2004	9,196,000	7,770,000	3,098,000	5,632,000	6,002,000	4,402,000	2,344,000	1,873,000
2005	9,816,000	7,323,000	3,724,000	5,540,000	6,787,000	5,561,000	2,272,000	2,063,000
2006	7,855,000	6,328,000	2,017,000	4,622,000	6,036,000	4,392,000	2,782,000	1,590,000
2007	7,046,000	6,518,000	4,395,000	4,766,000	5,684,000	4,639,000	2,549,000	1,809,000
2008	8,976,000	9,076,000	3,794,000	5,366,000	6,858,000	5,870,000	3,006,000	1,761,000
2009	6,801,000	6,395,000	3,066,000	5,345,000	6,937,000	4,835,000	2,853,000	1,906,000

Census Bureau data based on questionnaire mailed to 10,000 households asking both male and female heads of households and up to two other household members at least seven years old to indicate whether they have participated in bicycle riding at least six times over the previous year.

Source: US Census Bureau bike riding participation data

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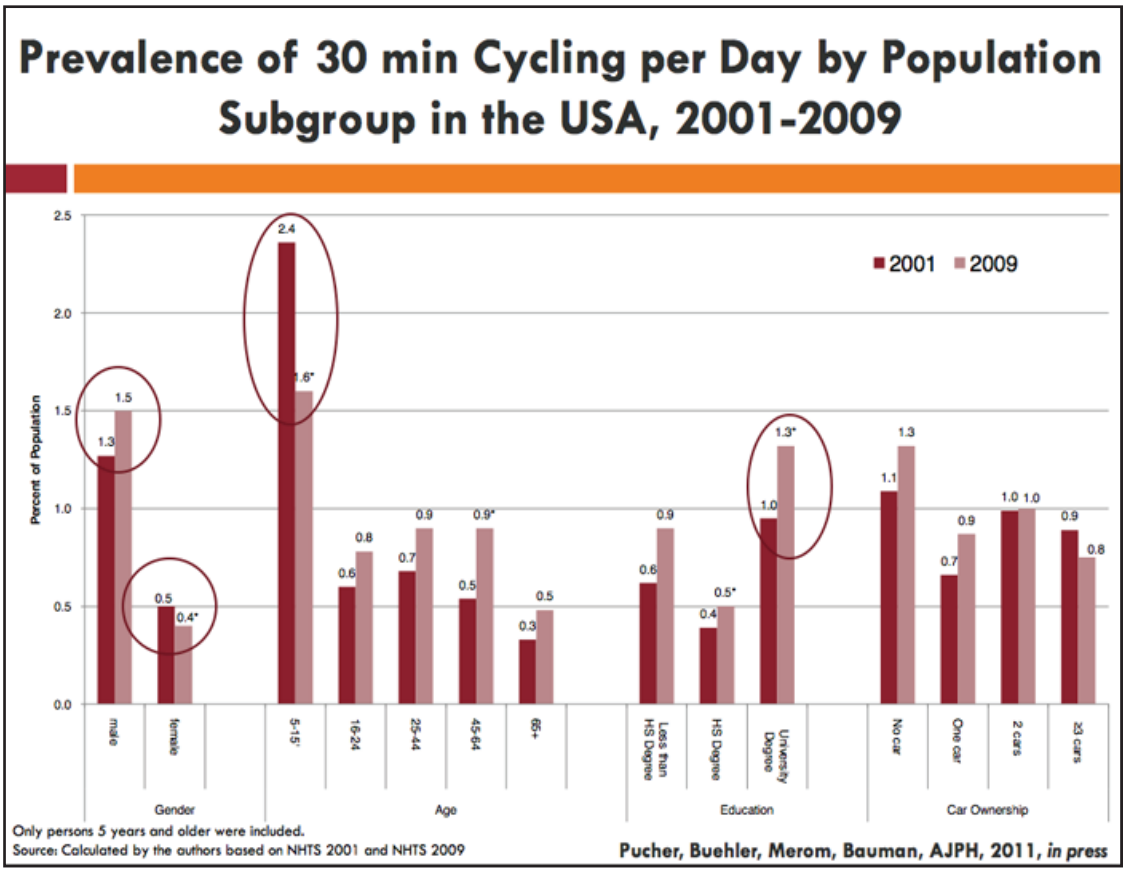
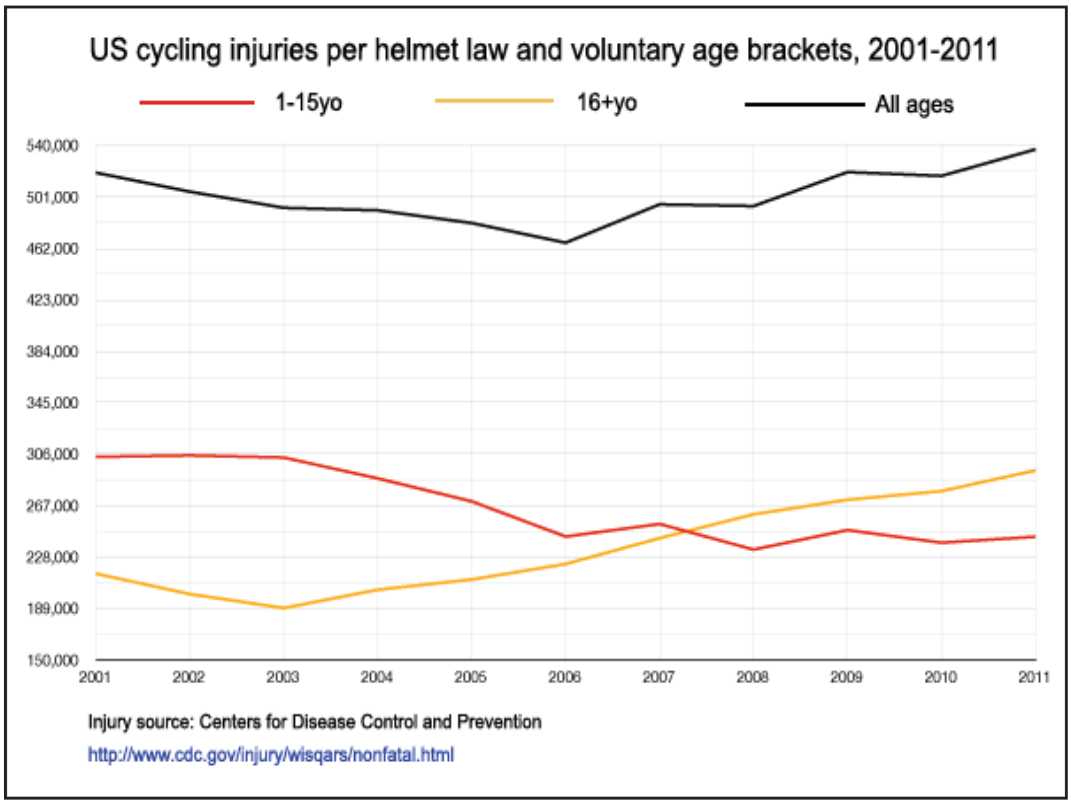
Figure 7



Source: Walking and Cycling in the United States, 2001-2009: Evidence from the National Household Travel Surveys, Pucher et al

Figure 8



Source: Centers for Disease Control and Prevention

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Figure 9a

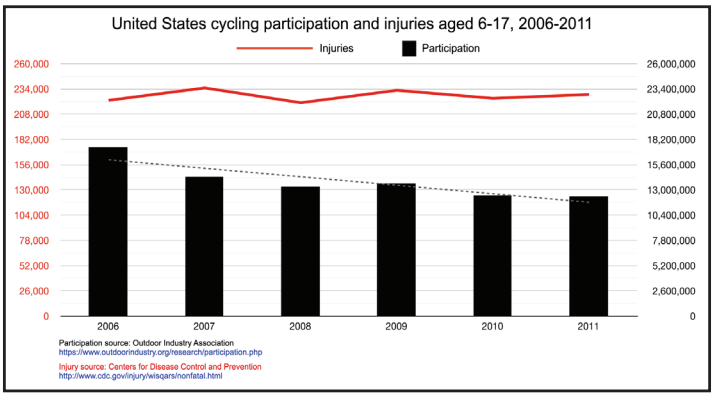


Figure 9b

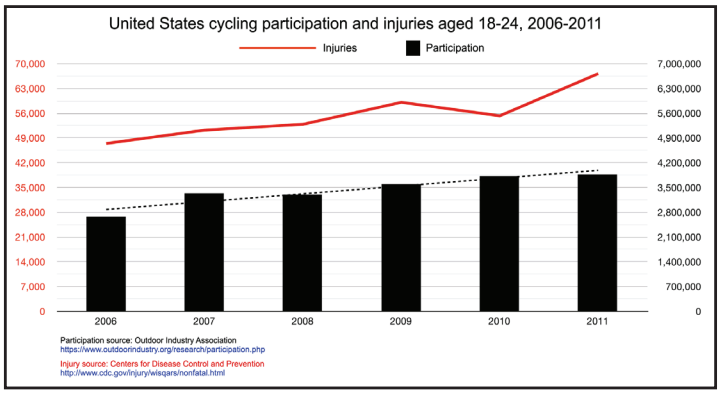
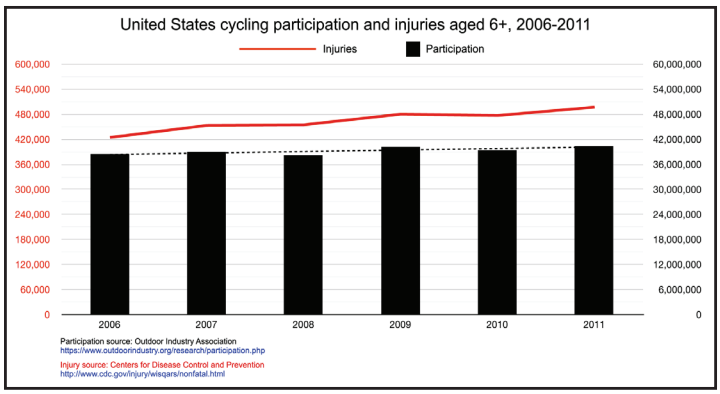


Figure 9c



Source: Outdoor Industry Association and Centers for Disease Control and Prevention

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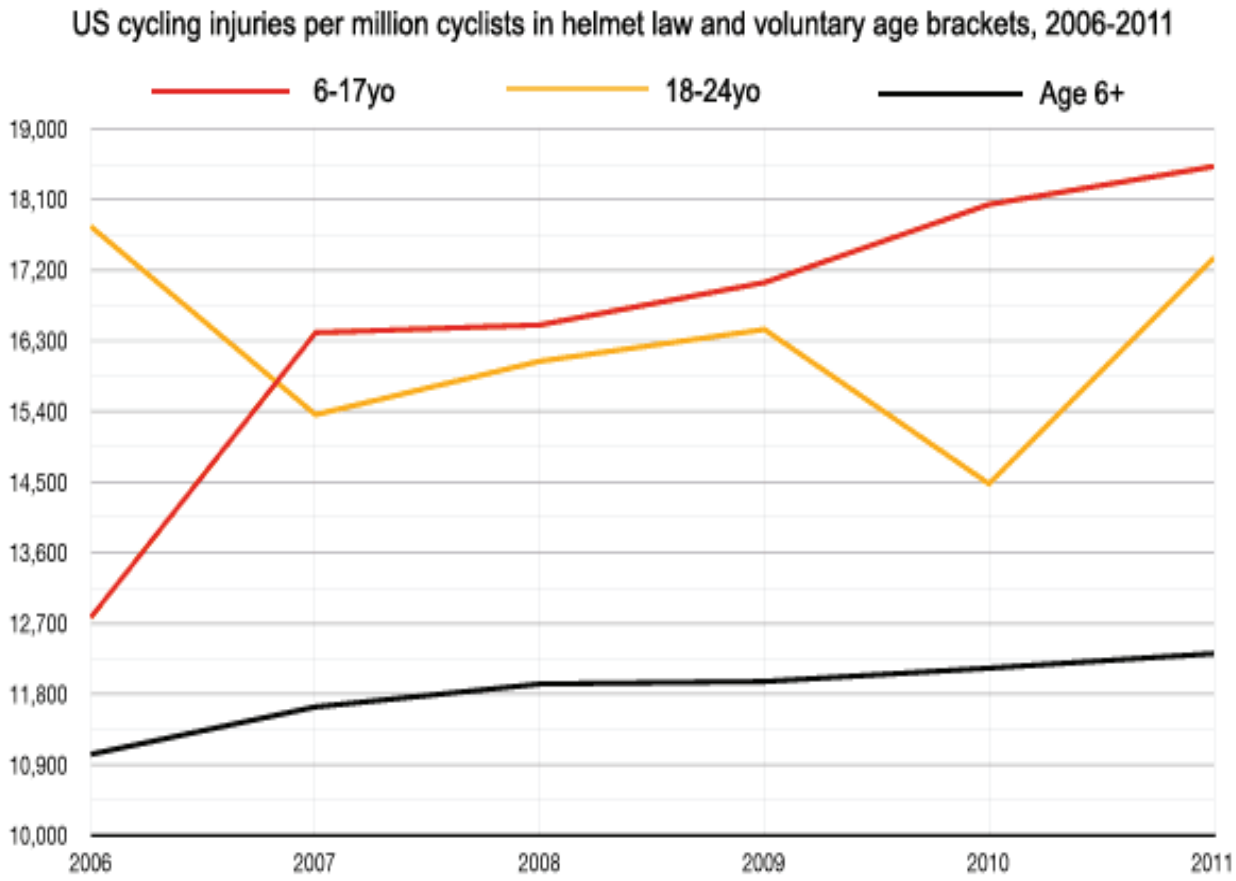
Figure 10



US cycling injuries per million cyclists

	6-17yo	18-24yo	All ages
2006	12,775	17,749	11,030
2007	16,399	15,355	11,633
2008	16,498	16,036	11,925
2009	17,038	16,440	11,957
2010	18,033	14,475	12,127
2011	18,515	17,348	12,312

Participation source: Outdoor Industry Association
https://www.outdoorindustry.org/research/participation.php

Injury source: Centers for Disease Control and Prevention
http://www.cdc.gov/injury/wisqars/nonfatal.html

Source: Outdoor Industry Association and Centers for Disease Control and Prevention

