NORTH CAROLINA

THE BURDEN OF

Pedestrian and Pedal Cyclist Motor Vehicle Traffic-Related Injuries North Carolina, 2008-2012

NORTH CAROLINA DIVISION OF PUBLIC HEALTH
INJURY AND VIOLENCE PREVENTION BRANCH

North Carolina Department of Health and Human Services
July 2014

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Pedestrian and Pedal Cyclist

Motor Vehicle Traffic-Related Injuries

North Carolina, 2008-2012

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Anna Austin, MPH

State of North Carolina • Pat McCrory, Governor
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Acknowledgements

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Highlights

- In 2012, pedestrians represented 15% of MVT-related deaths. Pedal cyclists represented 1%.
- Between 2008 and 2012, there were 1.7 pedestrian and 1.5 pedal cyclist MVT-related deaths per 100,000 North Carolina residents.
- Males were substantially more likely to die, be hospitalized, or visit the Emergency Department as a result of a pedestrian or pedal cyclist MVT-related crash.
- The majority of pedestrian and pedal cyclist MVT-related crashes in North Carolina occurred in urban areas and resulted in possible or evident injuries to the pedestrian or pedal cyclist.
- Alcohol was involved in over 30% of pedestrian and pedal cyclist MVT-related crashes that resulted in the death of the pedestrian or pedal cyclist.

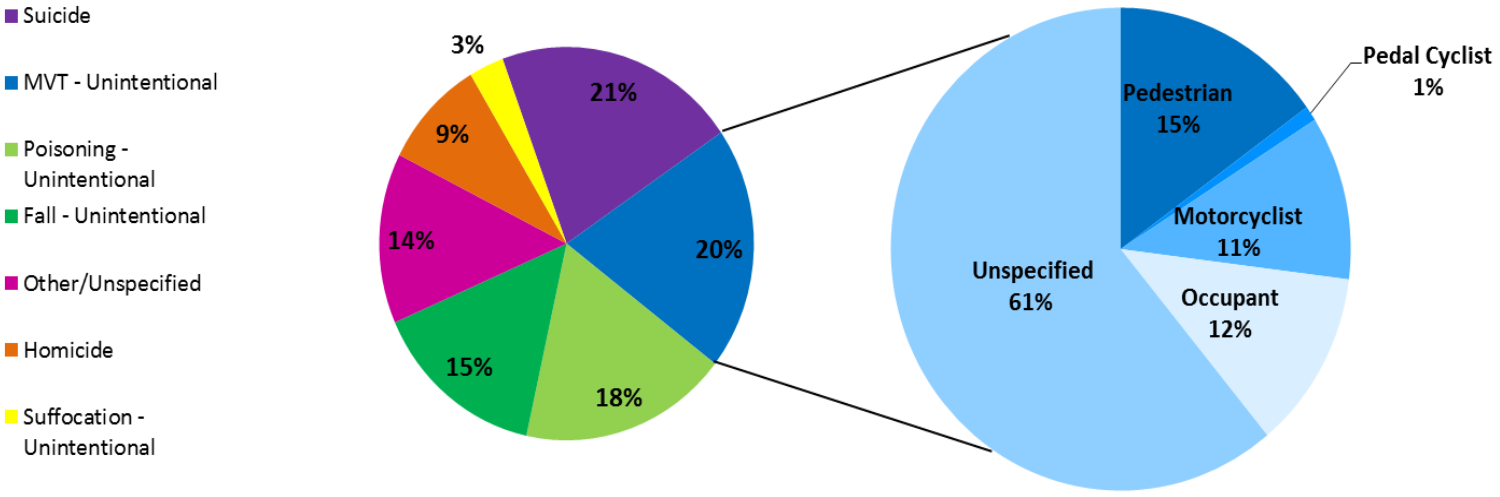
Section 1: Overview of Pedestrian and Pedal Cyclist Motor Vehicle Traffic (MVT) Injuries in N.C.

Unintentional MVT-related injuries are the leading cause of death among North Carolina residents ages 3 to 34, and a leading cause of injury death among North Carolinians of all ages.[1,2] Although the rate of MVT deaths has declined over the past decade, MVT-related deaths continue to place a substantial burden on North Carolinians, and many of these deaths are preventable.

In 2012, unintentional MVT-related injuries accounted for 20 percent of all injury deaths among North Carolina residents surpassed only by suicide (21%). Of the 1,885 MVT-related deaths among North Carolina residents in 2012, 15% of decedents were pedestrians and 1% were pedal cyclists (Figure 1). The focus of this report will be deaths and injuries among pedestrians and pedal cyclists as a result of MVT crashes.

Please note, in this report, MVT refers to *only* unintentional deaths and injuries. Motor vehicle traffic crashes with homicidal, suicidal, or undetermined intent and crashes that occur on private property or off roads are excluded.

Figure 1. Percent of Injury Deaths by Type and Unintentional MVT Deaths by Decedent Type: N.C. Residents, 2012



Data: N.C. State Center for Health Statistics, 2012
Analysis: Injury Epidemiology & Surveillance Unit

There are substantial economic and societal costs associated with pedestrian and pedal cyclist MVT-related injuries and deaths. Analyses estimate the medical and lost productivity costs associated with motor vehicle-related fatal and nonfatal injuries to be $10 billion among pedestrians and $5 billion among pedal cyclists each year. Of note is the fact that pedestrians made up only 5% of fatal and non-fatal MVT-related injuries in these analyses, but accounted for 10% of total costs.[3]

The Injury Iceberg illustrates the overall burden of pedestrian and pedal cyclist MVT-related deaths and injuries in North Carolina. Deaths account for only the tip of the iceberg with regard to pedestrian and pedal cyclist MVT-related injuries. In 2012 for each pedestrian or pedal cyclist death, there were approximately three hospitalizations and two and a half ED visits for MVT-related injuries.[4, 5] Surveillance data are not available for outpatient clinics or for injuries that are medically unattended. However, these numbers are likely to be far higher than the number of ED visits (Figure 2).

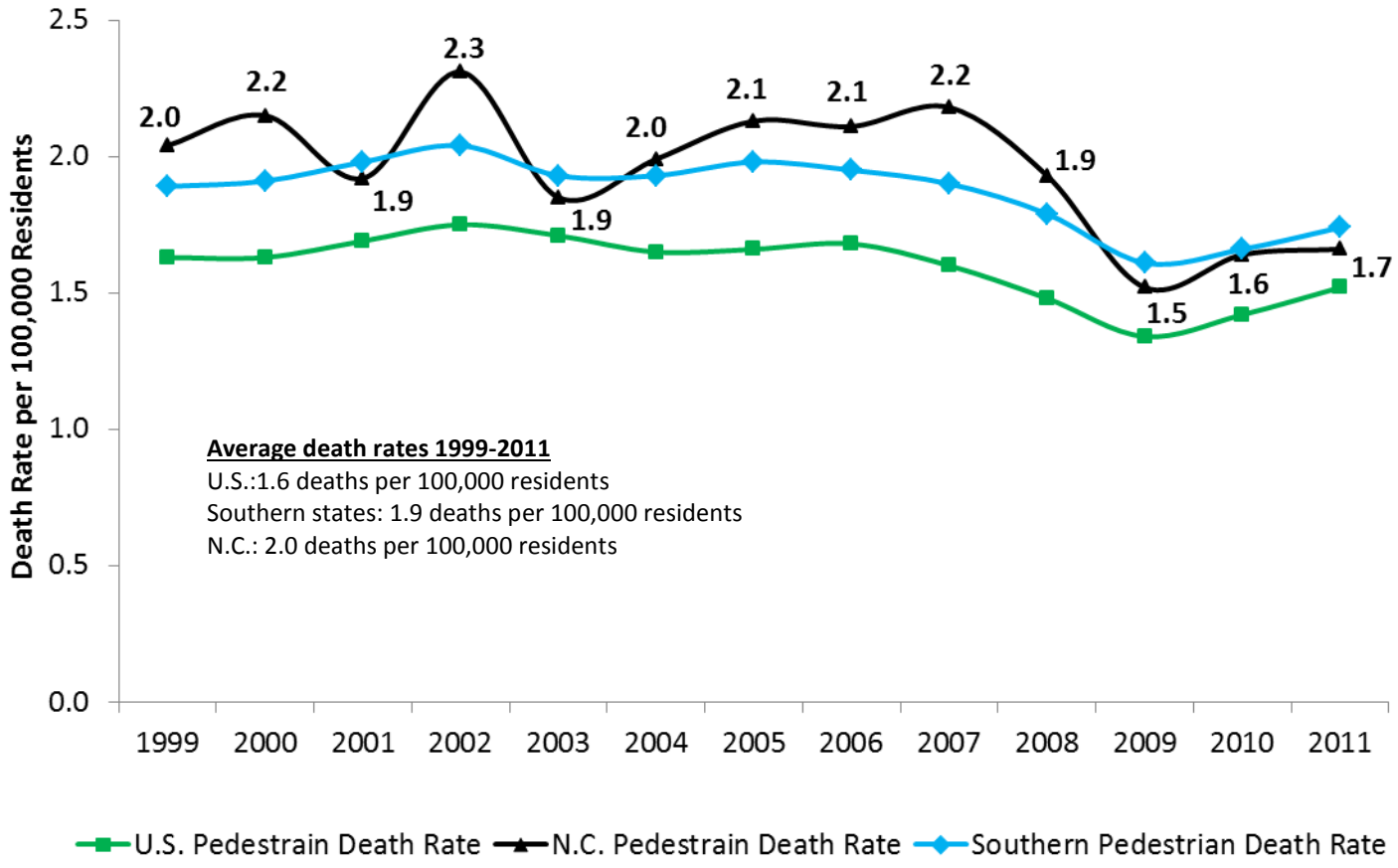
Figure 2. The Injury Iceberg—Pedestrian and Pedal Cyclist MVT-Related Injuries: N.C. Residents, 2012