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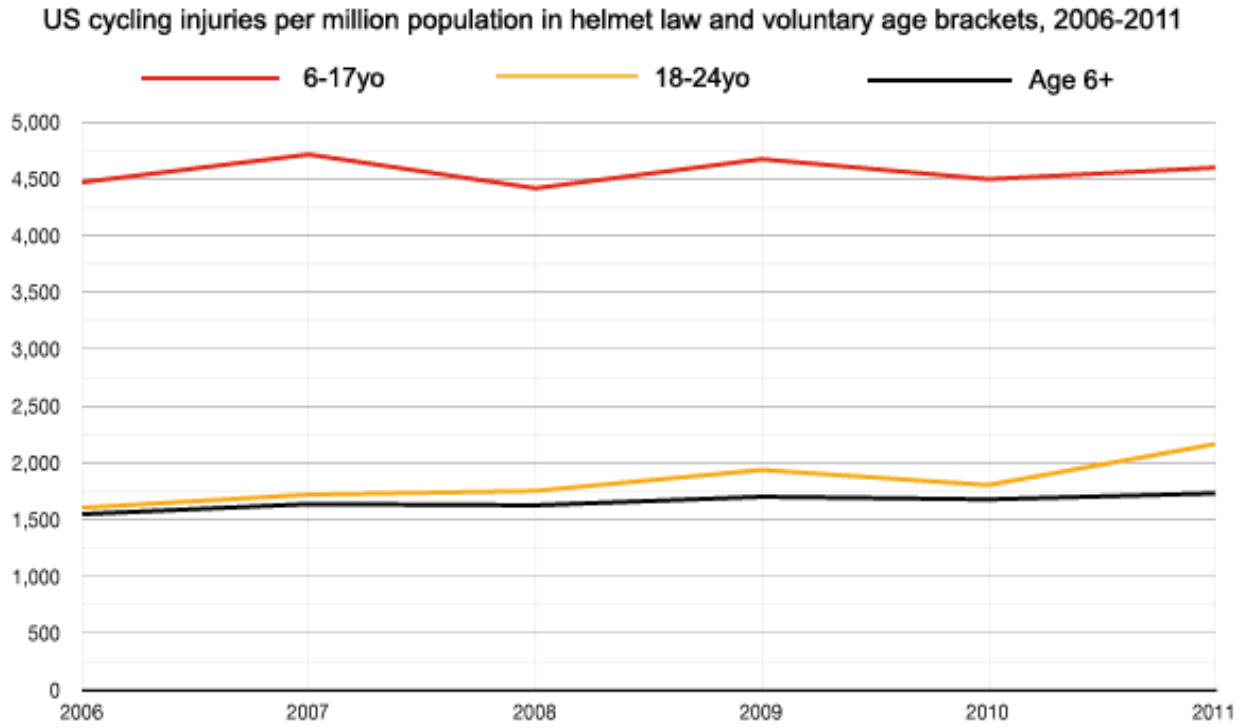
Figure 11



US cycling injuries per million population

	6-17yo	18-24yo	Age 6+
2006	4,467	1,603	1,546
2007	4,711	1,718	1,635
2008	4,414	1,751	1,624
2009	4,670	1,935	1,699
2010	4,494	1,802	1,676
2011	4,595	2,162	1,729

Injury source: Centers for Disease Control and Prevention
http://www.cdc.gov/injury/wisqars/nonfatal.html

Source: Centers for Disease Control and Prevention

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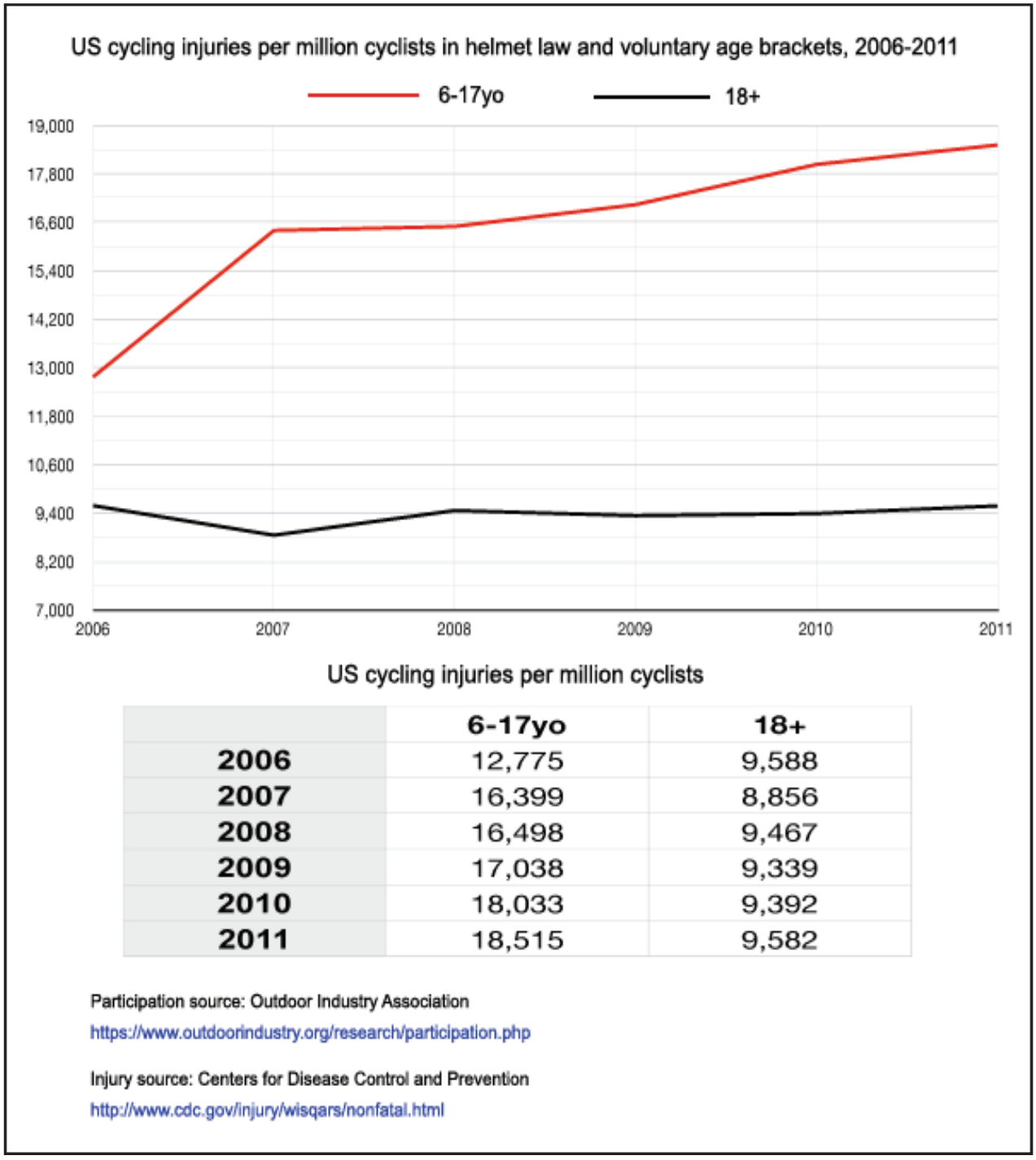
Figure 12



US cycling injuries per million cyclists

	6-17yo	18+
2006	12,775	9,588
2007	16,399	8,856
2008	16,498	9,467
2009	17,038	9,339
2010	18,033	9,392
2011	18,515	9,582

Participation source: Outdoor Industry Association
https://www.outdoorindustry.org/research/participation.php

Injury source: Centers for Disease Control and Prevention
http://www.cdc.gov/injury/wisqars/nonfatal.html

Source: Outdoor Industry Association and Centers for Disease Control and Prevention

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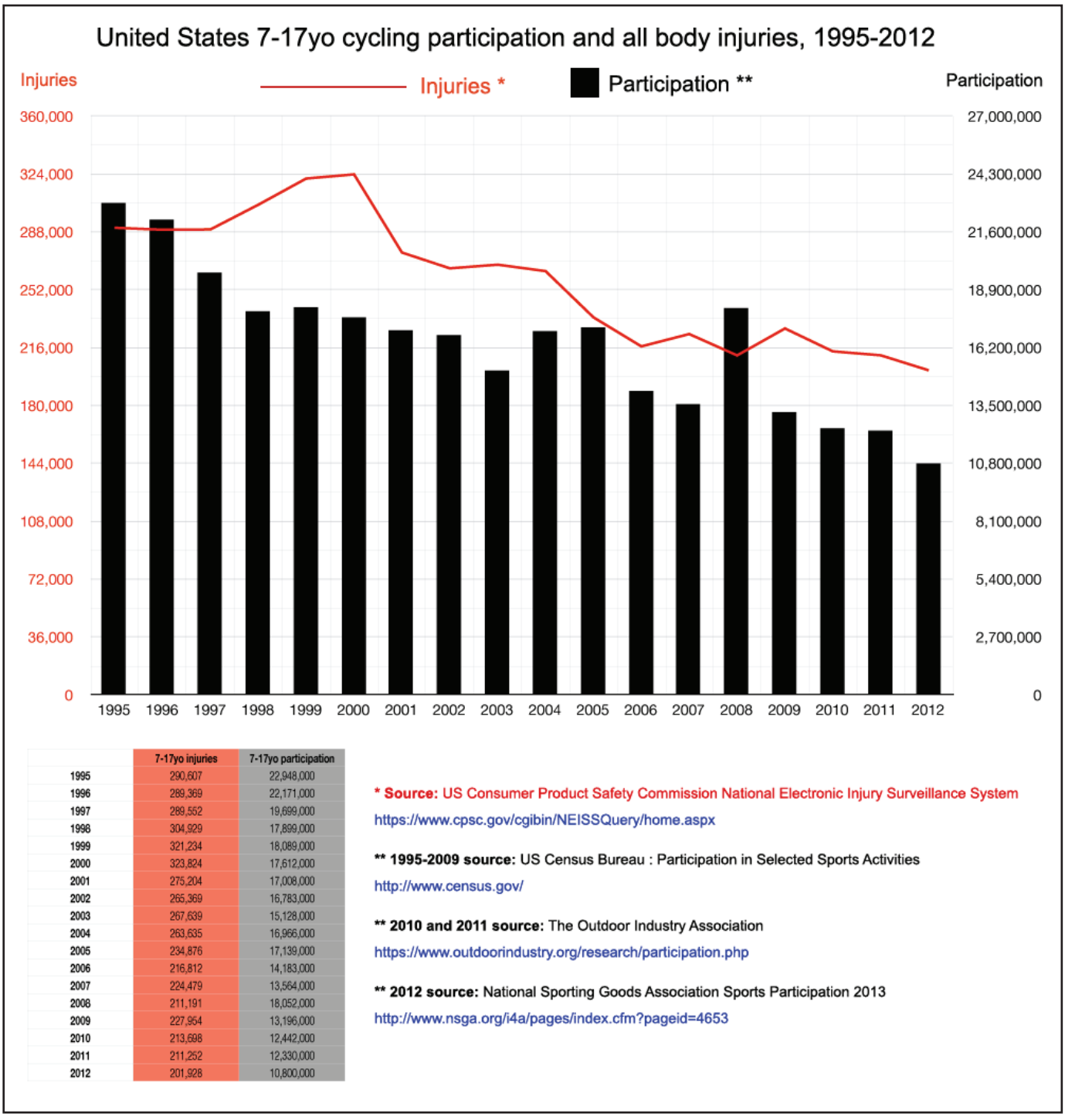
Figure 13



	7-17yo injuries	7-17yo participation
1995	290,607	22,948,000
1996	289,369	22,171,000
1997	289,552	19,699,000
1998	304,929	17,899,000
1999	321,234	18,089,000
2000	323,824	17,612,000
2001	275,204	17,008,000
2002	265,369	16,783,000
2003	267,639	15,128,000
2004	263,635	16,966,000
2005	234,876	17,139,000
2006	216,812	14,183,000
2007	224,479	13,564,000
2008	211,191	18,052,000
2009	227,954	13,196,000
2010	213,698	12,442,000
2011	211,252	12,330,000
2012	201,928	10,800,000

*** Source:** US Consumer Product Safety Commission National Electronic Injury Surveillance System
https://www.cpsc.gov/cgibin/NEISSQuery/home.aspx

**** 1995-2009 source:** US Census Bureau : Participation in Selected Sports Activities
http://www.census.gov/

**** 2010 and 2011 source:** The Outdoor Industry Association
https://www.outdoorindustry.org/research/participation.php

**** 2012 source:** National Sporting Goods Association Sports Participation 2013
http://www.nsga.org/i4a/pages/index.cfm?pageid=4653

Source: US Consumer Product Safety Commission National Electronic Injury Surveillance System, US Census Bureau Participation in Selected Sports Activities, Outdoor Industry Association and National Sporting Goods Administration Sports Participation 2013