Data: Death: N.C. State Center for Health Statistics, 2012;
Hospitalizations: N.C. State Center for Health Statistics, 2012, provisional;
Emergency Department: NC DETECT, 2012
Analysis: Injury Epidemiology & Surveillance Unit

Figure 3 presents rates of pedestrian MVT-related deaths for the United States, Southern states, and North Carolina from 1999 to 2011.[6] Rates for the Southern states and the U.S. decreased from 1999 to 2009 and then began to increase through 2011. According to data collected from the Fatal Analysis Reporting System (FARS) by the Governor's Highway Safety Association (GHSA), pedestrian MVT-related deaths in the U.S. increased by 15% from 2009 to 2012 while all other MVT-related deaths decreased by 3%.[7]

Rates of pedestrian MVT-related deaths fluctuated between 1999 and 2011 in North Carolina The rate of pedestrian and pedal cyclist MVT-related deaths in North Carolina peaked in 2002 with 2.3 pedestrian MVT-related deaths per 100,000 residents and then decreased to 1.9 deaths per 100,000 residents in 2003. The rate steadily increased from 2003 to 2007. Between 2008 and 2009, the rate of pedestrian MVT-related deaths decreased in North Carolina and then showed small increases through 2011.

Figure 3. Comparison of Rates of Pedestrian MVT-Related Deaths Between the United States, Southern States*, and North Carolina: 1999-2011

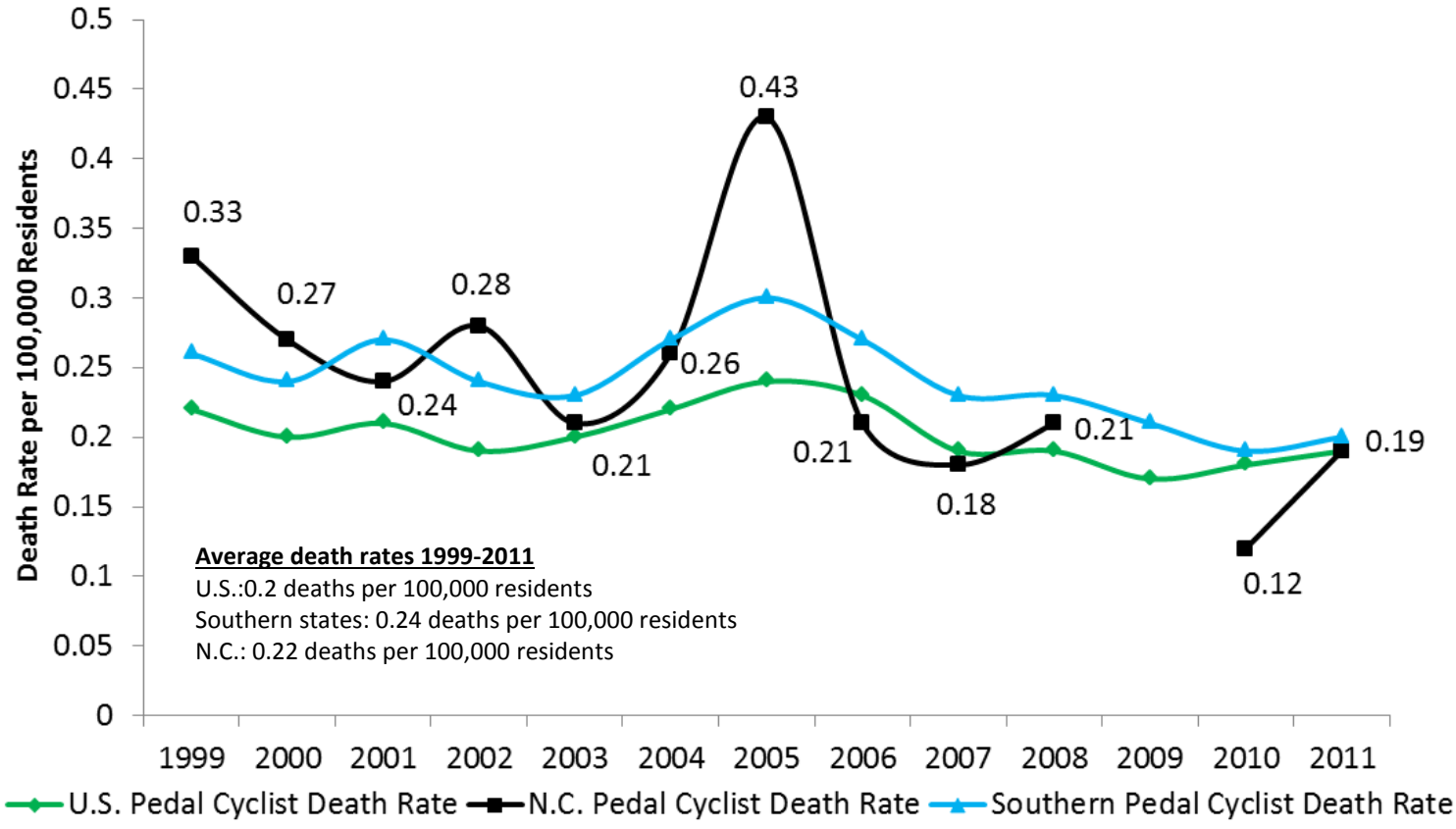


*Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia
Data: CDC WISQARS, 1999-2011

Figure 4 presents rates of pedal cyclist MVT-related deaths for the United States, Southern states, and North Carolina from 1999 to 2011.[6] Between 1999 and 2011, North Carolina and the Southern region generally had higher rates of pedal cyclist MVT-related deaths than the United States as a whole. Overall, between 1999 and 2011, rates for North Carolina, the Southern states, and the U.S. were all less than 1 pedal cyclist MVT-related death per 100,000 residents. In the U.S., pedal cyclist deaths account for approximately 2% of all MVT-related deaths.[8]

The rate of pedal cyclist MVT-related deaths in North Carolina peaked in 2005 with 0.43 pedal cyclist MVT-related deaths per 100,000 residents and then decreased to 1.9 deaths per 100,000 residents in 2003. The rate steadily increased from 2003 to 2007. Beginning in 2008 through 2009, the rate of pedestrian MVT-related deaths decreased in North Carolina and then showed small increases through 2011.

Figure 4. Comparison of Rates of Pedal Cyclist MVT-Related Deaths Between the United States, Southern States*, and North Carolina: 1999-2011



*Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia
Data: CDC WISQARS, 1999-2011

Section 2: Demographics of Pedestrian and Pedal Cyclist MVT-Related Deaths

Between 2008 and 2012, 804 North Carolina pedestrians and 70 pedal cyclists died from MVT-related injuries. Table 1 provides counts and rates of pedestrian and pedal cyclist MVT-related deaths for select populations. In North Carolina, certain populations are at a greater risk of dying from a MVT – related injuries sustained as a pedestrian or pedal cyclist than other populations.

- Between 2008 and 2012, the rate of pedestrian MVT-related deaths (1.7 deaths per 100,000) was higher than the rate of pedal cyclist MVT-related deaths (1.5 deaths per 100,000).
- Males were almost three times as likely to die from MVT-related injuries sustained as a pedestrian and five times as likely to die from MVT-related injuries sustained as a pedal cyclist as females.
- Rates of pedestrian and pedal cyclist MVT-related deaths did not vary considerably between individuals of Hispanic and non-Hispanic ethnicity.
- American Indians had the highest rate of pedestrian MVT-related deaths of all racial groups examined (2.8 deaths per 100,000), followed by blacks (2.3 deaths per 100,000) and whites (1.5 deaths per 100,000).
- The rate of pedestrian MVT-related deaths was highest among adults ages 45 to 54 (2.5 deaths per 100,000) followed by younger adults ages 25 to 34 (2.3 deaths per 100,000).
- The rate of pedal cyclist MVT-related deaths was highest among middle age adults. Adults ages 45 to 54 had the highest rate (0.30 deaths per 100,000) followed by adults ages 55 to 64 (0.19 per 100,000).