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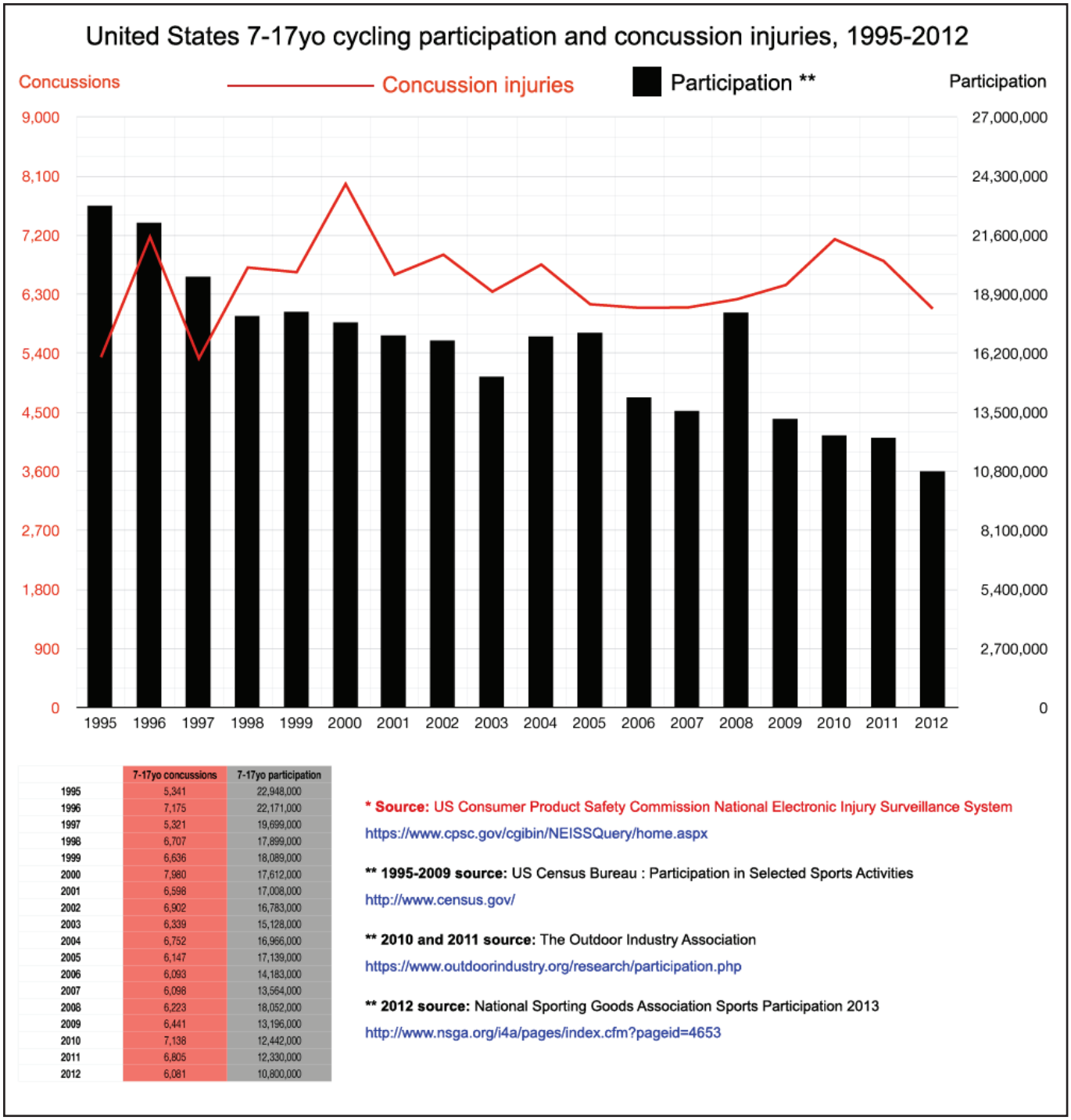
Figure 14



	7-17yo concussions	7-17yo participation
1995	5,341	22,948,000
1996	7,175	22,171,000
1997	5,321	19,699,000
1998	6,707	17,899,000
1999	6,636	18,089,000
2000	7,980	17,612,000
2001	6,598	17,008,000
2002	6,902	16,783,000
2003	6,339	15,128,000
2004	6,752	16,966,000
2005	6,147	17,139,000
2006	6,093	14,183,000
2007	6,098	13,564,000
2008	6,223	18,052,000
2009	6,441	13,196,000
2010	7,138	12,442,000
2011	6,805	12,330,000
2012	6,081	10,800,000

*** Source:** US Consumer Product Safety Commission National Electronic Injury Surveillance System
https://www.cpsc.gov/cgibin/NEISSQuery/home.aspx

**** 1995-2009 source:** US Census Bureau : Participation in Selected Sports Activities
http://www.census.gov/

**** 2010 and 2011 source:** The Outdoor Industry Association
https://www.outdoorindustry.org/research/participation.php

**** 2012 source:** National Sporting Goods Association Sports Participation 2013
http://www.nsga.org/i4a/pages/index.cfm?pageid=4653

Source: US Consumer Product Safety Commission National Electronic Injury Surveillance System, US Census Bureau Participation in Selected Sports Activities, Outdoor Industry Association and National Sporting Goods Administration Sports Participation 2013

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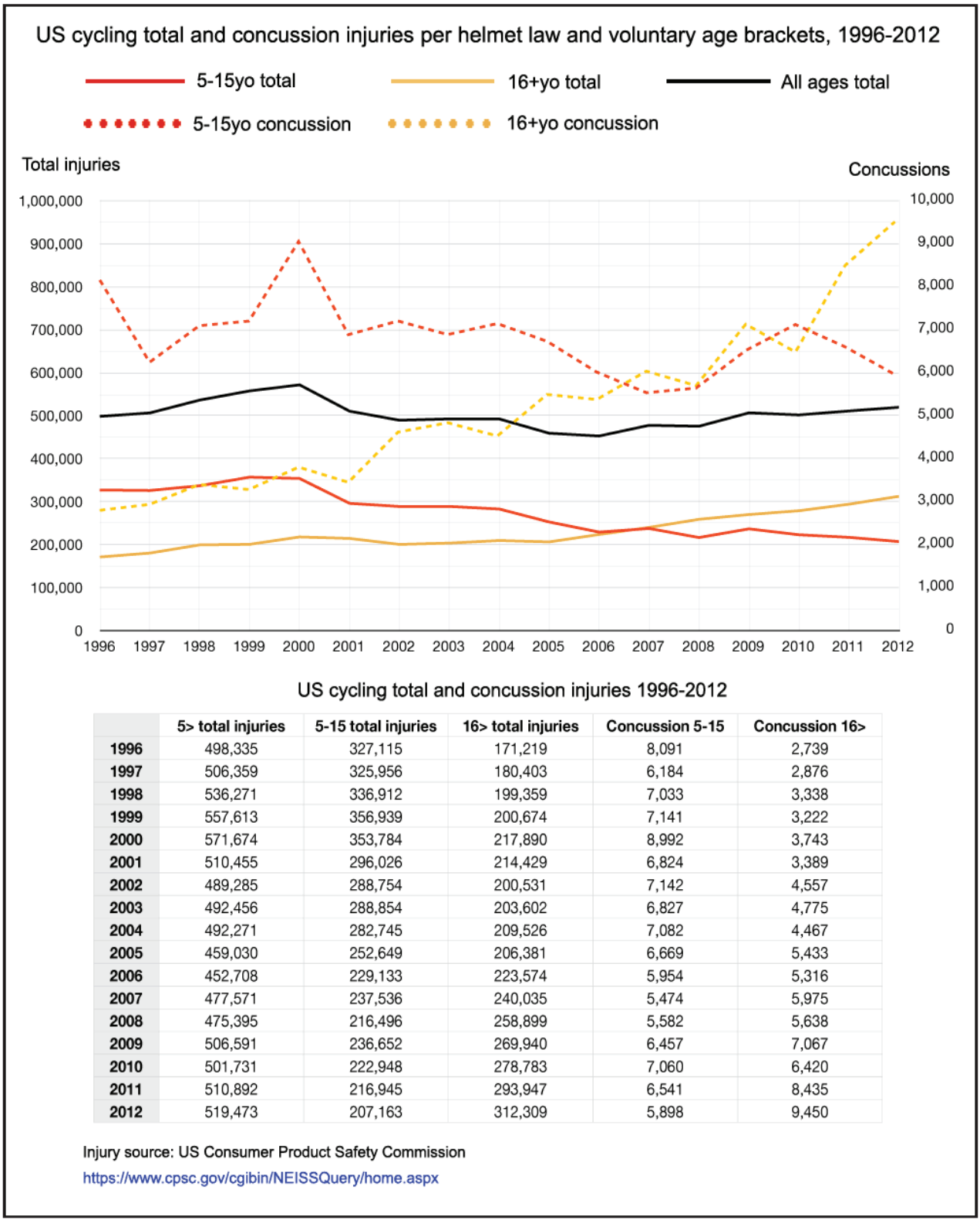
Figure 15



US cycling total and concussion injuries 1996-2012

	5> total injuries	5-15 total injuries	16> total injuries	Concussion 5-15	Concussion 16>
1996	498,335	327,115	171,219	8,091	2,739
1997	506,359	325,956	180,403	6,184	2,876
1998	536,271	336,912	199,359	7,033	3,338
1999	557,613	356,939	200,674	7,141	3,222
2000	571,674	353,784	217,890	8,992	3,743
2001	510,455	296,026	214,429	6,824	3,389
2002	489,285	288,754	200,531	7,142	4,557
2003	492,456	288,854	203,602	6,827	4,775
2004	492,271	282,745	209,526	7,082	4,467
2005	459,030	252,649	206,381	6,669	5,433
2006	452,708	229,133	223,574	5,954	5,316
2007	477,571	237,536	240,035	5,474	5,975
2008	475,395	216,496	258,899	5,582	5,638
2009	506,591	236,652	269,940	6,457	7,067
2010	501,731	222,948	278,783	7,060	6,420
2011	510,892	216,945	293,947	6,541	8,435
2012	519,473	207,163	312,309	5,898	9,450

Injury source: US Consumer Product Safety Commission
https://www.cpsc.gov/cgibin/NEISSQuery/home.aspx

Source: US Consumer Product Safety Commission National Electronic Injury Surveillance System

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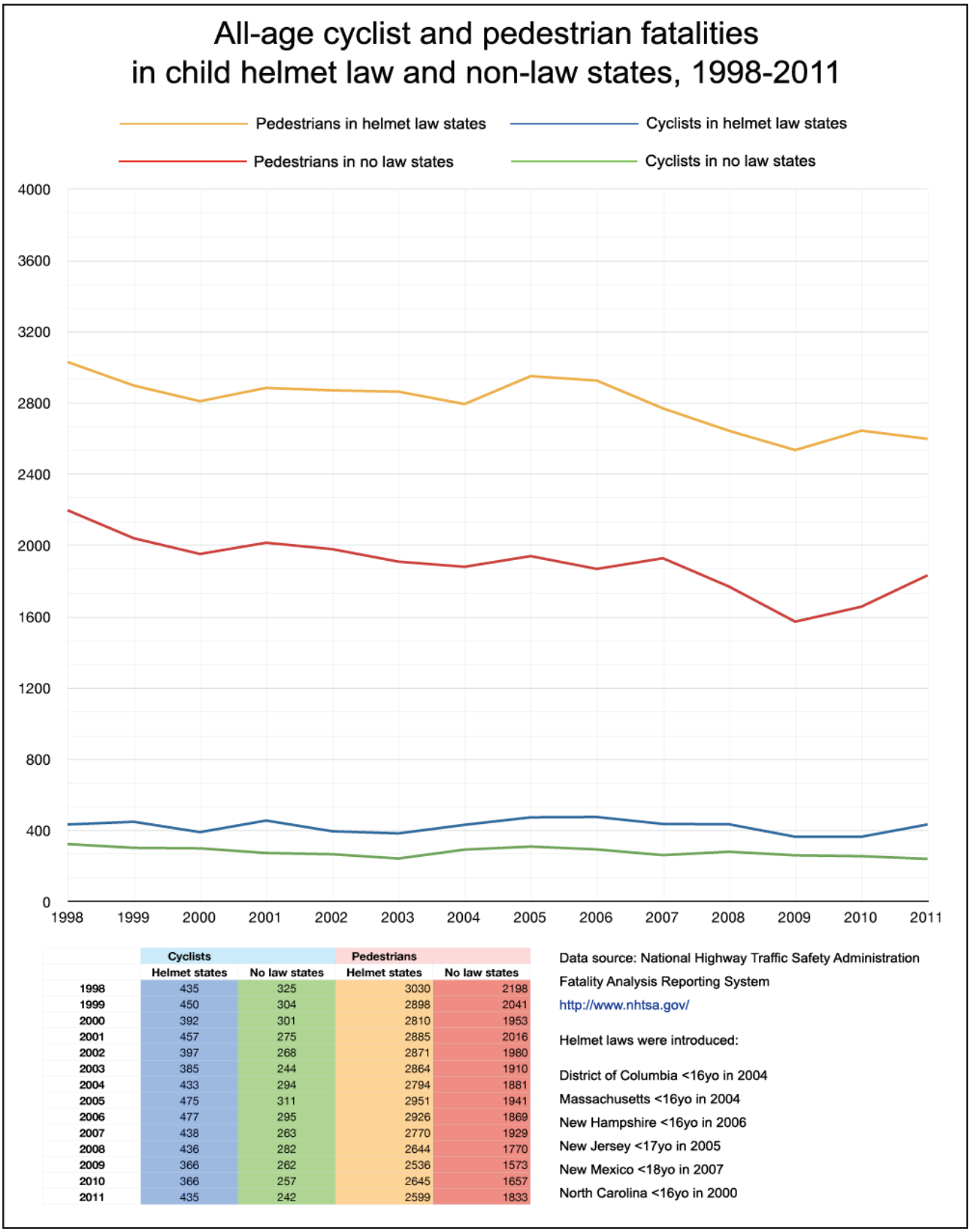
Figure 16



	Cyclists		Pedestrians	
	Helmet states	No law states	Helmet states	No law states
1998	435	325	3030	2198
1999	450	304	2898	2041
2000	392	301	2810	1953
2001	457	275	2885	2016
2002	397	268	2871	1980
2003	385	244	2864	1910
2004	433	294	2794	1881
2005	475	311	2951	1941
2006	477	295	2926	1869
2007	438	263	2770	1929
2008	436	282	2644	1770
2009	366	262	2536	1573
2010	366	257	2645	1657
2011	435	242	2599	1833

Data source: National Highway Traffic Safety Administration
Fatality Analysis Reporting System
http://www.nhtsa.gov/

Helmet laws were introduced:

District of Columbia <16yo in 2004
Massachusetts <16yo in 2004
New Hampshire <16yo in 2006
New Jersey <17yo in 2005
New Mexico <18yo in 2007
North Carolina <16yo in 2000

Source: FARS

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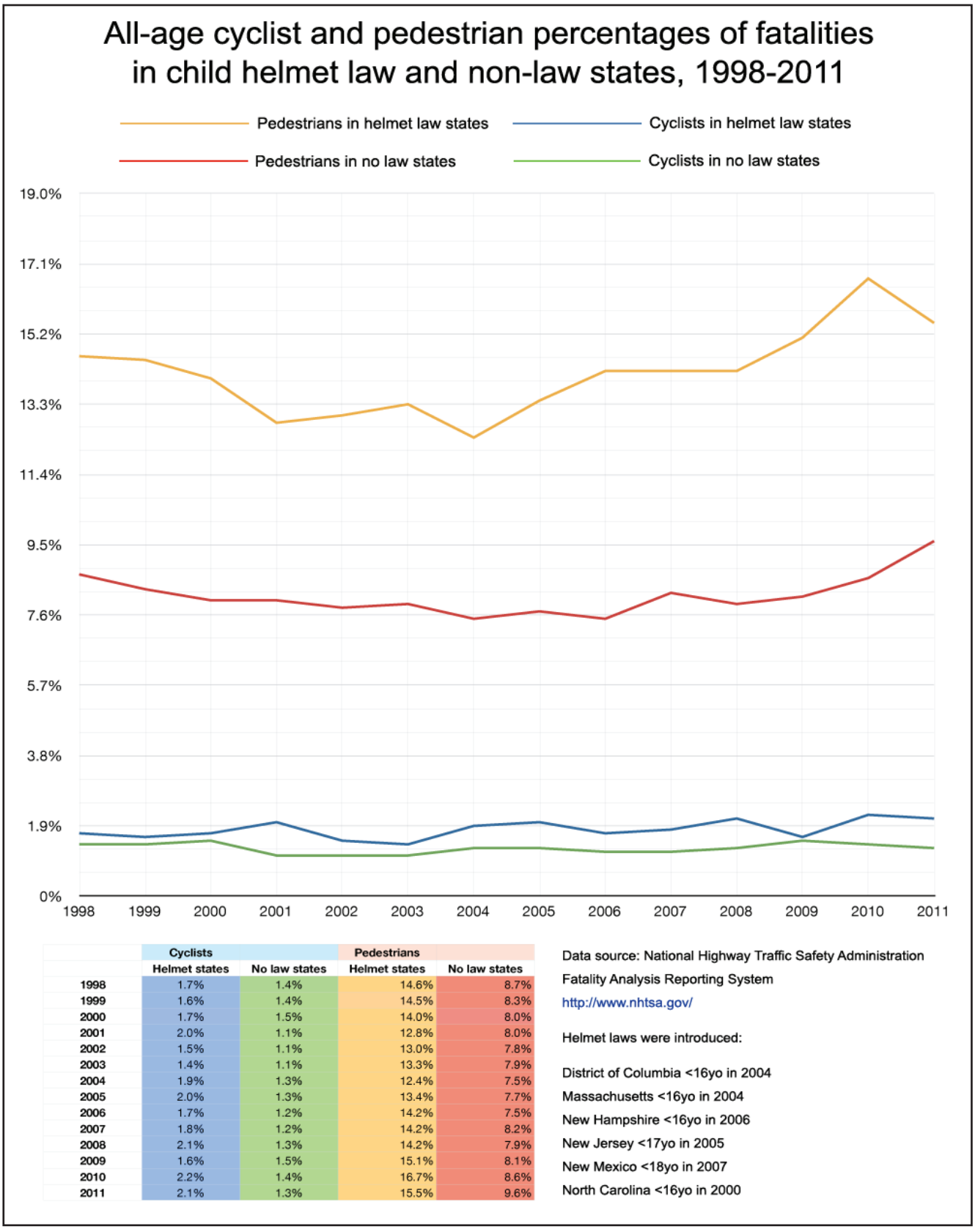
Figure 17



	Cyclists		Pedestrians	
	Helmet states	No law states	Helmet states	No law states
1998	1.7%	1.4%	14.6%	8.7%
1999	1.6%	1.4%	14.5%	8.3%
2000	1.7%	1.5%	14.0%	8.0%
2001	2.0%	1.1%	12.8%	8.0%
2002	1.5%	1.1%	13.0%	7.8%
2003	1.4%	1.1%	13.3%	7.9%
2004	1.9%	1.3%	12.4%	7.5%
2005	2.0%	1.3%	13.4%	7.7%
2006	1.7%	1.2%	14.2%	7.5%
2007	1.8%	1.2%	14.2%	8.2%
2008	2.1%	1.3%	14.2%	7.9%
2009	1.6%	1.5%	15.1%	8.1%
2010	2.2%	1.4%	16.7%	8.6%
2011	2.1%	1.3%	15.5%	9.6%

Data source: National Highway Traffic Safety Administration Fatality Analysis Reporting System
http://www.nhtsa.gov/

Helmet laws were introduced:

District of Columbia <16yo in 2004
Massachusetts <16yo in 2004
New Hampshire <16yo in 2006
New Jersey <17yo in 2005
New Mexico <18yo in 2007
North Carolina <16yo in 2000

Source: FARS

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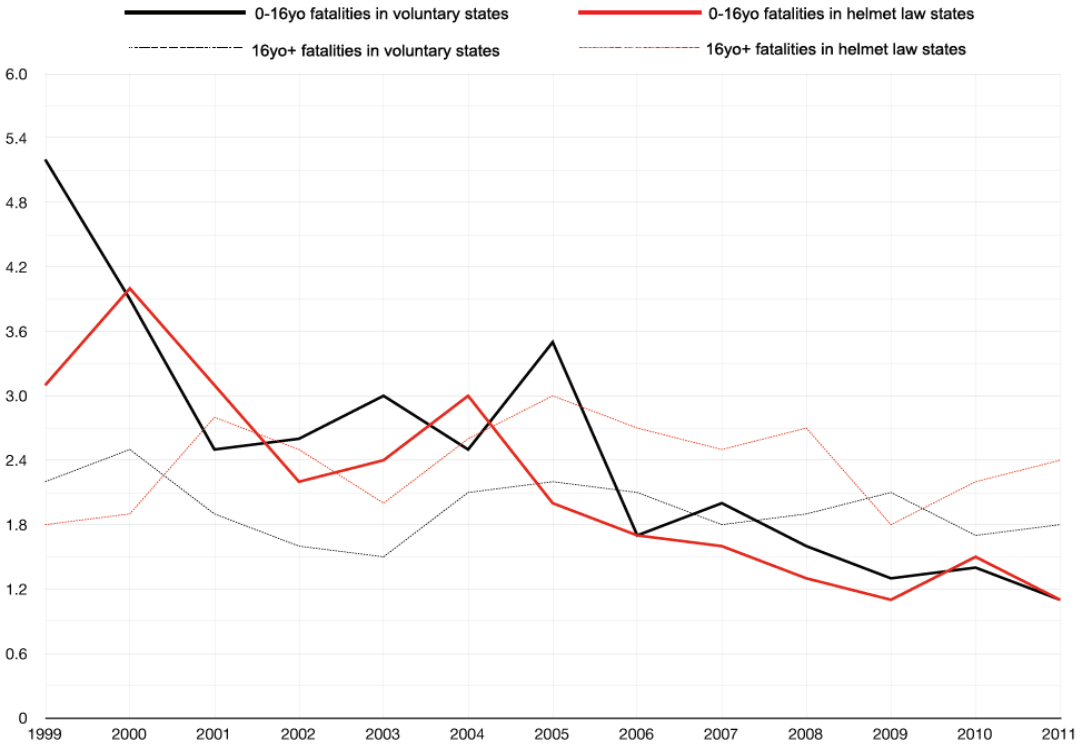
Figure 18



Average per million population fatality rates in child helmet law and voluntary American states

	Law states all ages	Law states 0-16	Law states 16+	No law states all ages	No law states 0-16	No law states 16+
1999	2.0	3.1	1.8	2.8	5.2	2.2
2000	2.8	4.0	1.9	2.9	3.9	2.5
2001	2.7	3.1	2.8	2.1	2.5	1.9
2002	2.4	2.2	2.5	1.9	2.6	1.6
2003	2.1	2.4	2.0	1.8	3.0	1.5
2004	2.6	3.0	2.6	2.1	2.5	2.1
2005	2.8	2.0	3.0	2.5	3.5	2.2
2006	2.5	1.7	2.7	1.9	1.7	2.1
2007	2.3	1.6	2.5	1.8	2.0	1.8
2008	2.4	1.3	2.7	1.8	1.6	1.9
2009	1.8	1.1	1.8	1.9	1.3	2.1
2010	2.1	1.5	2.2	1.7	1.4	1.7
2011	2.1	1.1	2.4	1.6	1.1	1.8
Averages	**2.4**	**2.2**	**2.4**	**2.1**	**2.5**	**2.0**

Data sources:

National Highway Traffic Safety Administration Fatality Analysis Reporting System

http://www-fars.nhtsa.dot.gov/QueryTool/QuerySection/selectyear.aspx

State bicycle fatalities and population data tables

http://www.cycle-helmets.com/us-state-fatalities-per-pop.xls

Source: FARS and US Census data tables (Excel)

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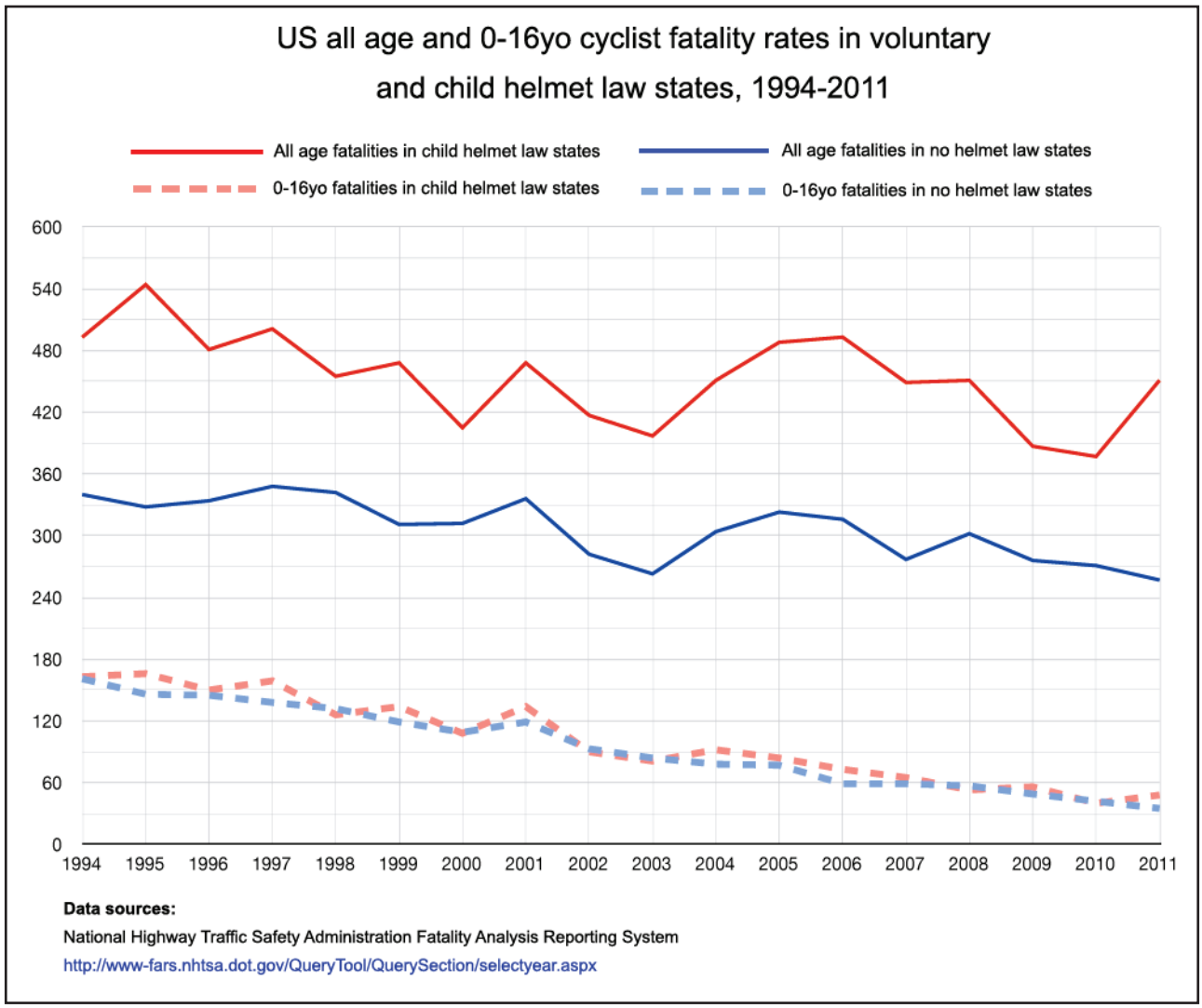
Figure 19



Source: National Highway Traffic Safety Administration's Fatality Analysis Reporting System