Definitions

- **Transportation-related injuries are those injuries involving modes of transportation such as cars, motorcycles, bicycles, and trains that occurred in traffic, i.e., on a public road or highway.**
  - If a report does not specify traffic-relatedness and the injury involved a motor vehicle crash, it is assumed the injury was traffic related
- **MVT-related incidents involve a motor vehicle (car, truck, van, SUV, etc.) and another motor vehicle, motorcycle, pedal cyclist, pedestrian, other transport vehicle, or object.**
- **MVT-related incidents are categorized according to the person injured:**
  - Motor vehicle occupant
  - Motor cyclist
  - **Pedestrian**
  - **Pedal cyclist**
  - Other transport

Pedestrian MVT-related injuries occur when the person injured in the crash was not riding in or on a motor vehicle, train, motorcycle, bicycle, or other vehicle at the time of the crash. Individuals stuck by cars, trucks, vans, heavy transport vehicles, buses, and SUVs are included. Individuals struck by motorcycles, trains, or bicycles are included in a separate category**.**

Pedal cyclist MVT-related injuries occur when a pedal cycle rider is injured in a collision, crash, or some other event involving a motor vehicle. Riders of unicycles, bicycles, tricycles, and mountain bikes are included.[9]

All pedestrian and pedal cyclist MVT-related deaths and injuries are classified using the World Health Organization's International Classification of Disease codes ICD-10 (deaths) and ICD-9-CM (nonfatal injuries). Supplemental information is provided in the Notes section (page 26).[10,11]

Table 1. Rates of Pedestrian and Pedal Cyclist MVT-Related Deaths by Selected Demographics: N.C. Residents, 2008-2012

	Pedestrian					Pedal Cyclist				
	Number	Percent	Rate†	95% C.I.		Number	Percent	Rate†	95% C.I.	
				Lower	Upper				Lower	Upper
Sex										
Male	582	72.4	2.5	2.3	2.7	59	84.3	0.25	0.19	0.32
Female	222	27.6	0.9	0.8	1.0	11	15.7	0.05	0.02	0.07
Hispanic Ethnicity										
Hispanic	730	90.8	1.7	1.5	1.8	67	95.7	0.15	0.12	0.19
Non-Hispanic	72	9.0	1.9	1.4	2.3	3	4.3	*	*	*
Race										
Asian	5	0.6	*	*	*	0	0	0	0	0
American Indian	20	2.5	2.8	1.6	4.0	3	4.3	*	*	*
Black	250	31.1	2.3	2.1	2.6	24	32.3	0.23	0.14	0.32
Other	5	0.6	*	*	*	0	0	0	0	0
White	524	65.2	1.5	1.4	1.6	43	61.4	0.12	0.08	0.16
Age Group										
0-14	49	6.1	0.5	0.4	0.7	3	4.3	*	*	*
15-24	117	14.6	1.8	1.4	2.1	10	14.3	0.15	0.05	0.25
25-34	143	17.8	2.3	1.9	2.7	6	8.6	*	*	*
35-44	133	16.5	2.0	1.7	2.4	12	17.1	0.18	0.08	0.28
45-54	169	21.0	2.5	2.1	2.9	20	28.6	0.30	0.17	0.43
55-64	94	11.7	1.7	1.3	2.0	11	15.7	0.19	0.08	0.31
65+	97	12.1	1.6	1.3	1.9	8	11.4	*	*	*
Total	804	100	1.7	1.6	1.8	70	100	0.15	0.12	0.18

Note: Percentages may not sum to 100 due to rounding and missing values.
†Rates are calculated per 100,000 N.C. residents.
*Rates based on fewer than 10 deaths are suppressed as these rates tend to be unstable.
Data: N.C. State Center for Health Statistics, 2008-2012
Analysis: Injury Epidemiology & Surveillance Unit

Section 3: Pedestrian and Pedal Cyclist MVT-Related Deaths by County

The number of pedestrian and pedal cyclist MVT-related deaths are not distributed equally across the state of North Carolina. Figure 6 displays the number of pedestrian and pedal cyclist MVT-related deaths by county of residence of the decedent for the 2008-2012. Please note that the county of residence of the decedent is not necessarily the county where the MVT crash occurred and the injury was sustained.

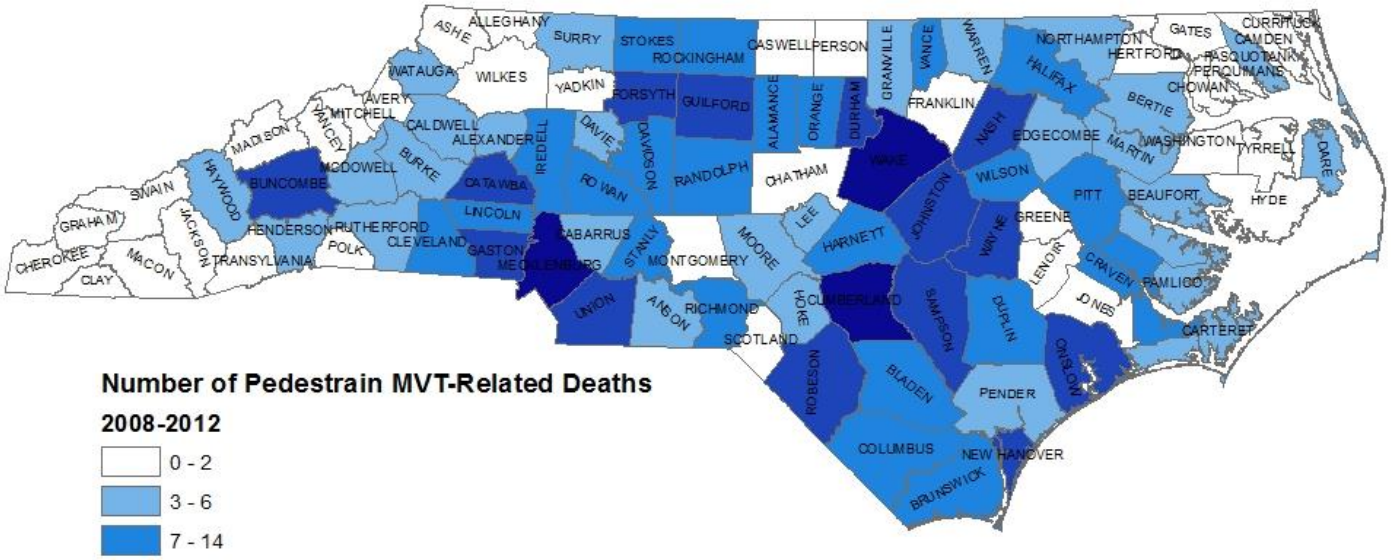
Differences in numbers between counties may be due to several different factors including differences in population, socioeconomic factors, infrastructure including highways, roadways, and sidewalks, and geography including amount of rural versus urban space. Cut-off points were based on "natural breaks" occurring in the number of pedestrian or pedal cyclist MVT-related deaths.

- Between 2008 and 2012, Mecklenburg County (79 deaths) had the greatest number of pedestrian MVT-related deaths followed by Cumberland (41 deaths), Wake (40 deaths), Guilford (35 deaths), and Robeson (29 deaths) counties. A total of eight counties had no pedestrian MVT-related deaths from 2008 to 2012.

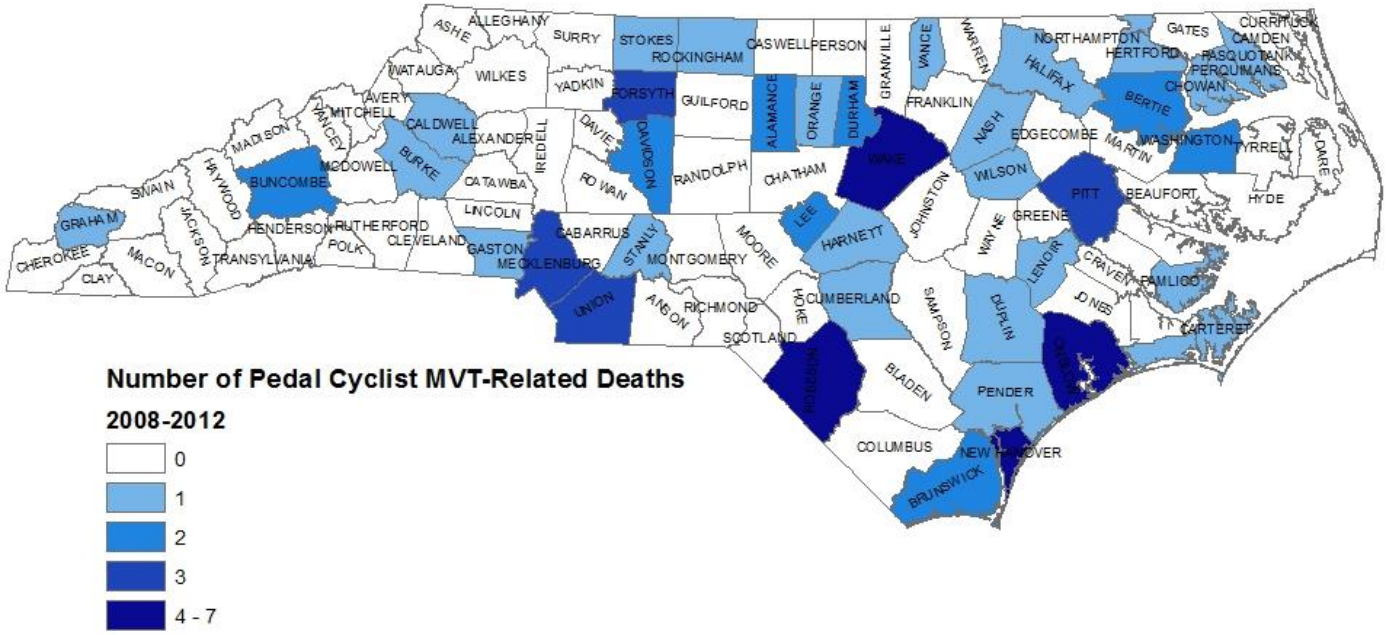
- Between 2008 and 2012, Wake County (7 deaths) had the greatest number of pedal cyclist MVT-related deaths followed by New Hanover, Onslow, and Robeson counties (4 deaths per county). A total of 61 counties had no pedal cyclist MVT-related deaths from 2008 to 2012.