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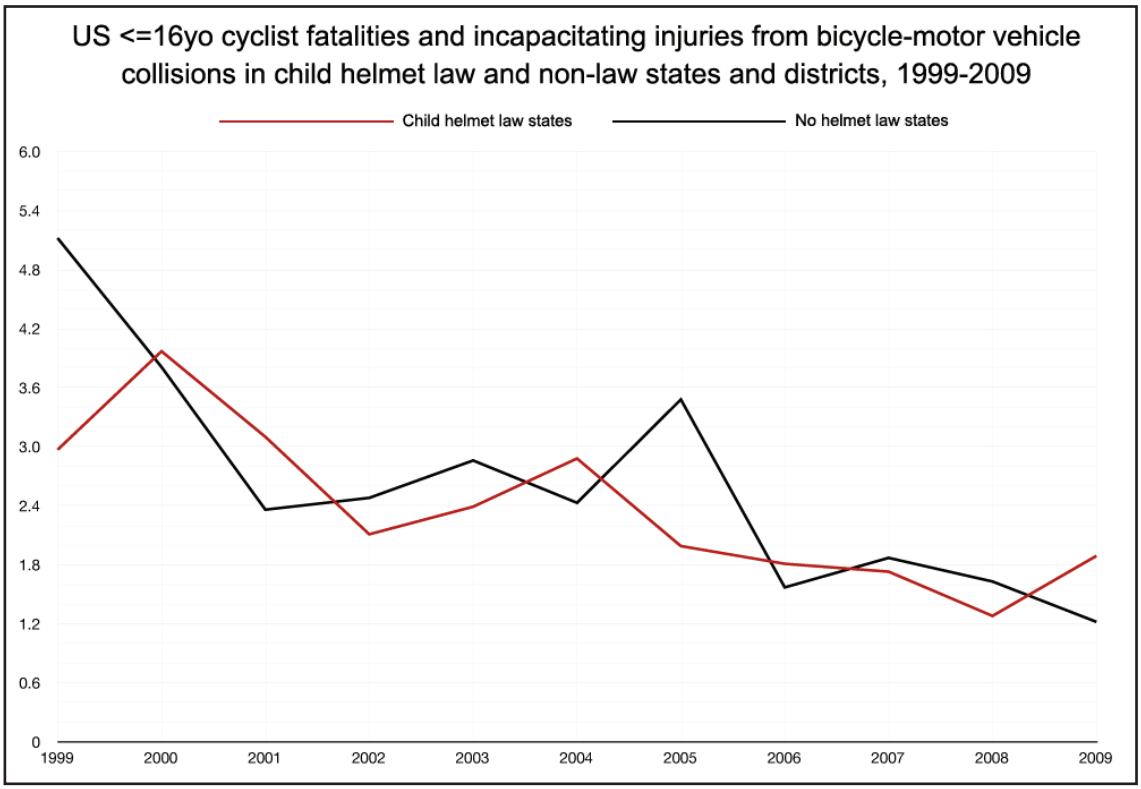
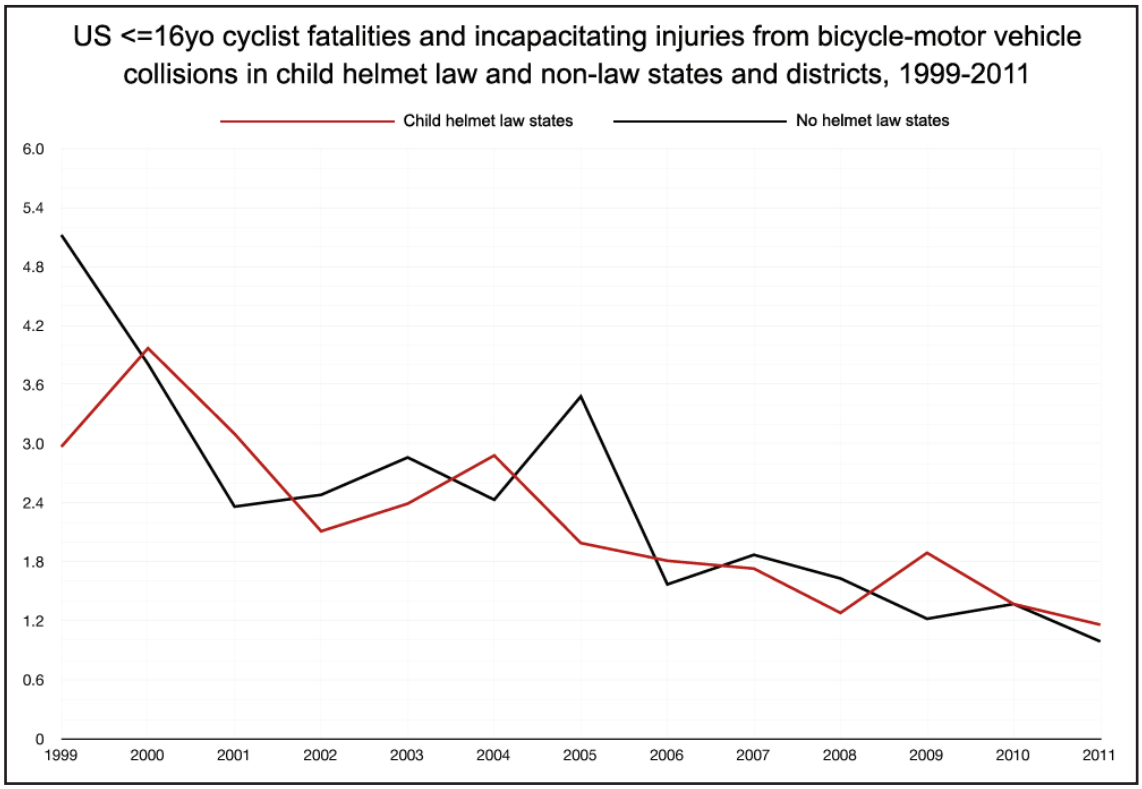
Figure 20



Source: National Highway Traffic Safety Administration's Fatality Analysis Reporting System

Excel spreadsheet data: http://www.cycle-helmets.com/us-fatals-serious-injuries-1999-2011.xls

Figure 21



Source: National Highway Traffic Safety Administration's Fatality Analysis Reporting System

Excel spreadsheet data: http://www.cycle-helmets.com/us-fatals-serious-injuries-1999-2011.xls

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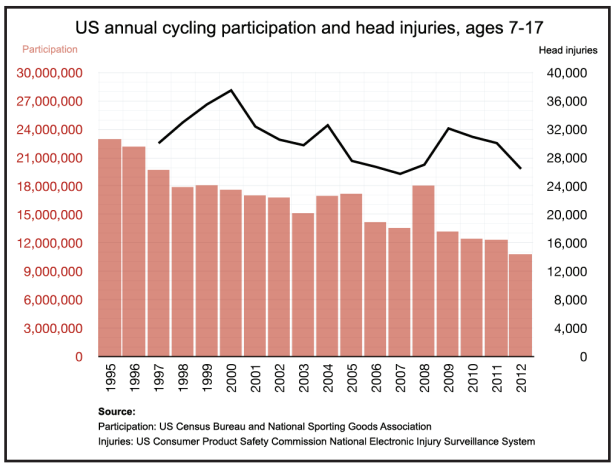

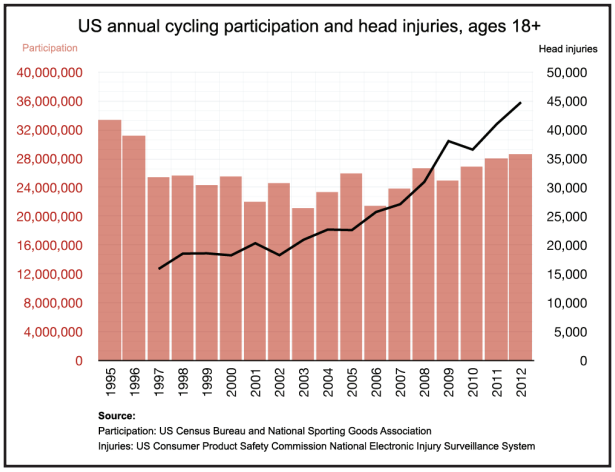

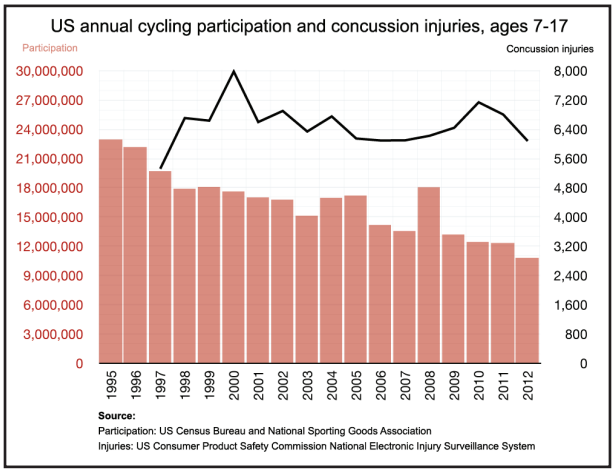

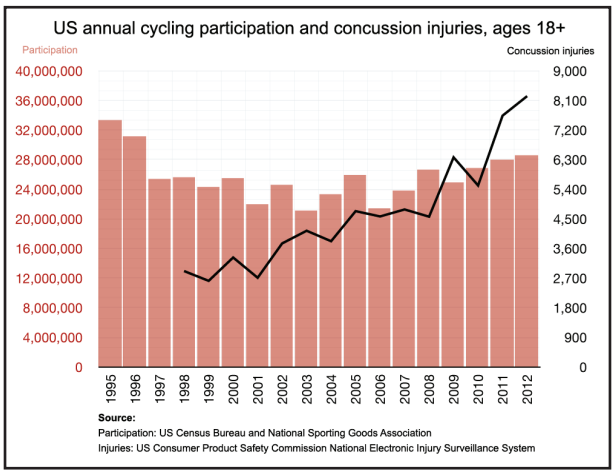

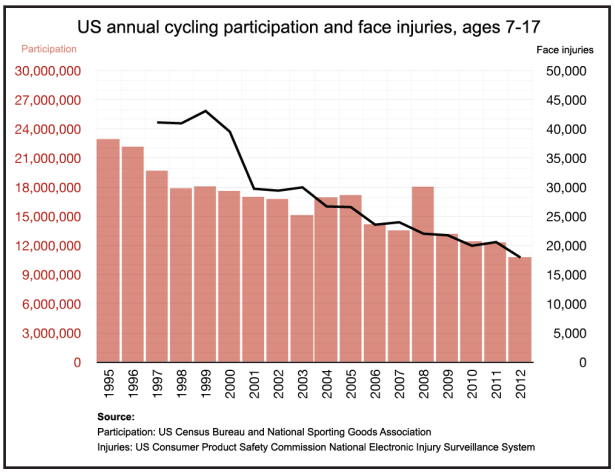

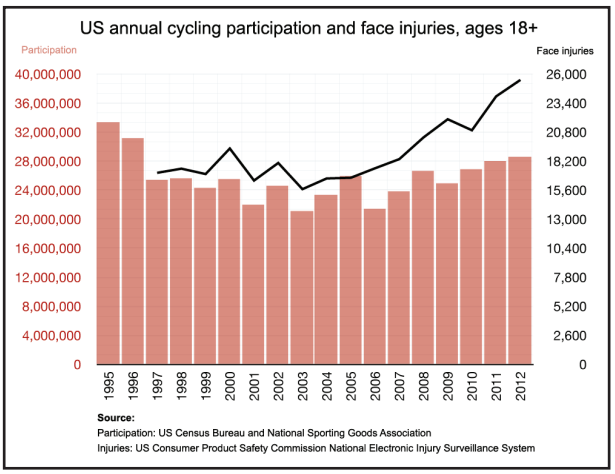

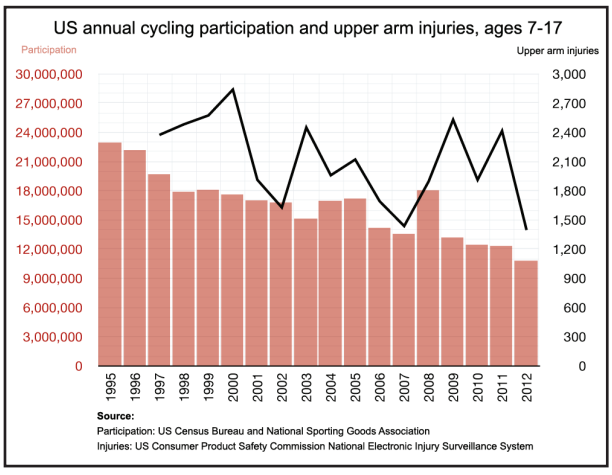

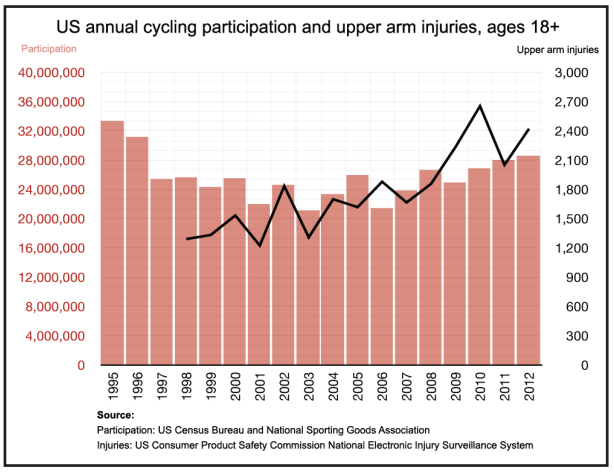

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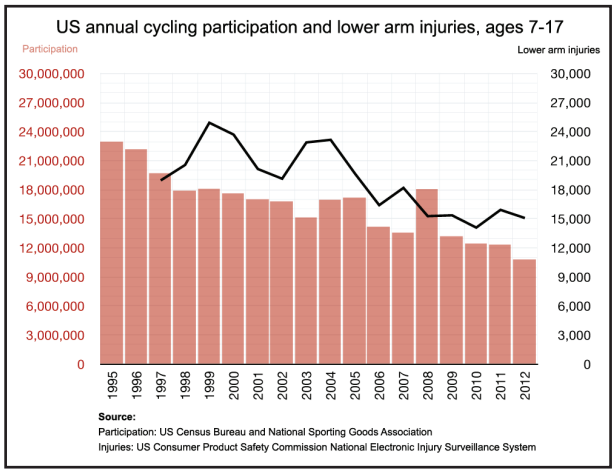