Figure 6: Number of Pedestrian and Pedal Cyclist MVT-Related Deaths by County: 2008-2012

Number of Pedestrain MVT-Related Deaths in North Carolina
by Decedent County of Residence: 2008-2012



Number of Pedal Cyclist MVT-Related Deaths in North Carolina
by Decedent County of Residence: 2008-2012



Data: N.C. State Center for Health Statistics, 2008-2012
Analysis: Injury Epidemiology & Surveillance Unit

Section 4: Hospitalizations Due to Pedestrian and Pedal Cyclist MVT-Related Injuries

Between 2008 and 2012, the median hospital charge was over *$39,000* for pedestrian MVT-related injuries and over $37,000 for pedal cyclist MVT-related injuries.

Total hospital charges were over *$167 million* for pedestrian and over *$39 million* for pedal cyclist MVT-related injuries.

Between 2008 and 2012, there were more than three times as many hospitalizations due to pedestrian and pedal cyclist MVT-related injuries as deaths. Table 2 presents hospital discharge data for pedestrian and pedal cyclist MVT-related injuries for 2008 to 2012.

- As with deaths, males were at a higher risk of a hospitalization due to MVT-related injuries sustained as a pedestrian or as a pedal cyclist than females. Males were two times as likely to be hospitalized for an MVT-related injury sustained as a pedestrian and eight times as likely to be hospitalized for an MVT-related injury sustained as a pedal cyclist as females.

- Hospitalization rates for pedestrian MVT-related injuries were highest among young adults ages 20 to 24 (7.6 hospitalizations per 100,000) followed by adults ages 25 to 34 (6.4 hospitalizations per 100,000). Hospitalization rates for pedal cyclist MVT-related injuries were highest among teenagers ages 15 to 19 (2.3 hospitalizations per 100,000) and adults ages 45 to 54 (2.2 hospitalizations per 100,000).

Table 2. Rates of Pedestrian and Pedal Cyclist MVT-Related Hospitalizations by Selected Demographics: N.C. Residents, 2008-2012

	Pedestrian					Pedal Cyclist				
	Number	Percent	Rate†	95% C.I.		Number	Percent	Rate†	95% C.I.	
				Lower	Upper				Lower	Upper
Sex										
Male	1,571	65.8	6.8	6.4	7.1	553	11.9	2.4	2.2	2.6
Female	814	34.2	3.3	3.1	3.6	75	88.1	0.3	0.2	0.4
Age Group										
0-4	85	3.6	2.7	2.1	3.2	*	0.2	*	*	*
5-9	111	4.7	3.5	2.8	4.1	37	5.9	1.2	0.8	1.5
10-14	121	5.1	3.9	3.2	4.6	56	8.9	1.8	1.4	2.3
15-19	211	8.8	6.5	5.6	7.4	76	12.1	2.3	1.8	2.9
20-24	255	10.7	7.6	6.7	8.5	31	4.9	0.9	0.6	1.2
25-34	398	16.7	6.4	5.8	7.0	67	10.7	1.1	0.8	1.3
35-44	337	14.1	5.1	4.6	5.6	94	15.0	1.4	1.1	1.7
45-54	364	15.3	5.4	4.8	5.9	146	23.4	2.2	1.8	2.5
55-64	249	10.4	4.4	3.9	5.0	82	13.1	1.5	1.1	1.8
65-74	119	5.0	3.4	2.8	4.0	22	3.5	0.6	0.4	0.9
75-84	83	3.5	4.2	3.3	5.1	13	2.1	0.7	0.3	1.0
≥85	53	2.2	7.0	5.1	8.9	*	0.5	*	*	*
Total	2,386	100	5.0	4.8	5.2	628	100	1.3	1.2	1.4

Note: Percentages may not sum to 100 due to rounding and missing values.
†Rates are calculated per 100,000 N.C. residents.
*Rates based on fewer than 10 deaths are suppressed as these rates tend to be unstable.
Data: N.C. State Center for Health Statistics, 2008-2012
Analysis: Injury Epidemiology & Surveillance Unit

Section 5: Emergency Department (ED) Visits Due to Pedestrian and Pedal Cyclist MVT-Related Injuries

In 2012, there were 2.5 times as many ED visits due to pedestrian and pedal cyclist MVT-related injuries as deaths. Table 3 presents data on ED visits for MVT-related injuries for 2012.

- The demographic profile of ED visits due to MVT-related injuries is similar that of hospitalizations and deaths with respect to sex. Between 2008 and 2012, males had higher rates of ED visits for pedestrian and pedal cyclist MVT-related injuries than females.

- With respect to age, young adults ages 20 to 24 (7.0 ED visits per 100,000) and teenagers ages 15 to 19 (6.0 ED visits per 100,000) had the highest rate of ED visits for pedestrian MVT-related injuries while youth ages 10 to 14 had the highest rate of ED visits for pedal cyclist MVT-related injuries (2.0 ED visits per 100,000).

Table 3. Rates of Pedestrian and Pedal Cyclist MVT-Related Emergency Department Visits by Selected Demographics: N.C. Residents, 2008-2012

	Pedestrian					Pedal Cyclist				
	Number	Percent	Rate†	95% C.I.		Number	Percent	Rate†	95% C.I.	
				Lower	Upper				Lower	Upper
Sex										
Male	987	61.0	4.3	4.0	4.5	443	85.5	1.9	1.7	2.1
Female	631	39.0	2.6	2.4	2.8	75	14.5	0.3	0.2	0.4
Age Group										
0-4	42	2.6	1.3	0.9	1.7	*	1.0	*	*	*
5-9	76	4.7	2.4	1.8	2.9	36	7.0	1.1	0.8	1.5
10-14	84	5.2	2.7	2.1	3.3	63	12.2	2.0	1.5	2.5
15-19	196	12.1	6.0	5.2	6.9	59	11.4	1.8	1.4	2.3
20-24	235	14.5	7.0	6.1	7.9	61	11.8	1.8	1.4	2.3
25-34	288	17.8	4.6	4.1	5.2	83	16.0	1.3	1.0	1.6
35-44	270	16.7	4.1	3.6	4.6	66	12.7	1.0	0.8	1.2
45-54	201	12.4	3.0	2.6	3.4	91	17.6	1.3	1.1	1.6
55-64	122	7.5	2.2	1.8	2.5	37	7.1	0.7	0.4	0.9
65-74	58	3.6	1.7	1.2	2.1	11	2.1	0.3	0.1	0.5
75-84	32	2.0	1.6	1.1	2.2	*	0.8	*	*	*
≥85	14	0.9	1.9	0.9	2.8	*	0.4	*	*	*
Total	1,618	100	3.4	3.2	3.6	518	100	1.1	1.0	1.2

Note: Percentages may not sum to 100 due to rounding and missing values.
†Rates are calculated per 100,000 N.C. residents.
*Rates based on fewer than 10 deaths are suppressed as these rates tend to be unstable.
Data: N.C. State Center for Health Statistics, 2008-2012; NC DETECT, 2008-2012
Analysis: Injury Epidemiology & Surveillance Unit

Section 6: North Carolina Pedestrian and Bicycle Crash Data Tool –

North Carolina Department of Transportation, Division of Bicycle and Pedestrian Transportation and University of North Carolina Highway Safety Research Center

The University of North Carolina Highway Safety Research Center (UNC-HSRC) collaborates with the North Carolina Department of Transportation (NCDOT), Division of Bicycle and Pedestrian Transportation (DBPT) to provide summary statistics of pedestrian and bicyclist MVT-related crashes.[12] All pedestrian and bicyclist MVT-related crashes reported to the N.C. Division of Motor Vehicles (DMV) by investigating law enforcement officers are included in the web-based Pedestrian and Bicycle Crash Data Tool. HRSC staff review and code data from the crash report form to include in the web-based Crash Data Tool. Additional variables from NCDOT's Crash Database are obtained and added to data collected from the crash report form.

Please note that this data represents only crashes reported by law enforcement to N.C. DMV. Previous research has demonstrated that police-reported crashes substantially underestimate the number of pedestrian and bicyclist MVT-related crashes that occur.[13-15]

Data from the Pedestrian and Bicycle Crash Data Tool differs somewhat from death certificate data regarding the number of deaths associated with pedestrian MVT-related crashes. The Crash Data Tool recorded 838 pedestrian deaths between 2008 and 2012 while 804 pedestrian deaths were identified using death certificate data. Pedal cyclist deaths from death certificate data and bicyclist deaths from the Crash Data Tool may not be directly comparable as pedal cyclist deaths include other forms of pedal transportation such as unicycles and tricycles.

Definitions

The North Carolina Pedestrian and Bicycle Crash Data Tool includes all pedestrian and pedal cyclist MVT-related crashes reported to the North Carolina Division of Motor Vehicles. **An MVT-related crash is reportable if it occurs on a traffic-way and meets at least one of the following criteria:**

1. The crash resulted in a **fatality**
2. The crash resulted in a **non-fatal personal injury**
3. The crash resulted in **total property damaged amounting to $1,000 or more**
4. The crash resulted in **property damage of any amount to a vehicle seized.**

Whether a **pedestrian or bicyclist** was involved or injured in the reportable MVT-related crash will be recorded in the general crash information section of the crash report filed by the law enforcement officer and sent to the DMV.[16]

Watch for Me NC

Watch for Me NC is a comprehensive program run by the North Carolina Department of Transportation (NCDOT) in partnership with local communities.

The program aims to reduce pedestrian and bicycle injuries and deaths through a comprehensive, targeted approach of public education and law enforcement. The two main components of the program are:

1. Safety and educational messages directed toward drivers, pedestrians, and bicyclists
2. Enforcement efforts by local law enforcement to reduce violations of traffic safety laws[17]

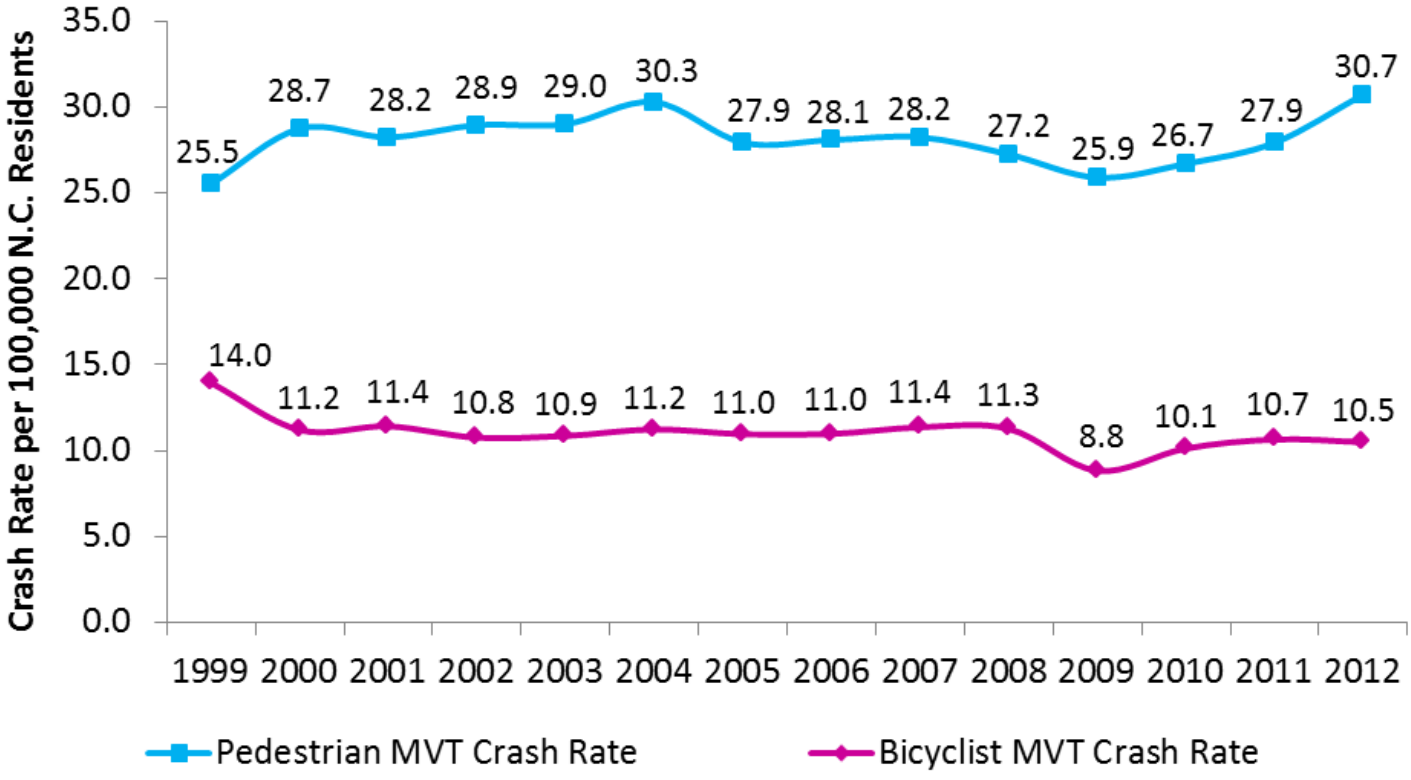
Figure 7 displays the rate of reportable pedestrian and bicyclist MVT-related crashes in North Carolina between 1999 and 2012.

- The rate of pedestrian MVT-related crashes remained relatively stable between 1999 and 2009 with a small peak in 2004. Beginning in 2009, the rate steadily increased to a high of 30.7 pedestrian MVT-related crashes per 100,000 North Carolina residents in 2012.

- Reasons for the increase in pedestrian MVT-related crashes between 2009 and 2012 may include more people walking than driving as a result of the 2008-2009 economic recession and high gasoline prices, the promotion of walking or biking for health and environmental benefits, milder weather patterns, and an increase in distracted driving and walking in recent years.[7]

- The rate of bicyclist MVT-related crashes has remained relatively stable between 1999 and 2012, except for a drop in the rate occurring in 2009. The highest rate occurred in 1999 (14.0 pedal cyclist crashes per 100,000 residents).

Figure 7. Rates of Reportable Pedestrian and Bicycle MVT-Related Crashes: 1999-2012



Data: N.C. Bicycle and Pedestrian Crash Tool, 1999-2012
Analysis: Injury Epidemiology & Surveillance Unit

Demographics of Reportable Pedestrian and Bicycle MVT Crashes

Between 2008 and 2012, there were a total of 13,186 pedestrian and 4,889 bicyclist MVT-related crashes reported by law enforcement in North Carolina Figures 8-10 display reportable pedestrian and bicyclist MVT-related crashes by selected demographics.

- Males represented a greater proportion of both pedestrian and bicyclist MVT-related crashes than females, though at a much higher percentage for bicyclist (83.7%) than pedestrian (59.2%) MVT-related crashes (Figure 8).

- The rate of pedestrian MVT-related crashes peaked among teenagers ages 15 to 19 (44.7 crashes per 100,000) and young adults ages 20 to 24 (48.2 crashes per 100,000) and then declined with increasing age (Figure 9).

- Similar patterns by age were observed for rates of bicyclist MVT-related crashes. The rate was highest among teenagers ages 15 to 19 (20.2 crashes per 100,000), and young adults ages 20 to 24 (18.0 crashes per 100,000; Figure 9).

- Youth ages 10 to 14 showed relatively low rates of pedestrian MVT-related crashes in comparison to other age groups (21.3 crashes per 100,000). However, this same age group showed one of the highest rates of bicyclist MVT-related crashes (18.0 crashes per 100,000; Figure 9).

Figure 8. Reportable Pedestrian and Bicycle MVT-Related Crashes by Sex: 2008-2012

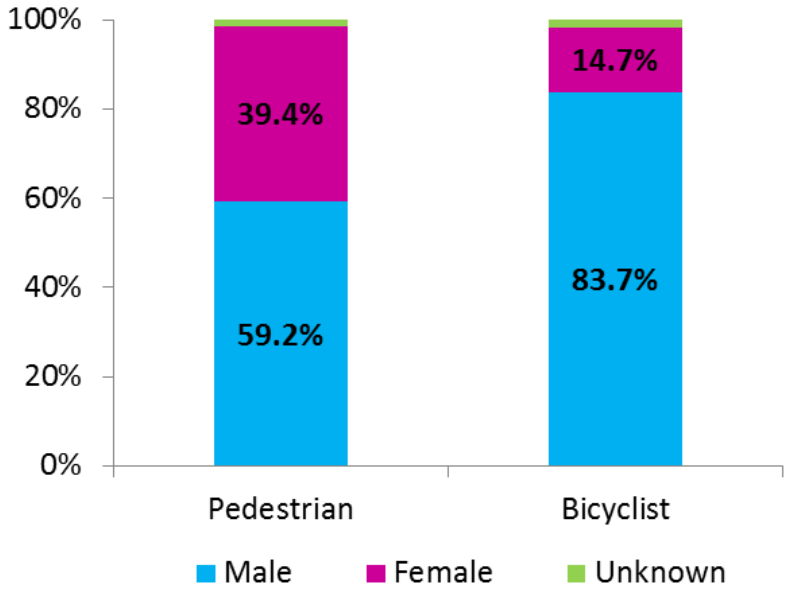
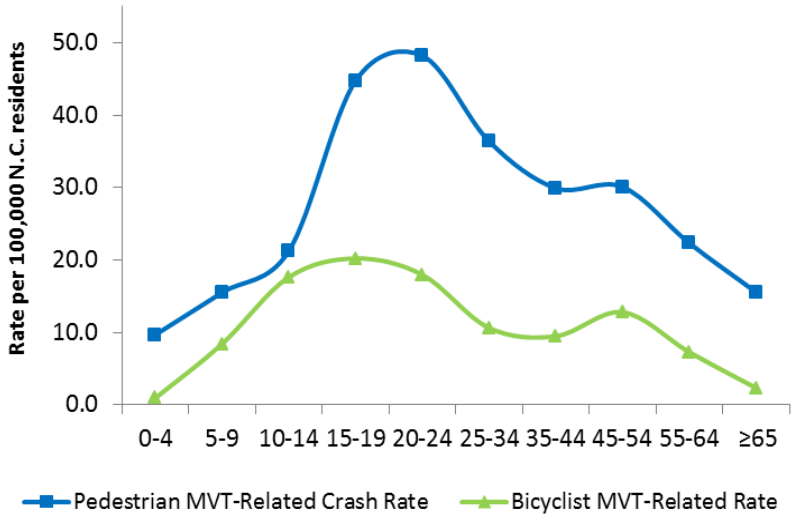


Figure 9. Rates of Reportable Pedestrian and Bicycle MVT-Related Crashes by Age: 2008-2012



Data: N.C. Bicycle and Pedestrian Crash Tool, 1999-2012
Analysis: Injury Epidemiology & Surveillance Unit

Time of Day and Locality of Reportable Pedestrian and Bicycle MVT-Related Crashes

Pedestrian and bicyclist MVT-related crashes are more likely to occur at certain times of day and in certain areas.