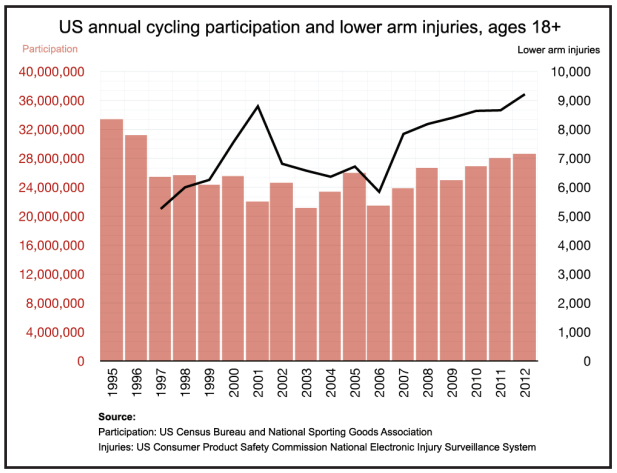

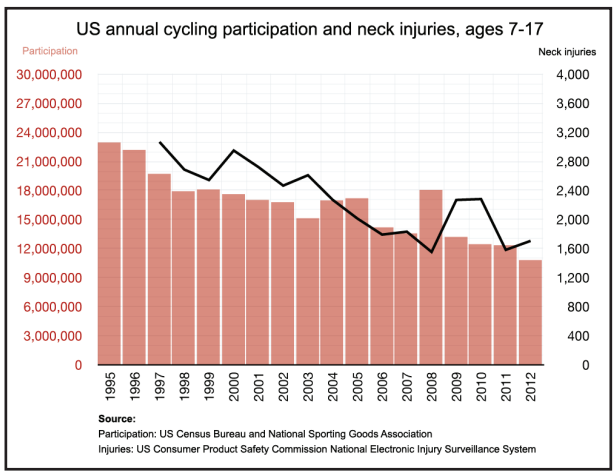

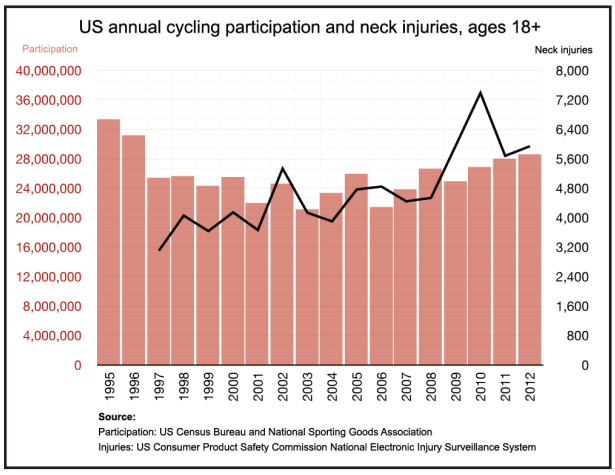

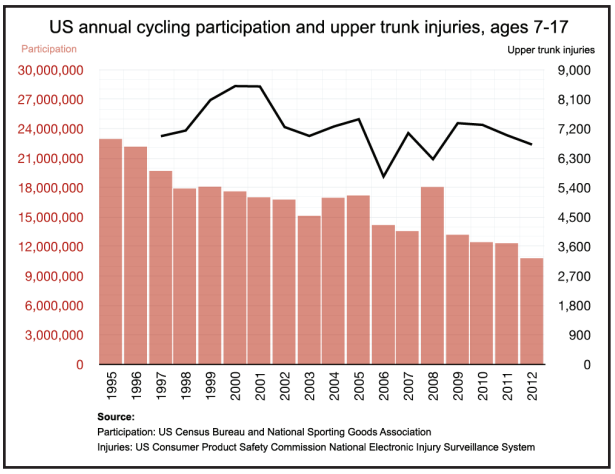

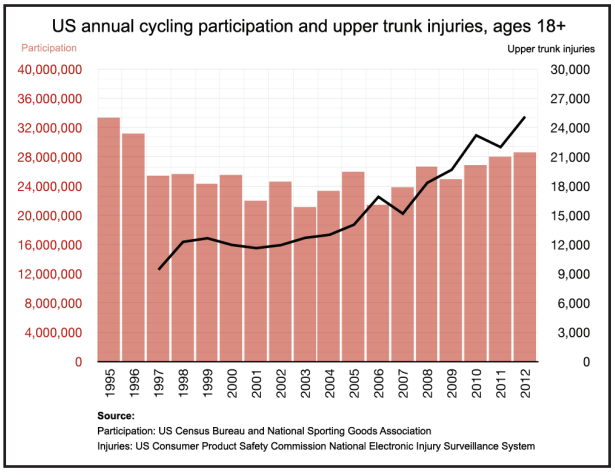

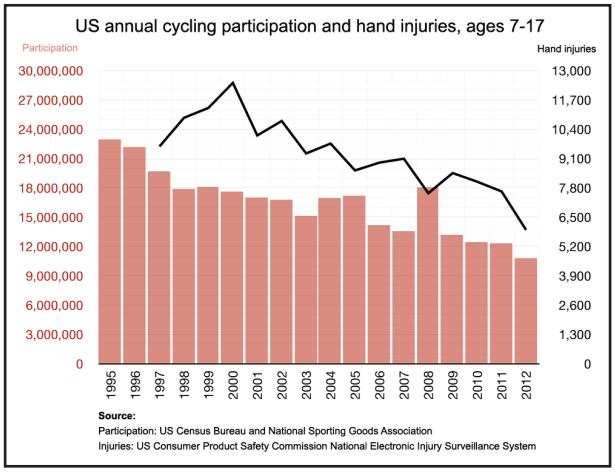

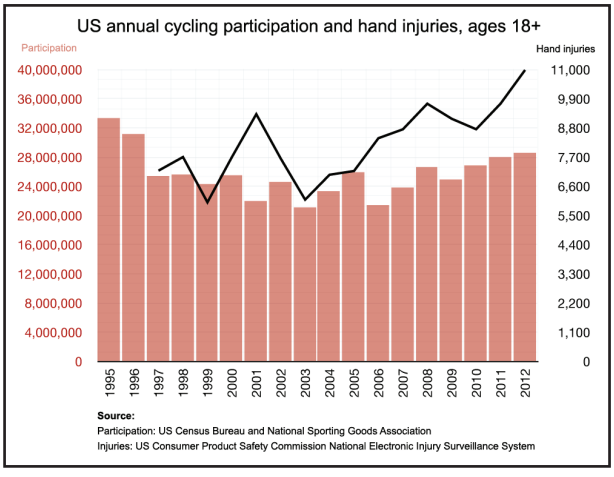

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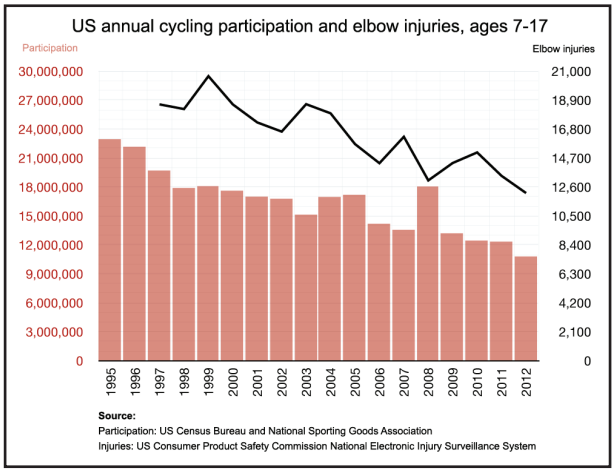

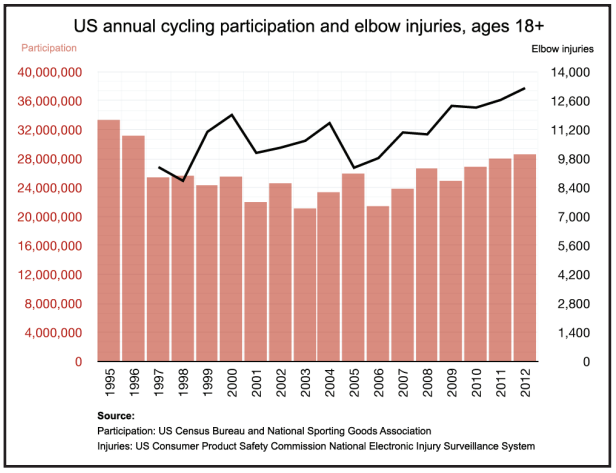

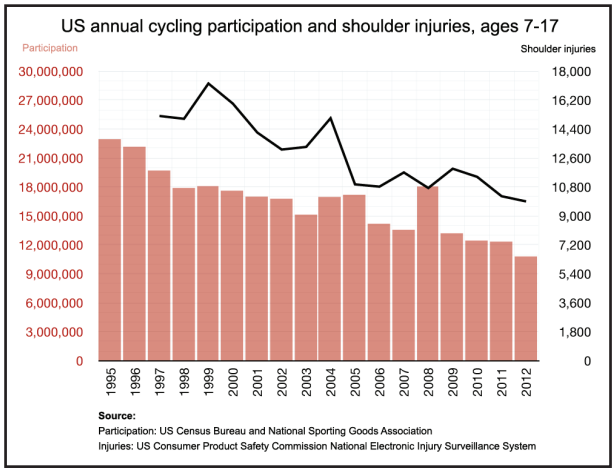

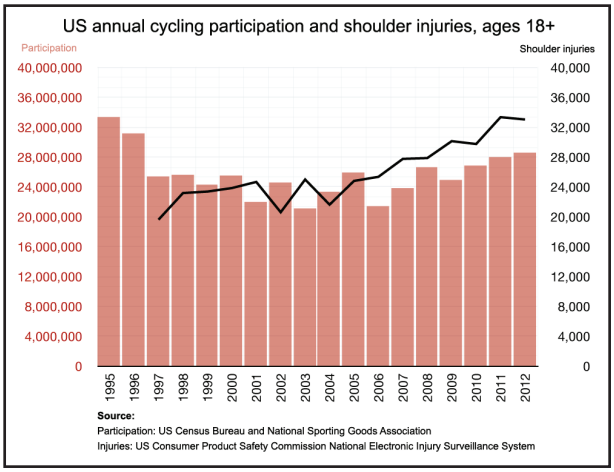

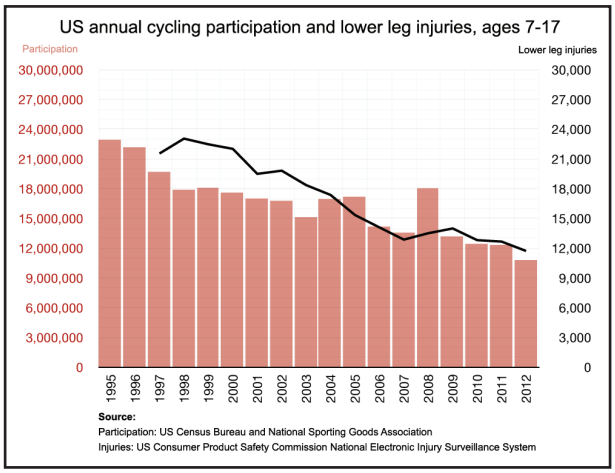

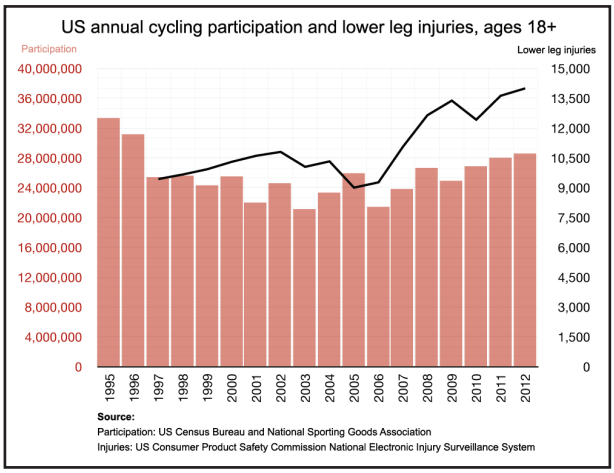

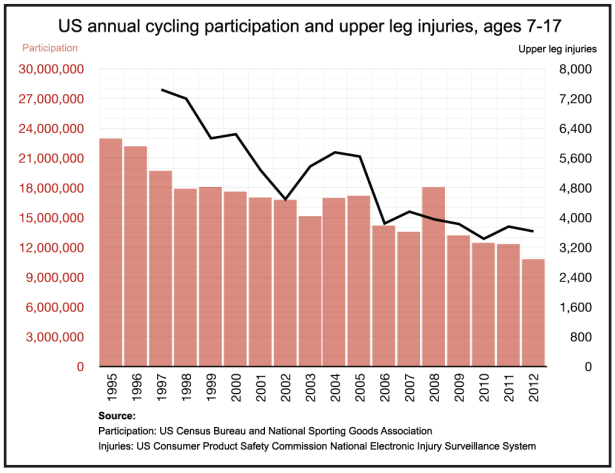

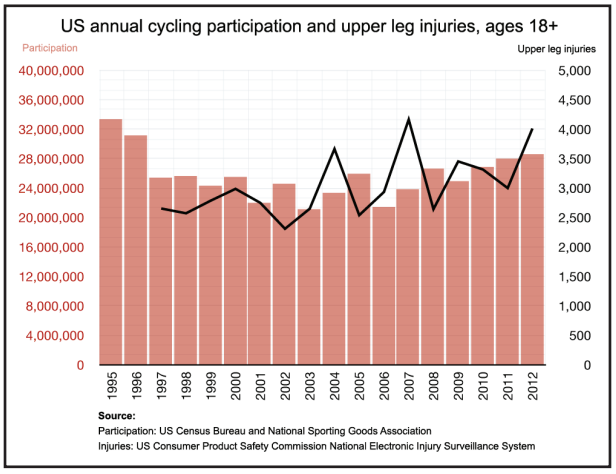

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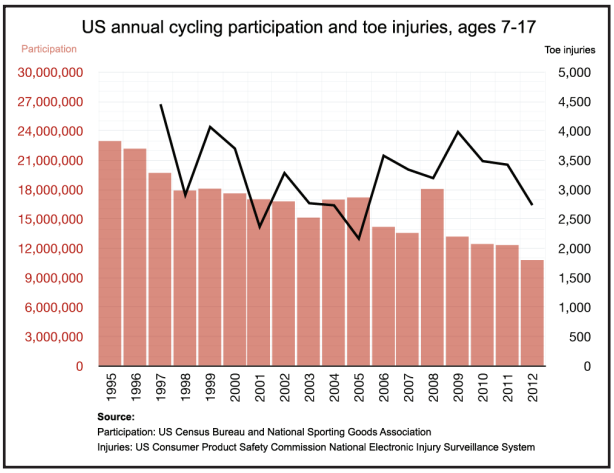

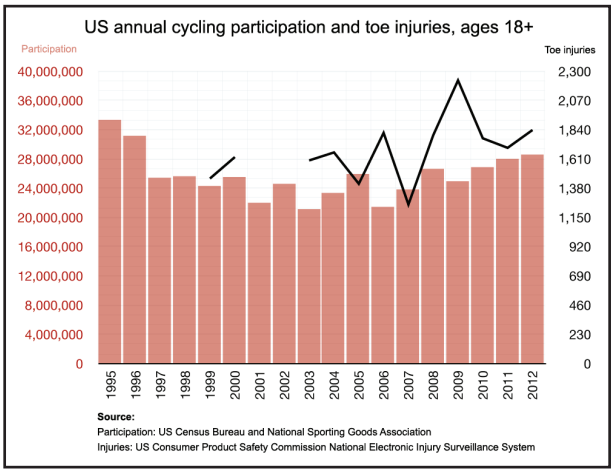

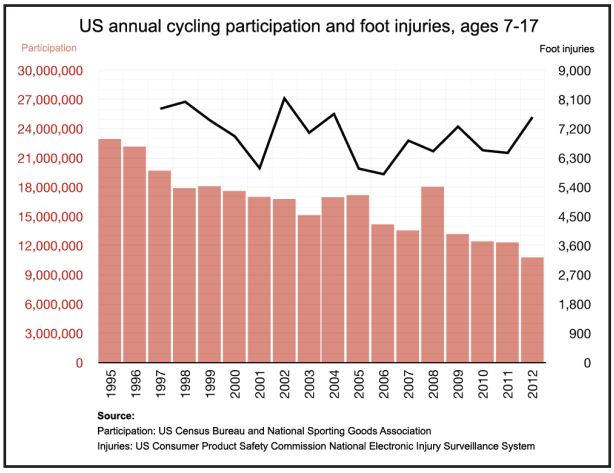

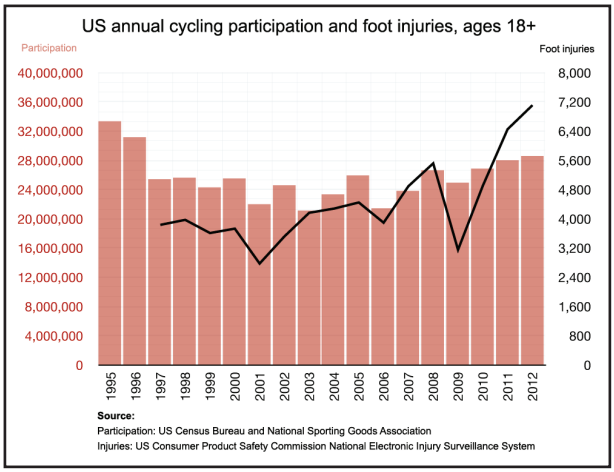

Source for charts 20 -47:

US Census Bureau Sports Activities Participation reports, 1995-2009
National Sporting Goods Association
US Consumer Product Safety Commission National Electronic Injury Surveillance System
Outdoor Recreation Participation Report 2013, Outdoor Foundation
Chart data Excel spreadsheet

Note: the years 2010 and 2011 in all charts above use participation data sourced to the Outdoor Industry Association for estimated cycling participation among ages 6-17. The OIA and NSGA participation data, the latter endorsed and used by the Census Bureau, have similar historic results but 2010 and 2011 have slightly inflated figures relative to other years because of the OIA's 6-17 age grouping instead of the NSGA's 7-17 age grouping.

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Table 1

Traumatic US	brain injury	deaths	http://www.cdc.gov/mmwr/preview/mmwrhtml/ss6005a1.htm			
Year	**M/V**	**Motorcycle**	**Bicycle**	**Pedestrian**	**Other**	**Total**
1997	10,114	719	432	2,167	3,939	**17,415**
1998	9,897	735	400	2,129	4,029	**17,238**
1999	7,514	1,013	326	1,773	5,850	**16,476**
2000	7,708	1,191	304	1,761	6,036	**17,000**
2001	7,698	1,303	294	1,819	5,755	**16,869**
2002	8,456	1,400	280	1,803	5,387	**17,326**
2003	8,091	1,524	279	1,824	4,900	**16,618**
2004	7,593	1,635	312	1,654	5,129	**16,323**
2005	7,462	1,716	365	1,724	5,353	**16,620**
2006	6,858	1,880	339	1,791	5,402	**16,270**
2007	6,119	1,856	241	1,626	5,241	**15,083**
1997-2001 av	8,586	992	351	1,930	5,122	17,000
2003-2007 av	7,225	1,722	307	1,724	5,205	16,183
% change	-15.90%	73.60%	-12.50%	-10.70%	1.60%	-4.80%

Source: The Centers for Disease Control and Prevention Surveillance for Traumatic Brain Injury Related Death - United States, 1997-2007

Table 2

TABLE 12: Estimated Average Annual Numbers, Rates, and Percentages of Traumatic Brain Injury-Related Hospitalizations, by Age Group and Specific Motor Vehicle–Traffic (MVT) External Causes, United States, 2002–2006

	MVT-OCCUPANT			MVT- MOTORCYCLE			MVT- PEDAL CYCLE			MVT- PEDESTRIAN			MVT- OTHER OR UNSPECIFIED			TOTAL	
AGE (YRS)	NUMBER	RATE▸	ROW %	NUMBER	RATE▸	ROW %	NUMBER	RATE▸	ROW %	NUMBER	RATE▸	ROW %	NUMBER	RATE▸	ROW %	NUMBER	RATE▸
0-4	1,426†	7.1†	65.3†	--	--	--	--	--	--	744§	3.7§	34.1§	12§	0.1§	0.6§	2,182	10.9
5-9	1,487†	7.5†	57.9†	100§	0.5§	3.9§	147§	0.7§	5.7§	677†	3.4†	26.4†	156§	0.8§	6.1§	2,567	13.0
10-14	984†	4.7†	46.6†	91§	0.4§	4.3§	360†	1.7†	17.0†	650†	3.1†	30.8†	26§	0.1§	1.2§	2,111	10.1
15-19	6,802	32.8	70.9	1,182§	5.7§	12.3§	243§	1.2§	2.5§	650§	3.1§	6.8§	722§	3.5§	7.5§	9,599	46.2
20-24	5,567	26.8	73.5	614§	3.0§	8.1§	143§	0.7§	1.9§	703§	3.4§	9.3§	543§	2.6§	7.2§	7,570	36.5
25-34	6,048	15.2	65.7	1,428†	3.6†	15.5†	357§	0.9§	3.9§	792†	2.0†	8.6†	583§	1.5§	6.3§	9,208	23.1
35-44	5,216	11.8	67.4	1,299†	2.9†	16.8†	66§	0.1§	0.8§	852§	1.9§	11.0§	311§	0.7§	4.0§	7,744	17.6
45-54	4,263	10.2	63.5	1,114†	2.7†	16.6†	131§	0.3§	1.9§	697§	1.7§	10.4§	506§	1.2§	7.5§	6,711	16.1
55-64	1,872	6.4	58.2	434§	1.5§	13.5§	49§	0.2§	1.5§	498§	1.7§	15.5§	364§	1.3§	11.3§	3,217	11.1
65-74	1,374	7.4	71.6	88§	0.5§	4.6§	28§	0.2§	1.5§	212§	1.1§	11.1§	215§	1.2§	11.2§	1,917	10.3
≥75	3,009	16.9	74.5	--	--	--	--	--	--	741§	4.2§	18.3§	289§	1.6§	7.2§	4,039	22.6
Total	**38,048**	**13.0**	**66.9**	**6,350**	**2.2**	**11.2**	**1,524**	**0.5**	**2.7**	**7,216**	**2.5**	**12.7**	**3,727**	**1.3**	**6.6**	**56,865**	**19.4**
Adjusted¶		12.9			2.2			0.5			2.5			1.3			19.4

▸ Average annual rate per 100,000 population.
† Sample size is 30-59; the value of the estimate was reported but may not be stable.
§ Sample size is less than 30; the value of the estimate was also reported, but it is not considered stable.
¶ Age-adjusted to the 2000 U.S. standard population.
-- No data for these cells.

Note: In-hospital deaths and patients who transferred from another hospital were excluded.

Numbers subject to rounding error.

Source: Traumatic Brain Injury

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Table 3

US traffic cyclist fatalities and injuries 2011

Age	Fatalities	Fatality rate*	Injuries	Injury rate*	Population
<5	5	0.25	-	-	20,162,000
5–9	26	1.28	2,000	117	20,334,000
10–15	35	1.41	7,000	276	24,862,000
16–20	50	2.26	8,000	380	22,083,000
21–24	53	3.02	4,000	247	17,558,000
25–34	71	1.7	7,000	168	41,790,000
35–44	78	1.92	5,000	116	40,628,000
45–54	157	3.51	7,000	146	44,718,000
55–64	108	2.84	5,000	138	38,062,000
65–74	58	2.58	2,000	80	22,482,000
75–84	23	1.75	1,000	48	13,175,000
85+	9	1.57	-	-	5,737,000
Total	**677**	**2.17**	**48,000**	**154**	**311,592,000**

** per million*

State	Helmet law	% traffic fatalities	per million population	# cyclist fatalities	# all traffic fatalities	State populations	Population 5 to 14
Alabama	<16	0.6%	1.04	5	894	4,802,740	627,423
Alaska	-	2.8%	2.77	2	72	722,718	102,306
Arizona	-	2.8%	3.55	23	825	6,482,505	903,236
Arkansas	-	1.1%	2.04	6	549	2,937,979	397,179
California	<18	4.1%	3.02	114	2,791	37,691,912	5,084,113
Colorado	-	1.8%	1.56	8	447	5,116,796	688,996
Conneticut	<15	3.6%	2.23	8	220	3,580,709	458,116
Delaware	<18	0%	0	0	99	907,135	113,485
Columbia	<16	3.7%	1.62	1	27	617,996	52,394
Florida	<16	5.2%	6.56	125	2,398	19,057,542	2,215,963
Georgia	<16	1.1%	1.43	14	1,223	9,815,210	1,392,823
Hawaii	<16	2.0%	1.45	2	100	1,374,810	164,843
Idaho	-	0%	0	0	167	1,584,985	239,866
Illinois	-	2.9%	2.1	27	918	12,869,257	1,724,130
Indiana	-	1.5%	1.69	11	750	6,516,922	894,935
Iowa	-	1.4%	1.63	5	360	3,062,309	403,200
Kansas	-	0.5%	0.7	2	386	2,871,238	401,989
Kentucky	-	0.3%	0.46	2	721	4,369,356	568,667
Louisiana	<12	2.7%	3.93	18	675	4,574,836	616,508
Maine	<16	0%	0	0	136	1,328,188	151,485
Maryland	<16	1.0%	0.86	5	485	5,828,289	744,913
Massachusetts	<16	1.5%	0.76	5	337	6,587,536	786,344
Michigan	-	2.7%	2.43	24	889	9,876,187	1,292,739
Minnesota	-	1.4%	0.94	5	368	5,344,861	709,851
Mississippi	-	1.1%	2.35	7	630	2,978,512	414,011
Missouri	-	0.1%	0.17	1	784	6,010,688	786,675
Montana	-	0.5%	1	1	209	998,199	122,255
Nebraska	-	1.1%	1.09	2	181	1,842,641	254,048
Nevada	-	1.6%	1.47	4	246	2,723,322	365,774
New Hampshir	<16	4.4%	3.03	4	90	1,318,194	158,818
New Jersey	<17	2.7%	1.93	17	627	8,821,155	1,144,912
New Mexico	<18	1.1%	1.92	4	353	2,082,224	286,221
New York	<14	4.9%	2.93	57	1,169	19,465,197	2,355,805
North Carolina	<16	2.0%	2.59	25	1,227	9,656,401	1,278,901
North Dakota	-	0.7%	1.46	1	148	683,932	81,154
Ohio	-	1.6%	1.39	16	1,016	11,544,951	1,508,863
Oklahoma	-	0.1%	0.26	1	696	3,791,508	518,398
Oregon	<16	4.5%	3.87	15	331	3,871,859	479,930
Pennsylvania	<12	0.9%	0.86	11	1,286	12,742,886	1,534,571
Rhode Island	<15	0%	0	0	66	1,051,302	123,010
South Carolina	-	1.8%	3.21	15	828	4,679,230	597,150
South Dakota	-	0.9%	1.21	1	111	824,082	110,521
Tennessee	<16	0.5%	0.78	5	946	6,403,353	833,453
Texas	-	1.4%	1.67	43	3,016	25,674,681	3,867,911
Utah	-	2.1%	1.77	5	240	2,817,222	488,236
Vermont	-	0.00%	0	0	55	626,431	71,019
Virginia	<14	0.80%	0.74	6	764	8,096,604	1,029,742
Washington	-	2.40%	1.61	11	457	6,830,038	870,369
West Virginia	<15	0%	0	0	337	1,855,364	214,338
Wisconsin	-	2.10%	2.1	12	582	5,711,767	741,622
Wyoming	-	0.70%	1.76	1	135	568,158	73,918

Source: US Department of Transportation National Highway Traffic Safety Administration

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Table 4

Total Fatalities and Pedalcyclist Fatalities in Traffic Crashes, 2002–2011

Year	Total Fatalities	Pedalcyclist Fatalities	Percent of Total Fatalities
2002	43,005	665	1.5
2003	42,884	629	1.5
2004	42,836	727	1.7
2005	43,510	786	1.8
2006	42,708	772	1.8
2007	41,259	701	1.7
2008	37,423	718	1.9
2009	33,883	628	1.9
2010	32,999	623	1.9
2011	32,367	677	2.1

Source: US Department of Transportation National Highway Traffic Safety Administration Traffic Safety Facts

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Table 5

NHTSA police reported fatalities 2002-2011
http://www-nrd.nhtsa.dot.gov/Pubs/811753.pdf

Year	M/V	Motorcycle	Bicycle	Pedestrian	Other	Total
2002	20,569	3,270	665	4,851	114	**29,469**
2003	19,725	3,714	629	4,774	140	**28,982**
2004	19,192	4,028	727	4,675	130	**28,752**
2005	18,512	4,576	786	4,892	186	**28,952**
2006	17,925	4,837	772	4,795	185	**28,514**
2007	16,614	5,174	701	4,699	158	**27,346**
2008	14,646	5,312	718	4,414	188	**25,278**
2009	13,135	4,469	628	4,109	151	**22,492**
2010	12,491	4,518	623	4,302	185	**22,119**
2011	11,981	4,612	677	4,432	198	**21,900**
2002-2006 av	19,185	4,085	715.8	4,797	151	28,934
2007-2011 av	13,773	4,817	669.4	4,391	176	23,827
% change	**-28.20%**	**17.90%**	**-6.50%**	**-8.50%**	**16.60%**	**-17.70%**

Source: US Department of Transportation National Highway Traffic Safety Administration Traffic Safety Facts

Table 6

NHTSA police reported injuries 2002-2011
http://www-nrd.nhtsa.dot.gov/Pubs/811753.pdf

Year	M/V	Motorcycle	Bicycle	Pedestrian	Other	Total
2002	1,805,000	65,000	48,000	71,000	7,000	**1,996,000**
2003	1,756,000	67,000	46,000	70,000	8,000	**1,947,000**
2004	1,643,000	76,000	41,000	68,000	9,000	**1,837,000**
2005	1,573,000	87,000	45,000	64,000	8,000	**1,777,000**
2006	1,475,000	88,000	44,000	61,000	7,000	**1,675,000**
2007	1,379,000	103,000	43,000	70,000	10,000	**1,605,000**
2008	1,304,000	96,000	52,000	69,000	9,000	**1,530,000**
2009	1,216,000	90,000	51,000	59,000	7,000	**1,423,000**
2010	1,253,000	82,000	52,000	70,000	8,000	**1,465,000**
2011	1,240,000	81,000	48,000	69,000	9,000	**1,447,000**
2002-2006 av	1,650,400	76,600	44,800	66,800	7,800	1,846,400
2007-2011 av	1,278,400	90,400	49,200	67,400	8,600	1,494,000
% change	**-22.50%**	**18.00%**	**9.80%**	**0.90%**	**10.30%**	**-19.10%**

Source: US Department of Transportation National Highway Traffic Safety Administration Traffic Safety Facts