- Between 2008 and 2012, the number of both pedestrian and bicyclist MVT-related crashes was lowest in the early morning hours and late at night and highest in late afternoon and early evening (Figure 10).
- Beginning around 9 a.m., the number of both pedestrian and bicyclist MVT-related crashes began to increase steadily over the course of the day until peaks at 5 p.m. for pedal cyclist (514 crashes) and 6 p.m. for pedestrian MVT-related crashes (1,019 crashes; Figure 10).
- The majority of both pedestrian and bicyclist MVT-related crashes occurred in urban areas (Figure 11).

Figure 10. Number of Reportable Pedestrian and Bicycle MVT-Related Crashes by Time of Day of Crash: 2008-2012

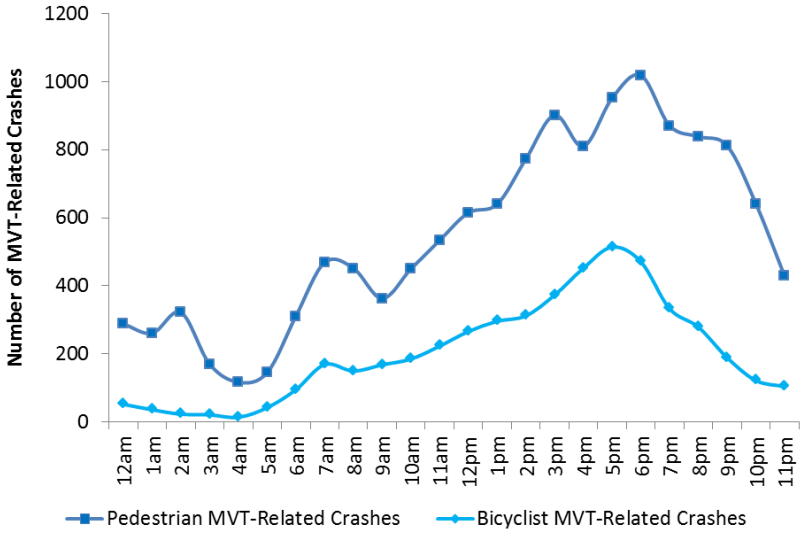
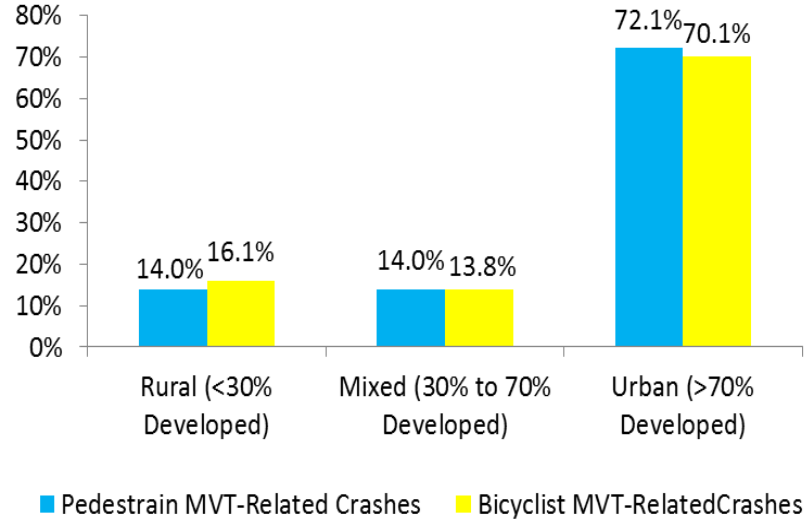


Figure 11. Number of Reportable Pedestrian and Bicycle MVT-Related Crashes by Locality of Crash: 2008-2012



Data: N.C. Bicycle and Pedestrian Crash Tool, 1999-2012
Analysis: Injury Epidemiology & Surveillance Unit

Pedestrian and Bicycle MVT-Related Crashes by County

The rate of pedestrian and bicyclist MVT-related crashes differs by county in North Carolina. Figure 12 displays the rate of pedestrian and bicyclist MVT-related deaths occurring in each county per 100,000 residents in that county for 2008-2012.

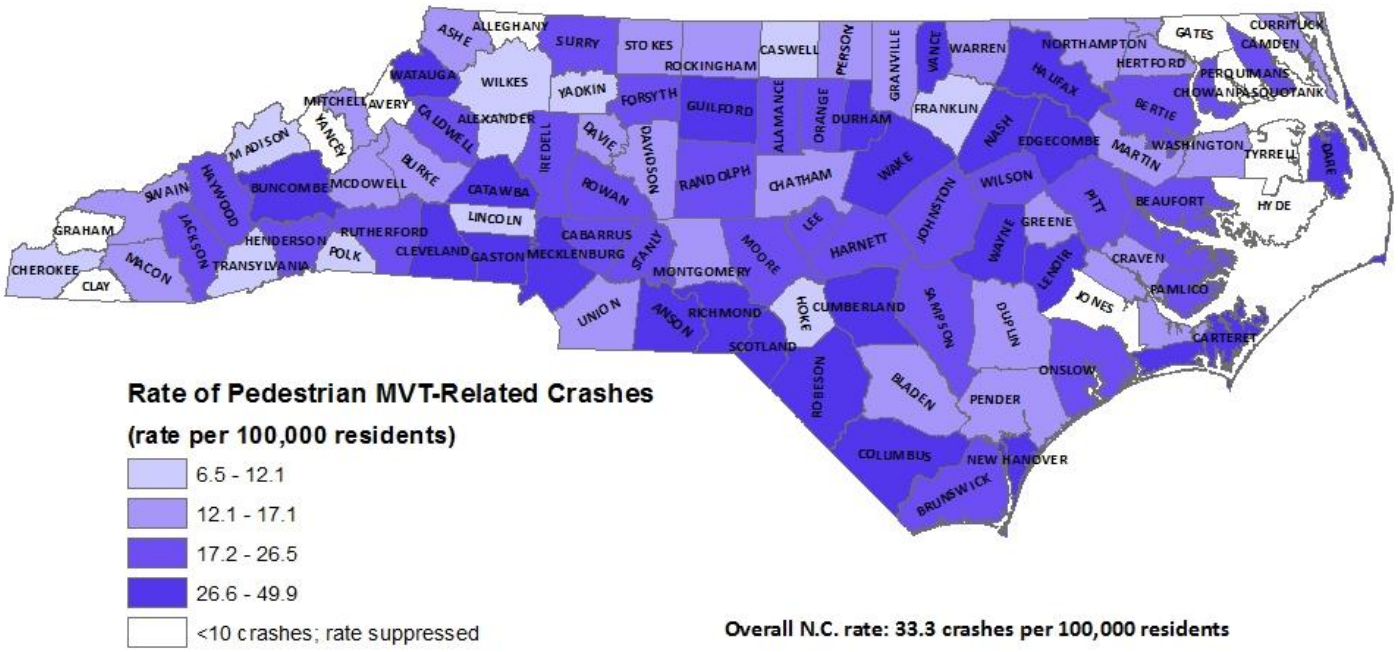
Differences in rates between counties may be due to several different factors including differences in population, socioeconomic factors, infrastructure including highways, roadways, and sidewalks, and geography including amount of rural versus urban space. Cut-off points were based on "natural breaks" occurring in the rate of pedestrian or pedal cyclist MVT-related crashes.

- Between 2008 and 2012, Halifax County (49.9 crashes per 100,000) had the highest rate of pedestrian MVT-related crashes followed by Mecklenburg (44.3 crashes per 100,000), Durham (43.8 crashes per 100,000), Guilford (42.6 crashes per 100,000), and Robeson (41.7 crashes per 100,000) counties. A total of 11 counties had fewer than ten pedestrian MVT-related crashes from 2008 to 2012.

- Between 2008 and 2012, Dare County (46.2 crashes per 100,000) had the highest rate of bicyclist MVT-related deaths followed by New Hanover (32.7 crashes per 100,000), Carteret (19.4 crashes per 100,000), Orange (19.3 crashes per 100,000), and Lenoir (18.2 crashes per 100,000) counties. A total of 41 counties had fewer than ten bicyclist MVT-related crashes from 2008 to 2012.