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Table 7

NHTSA 2011 http://www-fars.nhtsa.dot.gov

State	Helmet law	# all cyclist fatalities	# cyclist fatalities 5-14	Population 5 to 14	Per million population 5-14
Alabama	<16	5	2	627,423	3.2
Alaska	-	3	0	102,306	0.0
Arizona	-	24	2	903,236	2.2
Arkansas	-	7	1	397,179	2.5
California	<18	117	11	5,084,113	2.2
Colorado	-	8	0	688,996	0.0
Conneticut	<15	8	3	458,116	6.5
Delaware	<18	0	0	113,485	0.0
Columbia	<16	1	0	52,394	0.0
Florida	<16	129	9	2,215,963	4.1
Georgia	<16	15	2	1,392,823	1.4
Hawaii	<16	2	0	164,843	0.0
Idaho	-	0	0	239,866	0.0
Illinois	-	29	3	1,724,130	1.7
Indiana	-	11	2	894,935	2.2
Iowa	-	5	0	403,200	0.0
Kansas	-	2	1	401,989	2.5
Kentucky	-	2	0	568,667	0.0
Louisiana	<12	18	1	616,508	1.6
Maine	<16	0	0	151,485	0.0
Maryland	<16	5	0	744,913	0.0
Massachusetts	<16	5	0	786,344	0.0
Michigan	-	24	2	1,292,739	1.5
Minnesota	-	5	0	709,851	0.0
Mississippi	-	7	2	414,011	4.8
Missouri	-	1	0	786,675	0.0
Montana	-	1	0	122,255	0.0
Nebraska	-	3	0	254,048	0.0
Nevada	-	5	0	365,774	0.0
New Hampshire	<16	5	1	158,818	6.3
New Jersey	<17	17	0	1,144,912	0.0
New Mexico	<18	4	0	286,221	0.0
New York	<14	58	4	2,355,805	1.7
North Carolina	<16	27	2	1,278,901	1.6
North Dakota	-	1	1	81,154	12.3
Ohio	-	17	3	1,508,863	2.0
Oklahoma	-	1	0	518,398	0.0
Oregon	<16	17	0	479,930	0.0
Pennsylvania	<12	11	2	1,534,571	1.3
Rhode Island	<15	0	0	123,010	0.0
South Carolina	-	17	3	597,150	5.0
South Dakota	-	1	0	110,521	0.0
Tennessee	<16	7	0	833,453	0.0
Texas	-	46	5	3,867,911	1.3
Utah	-	6	3	488,236	6.1
Vermont	-	0	0	71,019	0.0
Virginia	-	6	0	1,029,742	0.0
Washington	-	11	1	870,369	1.1
West Virginia	<15	0	0	214,338	0.0
Wisconsin	-	13	0	741,622	0.0
Wyoming	-	1	0	73,918	0.0
		708	**66**	**41,047,129**	**Av 1.5**

Source: National Highway Traffic Safety Administration's Fatality Analysis Reporting System

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Table 8

NHTSA 2010 http://www-fars.nhtsa.dot.gov

State	Helmet law	# all cyclist fatalities	# cyclist fatalities 5-16	Population 5 to 16	Per million population 5-16
Alabama	<16	7	1	755,920	1.3
Alaska	-	0	0	122,770	0.0
Arizona	-	19	2	1,081,315	1.8
Arkansas	-	2	0	474,876	0.0
California	<18	102	5	6,166,006	0.8
Colorado	-	8	0	820,623	0.0
Conneticut	<15	7	1	556,334	1.8
Delaware	<18	3	1	136,784	7.3
Columbia	<16	2	0	63,005	0.0
Florida	<16	84	7	2,683,414	2.6
Georgia	<16	20	1	1,664,878	0.6
Hawaii	<16	3	0	198,013	0.0
Idaho	-	4	0	285,815	0.0
Illinois	-	26	4	2,083,954	1.9
Indiana	-	13	1	1,076,493	0.9
Iowa	-	8	1	483,978	2.1
Kansas	-	1	0	480,952	0.0
Kentucky	-	7	3	682,249	4.4
Louisiana	<12	11	0	737,944	0.0
Maine	<16	1	1	184,153	5.4
Maryland	<16	9	2	900,824	2.2
Massachusetts	<16	7	0	955,791	0.0
Michigan	-	33	7	1,570,334	4.5
Minnesota	-	9	3	852,724	3.5
Mississippi	-	4	0	497,470	0.0
Missouri	-	7	1	946,515	1.1
Montana	-	0	0	147,423	0.0
Nebraska	-	2	0	303,606	0.0
Nevada	-	6	2	439,476	4.6
New Hampshire	<16	0	0	194,384	0.0
New Jersey	<17	13	3	1,385,850	2.2
New Mexico	<18	8	0	342,880	0.0
New York	<14	36	7	2,863,449	2.4
North Carolina	<16	26	2	1,528,813	1.3
North Dakota	-	1	0	97,549	0.0
Ohio	-	13	3	1,823,024	1.6
Oklahoma	-	9	4	618,093	6.5
Oregon	<16	8	1	577,743	1.7
Pennsylvania	<12	21	5	1,865,654	2.7
Rhode Island	<15	2	1	149,639	6.7
South Carolina	-	14	0	715,543	0.0
South Dakota	-	2	0	132,298	0.0
Tennessee	<16	4	0	1,001,552	0.0
Texas	-	43	3	4,614,449	0.7
Utah	-	7	2	575,663	3.5
Vermont	-	1	1	86,733	11.5
Virginia	-	13	3	1,237,218	2.4
Washington	-	6	1	1,046,785	1.0
West Virginia	<15	3	1	259,057	3.9
Wisconsin	-	10	1	893,498	1.1
Wyoming	-	0	0	87,935	0.0
		645	**81**	**49,451,448**	**Av 1.9**

Source: National Highway Traffic Safety Administration's Fatality Analysis Reporting System

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Table 9

State	Helmet law	Bike risk of death per 10K	Ped risk of death per 10K	2005/09 av bike fatalities # <16	2005/09 av % bike fatalities <16
Alabama	<16	10.93	10.95	2	23.74%
Alaska		2.67	1.5	0	30.00%
Arizona		3.86	9.11	3	10.21%
Arkansas		11.25	8.07	1	17.33%
California	<18	2.98	5.91	14	12.34%
Colorado		1.71	3.32	2	21.44%
Connecticut	<15	4.29	3.39	1	21.33%
Delaware	<18	12.61	8.15	1	13.33%
Florida	<16	10.8	16.96	7	5.72%
Georgia	<16	8.3	9.4	3	17.12%
Hawaii	<16	2.51	3.48	0	0.00%
Idaho		1.82	2.62	1	19.52%
Illinois		3	3.39	4	18.64%
Indiana		5.31	3.78	3	18.16%
Iowa		3.74	1.7	1	14.13%
Kansas		4.15	2.63	1	23.33%
Kentucky		4.65	4.97	1	22.00%
Louisiana	<12	9.8	11.97	2	13.50%
Maine	<16	2.66	2.03	1	18.33%
Maryland	<16	4.86	8.13	2	24.59%
Massachussets	<16	1.89	2.09	2	27.94%
Michigan	-	4.83	5.21	4	18.64%
Minnesota	-	2.17	2.1	2	27.19%
Mississippi	-	14.14	10.4	1	18.17%
Missouri	-	3.37	5.86	2	35.56%
Montana	-	1.78	2.71	1	31.67%
Nebraska	-	1.54	1.27	0	26.67%
Nevada	-	5.97	7.81	2	24.76%
New Hampshire	<16	4.29	2.18	1	43.33%
New Jersey	<17	5.65	5.08	3	20.83%
New Mexico	<18	3.83	9.1	1	10.19%
New York	<14	4.44	2.35	7	16.97%
North Carolina	<16	10.01	9	2	9.58%
North Dakota	-	1.65	1.96	0	20.00%
Ohio	-	5.1	3.71	3	18.22%
Oklahoma	-	6.96	6.84	1	29.20%
Oregon	<16	1.36	3.02	1	5.15%
Pennsylvania	<12	2.68	2.78	4	27.93%
Rhode Island	<15	2.14	4.16	0	0.00%
South Carolina	-	13.51	11.71	2	11.31%
South Dakota	-	0	1.85	0	0.00%
Tennessee	<16	8.65	7.39	2	32.95%
Texas	-	7.95	9.07	9	17.81%
Utah	-	2.36	3.46	1	25.00%
Vermont	-	0	0.87	0	0.00%
Virginia	-	3.84	4.39	2	13.55%
Washington	-	1.88	2.61	1	9.01%
West Virginia	<15	3.28	3.89	0	0.00%
Wisconsin		2.1	2.55	2	17.87%
Wyoming		1.79	1.66	0	10.00%
National		4.18	5	108	14.94%
		No law av 4.2	No law av 4.4	No law av 1.7	No law av 18.9%
		Law av 5.6	Law av 6.3	Law av 2.7	Law av 16.4%

Source: Alliance Bicycling and Walking Benchmarking Project

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American state child helmet law years of introduction and population proportions

State	Helmet law	Ages	Introduction	Total population	Law age population	% total population
Alabama	State law	Under 16	1995	4,822,023	995,773	20.7%
Alaska	-	-	-	731,449		
Arizona	-	-	-	6,553,255		
Arkansas	-	-	-	2,949,131		
California	State Law	Passengers under 5	1987			
		Riders under 18	1994	38,041,430	9,240,219	24.3%
Colorado	-	-	-	5,187,582		
Connecticut	State Law	Under 16	1993	3,590,347	695,153	19.4%
Delaware	State Law	Under 18	1996	917,092	181,603	19.8%
District of Columbia	District Law	Under 16	2000	632,323	98,464	15.6%
Florida	State Law	Under 16	1997	19,317,568	3,531,380	18.3%
Georgia	State Law	Under 16	1993	9,919,945	2,215,885	22.3%
Hawaii	State Law	Under 16	2001	1,392,313	270,145	19.4%
Idaho	-	-	-	1,595,728		
Illinois	-	-	-	12,875,255		
Indiana	-	-	-	6,537,334		
Iowa	-	-	-	3,074,186		
Kansas	-	-	-	2,885,905		
Kentucky	-	-	-	4,380,415		
Louisiana	State Law	Under 12	2002	4,601,893	748,438	16.3%
Maine	State Law	Under 16	1999	1,329,192	232,900	17.5%
Maryland	State Law	Under 16	1995	5,884,563	1,187,583	20.2%
Massachusetts	State Law	Passengers under 5	1990			
		Riders under 17	1994/2004	6,646,144	1,314,702	19.8%
Michigan	-	-	-	9,883,360		
Minnesota	-	-	-	5,379,139		
Mississippi	-	-	-	2,984,926		
Missouri	-	-	-	6,021,988		
Montana	-	-	-	1,005,141		
Nebraska	-	-	-	1,855,525		
Nevada	-	-	-	2,758,931		
New Hampshire	State Law	Under 16	2006	1,320,718	239,173	18.1%
New Jersey	State Law	Under 17	1992/2005	8,864,590	2,026,384	22.9%
New Mexico	State Law	Under 18	2007	2,085,538	514,442	24.7%
New York	State Law	Passengers under 5	1989			
		Riders under 14	2000	19,570,261	3,267,787	16.7%
North Carolina	State Law	Under 16	2001	9,752,073	2,035,524	20.9%
North Dakota	-	-	-	699,628		
Ohio	-	-	-	11,544,225		
Oklahoma	-	-	-	3,814,820		
Oregon	State Law	Under 16	1994	3,899,353	762,061	19.5%
Pennsylvania	State Law	Under 12	1995	12,763,536	1,773.641	13.9%
Rhode Island	State Law	Under 16	1996/1998/2007	1,050,292	189,633	18.1%
South Carolina	-	-	-	4,723,723		
South Dakota	-	-	-	833,354		
Tennessee	State Law	Under 16	1994/2000	6,456,243	1,324,560	20.5%
Texas	-	-	-	26,059,203		
Utah	-	-	-	2,855,287		
Vermont	-	-	-	626,011		
Virginia	-	-	-	8,185,867		
Washington State	-	-	-	6,897,012		
West Virginia	State Law	Under 15	1996	1,855,413	317,689	17.1%
Wisconsin	-	-	-	5,726,398		
Wyoming	-	-	-	576,412		

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US state and municipal bicycle helmet law enforcement since 2004

2004		
Dist.of Col.(Skate,etc)	Under 16	2004
State of Mass.	Under 17,not 13	2004
East Cleveland, OH	Under 18	2004
Dayton, OH	Under 14	2004
Lawrence, KS	Under 15	2004
Cincinnati, OH	Under 16	2004
Bethel, AK	Under 18	2004
Enon, OH	Under 16	2004
Kenai, AK	Under 16	2004
Kettering, OH	Under 16	2004
Spokane, WA	All ages	2004
Marietta, OH	Under 16	2004
Eastchester, NY	Under 19	2004
Webster Groves, MO	Under 17	2004
Normandy, MO	Under 17	2004
Norwood Court, MO	Under 17	2004
2005		
New Jersey (amended)	Under 17	2005
Anchorage, AK	Under 16	2005
Sitka, AK	Under 18	2005
Auburn	All ages	2005
Bella Villa, MO	Under 17	2005
Bellefontaine Neighbors, MO	Under 17	2005
Clayton, MO	Under 17	2005
Ellisville, MO	Under 17	2005
Olivette, MO (Amended 2008)	Under 17* (After 2008)	2005
Overland, MO	Under 17	2005
Velda Village Hills, MO	All ages	2005
Wilber Park, MO	Under 17	2005
Wildwood, MO	Under 17	2005
2006		
New Hampshire (State)	Under 16	2006
St. Charles, MO	Under 16	2006
Velda City. MO	All ages	2006
Ballwin. MO	Under 17	2006
Juneau, AK	Under 18	2006
2007		
New Mexico (State)	Under 18	2007
Hanley Hills, MO	Under 17	2007
Hazelwood, MO	Under 17	2007
2008		
Vancouver, WA	All ages	2008
Black Jack, MO	All ages	2008
Chesterfield, MO	Under 17	2008
Glendale, MO	All ages	2008
Moline Acres, MO	Under 17	2008
Riverview, MO	Under 17	2008
Sycamore Hills, MO	All ages	2008
St. Louis County, MO - all areas	Under 17	2008
2009		
Columbus, OH	Under 18	effective 2009
2010		
Hernando, MS	Under 17 *	2010
Ridgeland, MS	???	2010
Starkville, MS	All ages *	2010
Flagstaff, AZ	Under 18	2010
Bexley, OH	Under 16	2010

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