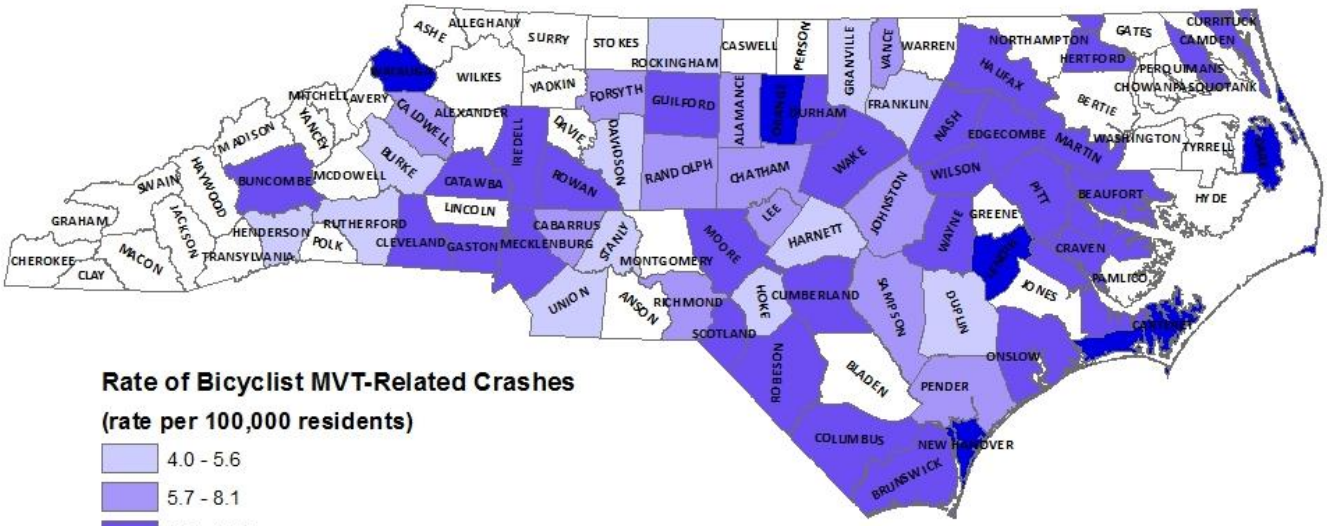
Figure 12. Rate of Reportable Pedestrian and Bicyclist MVT-Related Crashes by County: 2008-2012

Rate of Pedestrian MVT-Related Crashes by County: North Carolina Residents, 2008-2012



Overall N.C. rate: 33.3 crashes per 100,000 residents

Rate of Bicyclist MVT-Related Crashes by County: North Carolina Residents, 2008-2012



Overall N.C. rate: 12.4 crashes per 100,000 residents

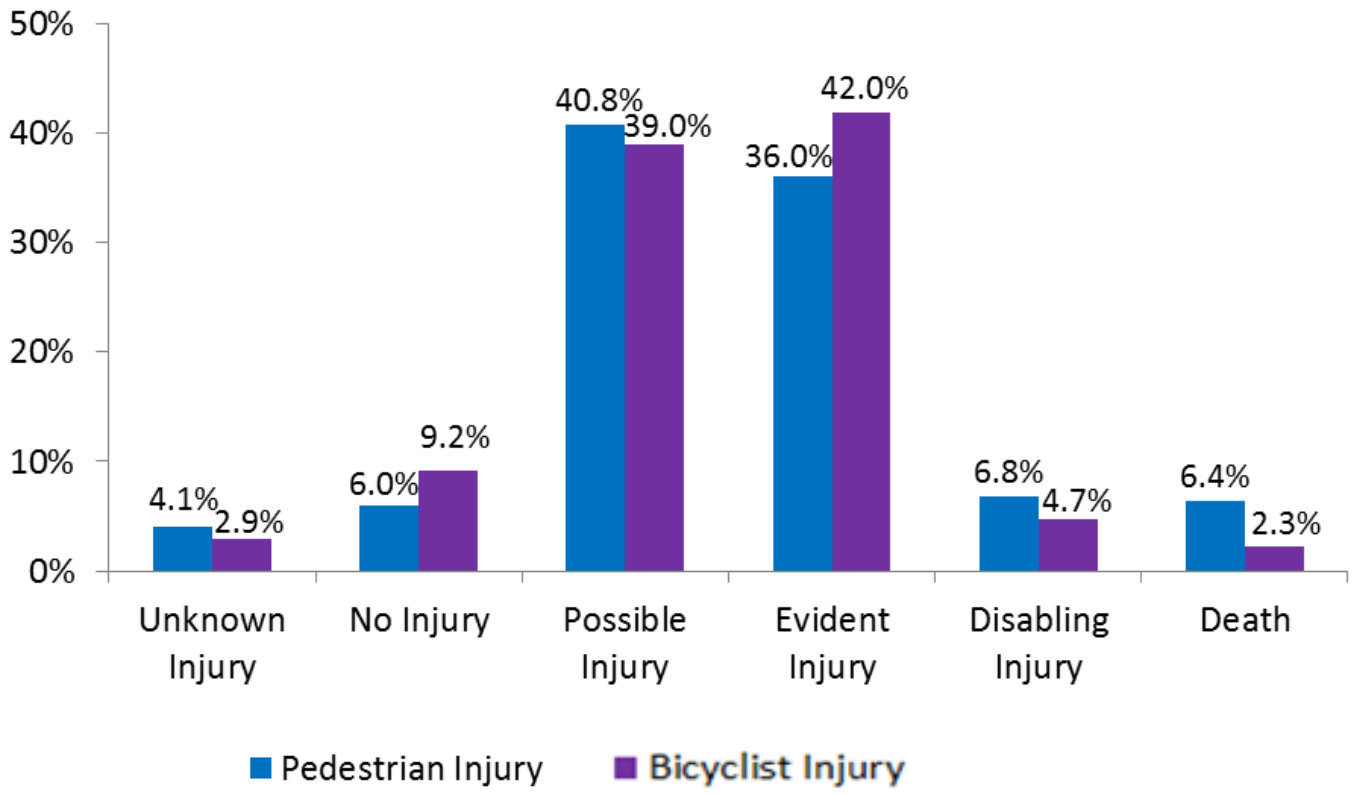
Data: N.C. Bicycle and Pedestrian Crash Tool, 1999-2012
Analysis: Injury Epidemiology & Surveillance Unit

Injury Severity of Reportable Pedestrian and Bicyclist MVT Crashes

According to the National Highway and Transportation Safety Administration (NHTSA), more than 12 pedestrians and approximately two pedal cyclists die each day in the U.S. as a result of an MVT-related crash. As previously mentioned fatal injuries only represent the tip of the iceberg with regard to pedestrian and pedal cyclist MVT- related injuries. In the U.S., a pedestrian sustains a non-fatal injury in an MVT-related crash every seven minutes.[18] However, research into hospital records has shown that only a portion of pedestrian and pedal cyclist MVT-related crashes are reported to or recorded by the police, so non-fatal injury estimates likely underestimate the true burden of these crashes and subsequent injuries.[13-15]

Figure 13 displays the severity of the injury sustained by the pedestrian or bicyclist involved in an MVT-related crash as recorded on the crash report form by law enforcement. The majority of pedestrian and bicyclist MVT-related crashes resulted in a possible or evident injury to the pedestrian or bicyclist. A greater proportion of pedestrian MVT-related crashes resulted in death (6.4%) than bicyclist MVT-related crashes (2.3%).

Figure 13. Injury Severity of Reportable Pedestrian and Bicyclist MVT-Related Crashes: 2008-2012



Data: UNC Highway Safety Research Council, 2012
Analysis: Injury Epidemiology & Surveillance Unit

Injury Severity of Reportable Pedestrian and Bicyclist MVT Crashes by Alcohol Involvement

Table 4 presents the severity of the injury sustained by the pedestrian or bicyclist involved in an MVT-crash by alcohol involvement. Alcohol involvement in MVT-related crashes may be on the part of the driver or the pedestrian/bicyclist. A total of 2,003 pedestrian and 396 bicyclist MVT-related crashes between 2008 and 2012 involved alcohol.

Of the pedestrian MVT-related crashes that resulted in the death of the pedestrian, 37.0% involved alcohol. Of the bicyclist MVT-related crashes that resulted in the death of the bicyclist, 31.5% involved alcohol. For both pedestrian and bicyclist MVT-related crashes, the proportion of crashes involving alcohol decreased with decreasing crash severity.

Not shown are data indicating whether alcohol involvement was on the part of the driver or the pedestrian/bicyclist. Of the 2,003 pedestrian MVT-related crashes that involved alcohol, 81% involved alcohol on the part of the pedestrian and 25% involved alcohol in the part of the driver. Of the 396 bicyclist MVT-related crashes, 83% involved alcohol on the part of the pedal cyclist and 20% involved alcohol on the part of the driver. Note that these percentages do not sum to 100% because alcohol may have been involved on the part of both the driver and the pedestrian/bicyclist.

Table 4. Injury Severity of Reportable Pedestrian and Bicyclist MVT-Related Crashes by Alcohol Involvement : 2008-2012

	Pedestrian						Bicyclist					
	Alcohol Involved		Alcohol NOT Involved		Total		Alcohol Involved		Alcohol NOT Involved		Total	
Injury Severity	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
Killed	310	37.0	528	63.0	838	100	8	68.5	132	31.5	111	100
Disabling Injury	231	25.9	661	74.1	892	100	35	84.9	76	15.1	232	100
Evident Injury	796	16.8	3,954	83.2	4,750	100	35	91.9	197	8.1	2,051	100
Possible Injury	514	9.6	4,867	90.4	5,381	100	116	93.6	1,885	6.4	1,905	100
No Injury	91	11.6	696	88.4	787	100	122	93.3	1,783	6.7	450	100
Unknown Injury	61	11.3	477	88.7	538	100	30	91.9	420	5.7	140	100

Section 7: Conclusions

Pedestrian and pedal cyclist MVT-related deaths and injuries are an important public health concern in North Carolina, particularly for certain populations shown to be at increased risk. High rates of death are observed among males and middle age adults while higher rates of hospitalizations and Emergency Department admissions are observed among males and youth and young adults. To fully understand risk and protective factors and to reduce the burden of this complex public health issue on North Carolinians, public health, highway safety, transportation, law enforcement, and public policy organizations will need to collaborate and coordinate strategic efforts. Additionally, continuing population-based surveillance is necessary to provide data on changing trends regarding pedestrian and pedal cyclist MVT-related injuries and inform such efforts.

Section 8: Additional Sources of Information

North Carolina:

North Carolina Division of Public Health, Injury and Violence Prevention Branch
www.injuryfreenc.ncdhhs.gov

North Carolina Department of Transportation
www.ncdot.gov

- **Governor's Highway Safety Program**
  www.ncdot.org/programs/ghsp
- **Division of Bicycle and Pedestrian Transport**
  www.ncdot.gov/bikeped
- **Pedestrian and Bicycle Crash Data Tool**
  www.pedbikeinfo.org/pbcat_nc/index.cfm
- **Bicycle Helmet Initiative**
  www.ncdot.gov/bikeped/safetyeducation/helmet_initiative
- **Watch for Me NC**
  www.watchformenc.org

University of North Carolina Highway Safety Research Center
www.hsrc.unc.edu/index.cfm

Safe Kids North Carolina
www.safekids.org/bike
www.safekids.org/walkingsafelytips

National:

Centers for Disease Control and Prevention, National Center for Injury Prevention and Control
www.cdc.gov/Motorvehiclesafety/Pedestrian_safety/index.html

U.S. Department of Transportation, Federal Highway Administration
http://safety.fhwa.dot.gov/ped_bike

National Highway Traffic Safety Administration
www.nhtsa.gov

- **Safe Routes to School**
  www.nhtsa.gov/Driving+Safety/SRTS/srts-kit

Pedestrian and Bicycle Information Center
www.pedbikeinfo.org

Section 9: Notes

Rates: All rates (unless documented otherwise) are per 100,000 North Carolina residents. Rates are not age-adjusted, unless labeled as such.

95 Percent Confidence Intervals: Data are frequently reported as point estimates with an associated 95 percent confidence interval. A confidence interval is the range of values within which the expected "true" value falls 95 percent of the time. In general, a rate with a large numerator will have a narrower 95 percent confidence interval than a rate with a small numerator.[41]

Population Estimates: The North Carolina State Center for Health Statistics provided population data for the years 1990-2009. These estimates originate from the National Center of Health Statistics' Bridged Population Files.

Death Data: The North Carolina State Center for Health Statistics provided death certificate data for every death in North Carolina. Only North Carolina residents with a North Carolina county address were considered in our analyses. Deaths were limited to events in which the primary cause of death was identified as an injury. Primary cause of death was assigned with the International Classification, 10th Revision (ICD-10) codes. The coding used to classify deaths due to pedestrian MVT-related crashes was: V02–V04 (.1, .9), V09.2. The coding used to classify deaths due to pedal cyclist MVT-related crashes was: V12-V14 (.3-.9), V19.4, V19.6.

Hospital Discharge Data: The North Carolina Center for Health Statistics provided hospital discharge data for every hospital discharge of North Carolina residents. A hospital discharge occurs after a patient leaves a hospital following admission. This data does not represent number of patients, but number of discharges (multiple discharges per patient are possible). Cause of injury was assigned with International Classification, 9th Revision, Clinical Modification (ICD-9-CM) External Causes of Injury codes (E Codes). The coding used to classify hospitalizations due to pedestrian MVT-related crashes was: E810–E819 (.7). The coding used to classify hospitalizations due to pedal cyclist MVT-related crashes was: E810-E819 (.6).

Emergency Department Data: The North Carolina Disease Event Tracking and Epidemiologic Collection Tool (NC DETECT) is a state system that collects and monitors emergency department (ED) for public health purposes. NC DETECT receives data on at least a daily basis from hospital emergency departments statewide to provide early detection and timely public health surveillance. As of 2010, NC DETECT captured ED records from 113 of 114 (99%) 24/7 acute care hospital-affiliated EDs in NC and captured and estimated 99.5% of all eligible ED visits. The ED data and the hospital discharge data are not mutually exclusive. Cause of injury was assigned with International Classification, 9th Revision, Clinical Modification (ICD-9-CM) External Causes of Injury codes (E Codes). The coding used to classify ED visits due to pedestrian MVT-related crashes was: E810–E819 (.7). The coding used to classify ED visits due to pedal cyclist MVT-related crashes was: E810-E819 (.6).

Section 10: References

1. North Carolina Department of Health and Human Services, State Center for Health Statistics. Leading Causes of Death in North Carolina. www.schs.state.nc.us/schs/data/lcd/lcd.cfm. Updated 2012. Accessed June 30 2014.

2. North Carolina Department of Health and Human Services, State Center for Health Statistics. *North Carolina Mortality Data Files: 1999-2012* [Computer File]. Raleigh, N.C.: North Carolina Department of Health and Human Services, Division of Public Health, State Center for Health Statistics [Producer and Distributor].

3. Naumann RB, Dellinger AM, Zaloshnja E, Lawrence B, Miller TR. Incidence and total lifetime costs of motor vehicle-related fatal and nonfatal injury by road used type, United States, 2005. *Traffic Injury Prevention*. 2005;11:353–360.

4. North Carolina Department of Health and Human Services, Division of Public Health, State Center for Health Statistics. *North Carolina Hospital Discharge Data: 2008-2012* [Computer File]. Raleigh, N.C.: North Carolina Department of Health and Human Services, Division of Public Health, State Center for Health Statistics [Producer and Distributor].

5. The North Carolina Disease Event Tracking and Epidemiologic Collection Tool (NC DETECT). *North Carolina Emergency Department Data: 2008-2012* [Computer File]. Raleigh, N.C.: North Carolina Department of Health and Human Services, Division of Public Health.

6. United States Department of Health and Human Services, Centers for Disease Control and Prevention. Fatal Injury Data. www.cdc.gov/injury/wisqars/fatal.html . Accessed June 30 2014.

7. Williams, A. Pedestrian Traffic Fatalities by State: 2013 Preliminary Data. Governor's Highway Safety Association. www.ghsa.org/html/publications/pdf/spotlights/spotlight_ped2013.pdf. Updated 2013. Accessed June 30 2014.

8. United States Department of Transportation, National Highway Safety Administration. Traffic Safety Facts. www-nrd.nhtsa.dot.gov/Pubs/811743.pdf . Updated 2013. Accessed June 30 2013.

9. United States Department of Health and Human Services, Centers for Disease Control and Prevention. Recommended framework for presenting injury mortality data. *Morbidity and Mortality Weekly Report.* 1997;46.

10. United States Department of Health and Human Services, Centers for Disease Control and Prevention. Classification of Disease, Functioning, and Disability. www.cdc.gov/nchs/icd/icd9cm.htm. Updated June 18 2013. Accessed June 30 2014.

11. World Health Organization. International Classification of Disease (ICD). www.who.int/classifications/icd/en. Accessed June 30 2014.

12. North Carolina Department of Transportation, Division of Bicycle and Pedestrian Transportation. North Carolina Pedestrian and Bicycle Crash Data Tool. www.pedbikeinfo.org/pbcat_nc/index.cfm. Accessed June 30 2013.

13. Stutts JC, Williamson JE, Whitley T, Sheldon, FC. Bicycle accidents and injuries: A pilot study comparing hospital- and police-reported data. *Accident Analysis & Prevention*. 1900;22(1):67-78.

14. Stutts JC, WW Hunter. *Police-Reporting of Pedestrians and Bicyclists Treated in Hospital Emergency Rooms*. 1998. Accessed 7 July 2014 from www.katana.hsrc.unc.edu/cms/downloads/PoliceReporting_PedBikeHospital1998.pdf.

15. United States Department of Transportation Federal Highway Administration, University of North Carolina Highway Safety Research Center. Pedestrian and Bicyclist Crash Statistics. www.pedbikeinfo.org/data/factsheet_crash.cfm. Updated 2012. Accessed July 7 2014.

16. North Carolina Department of Transportation, Division of Motor Vehicles. North Carolina Crash Report Instruction Manual. www.nhtsatsis.net/statecatalog/states/nc/docs/NC_DMV349_Instruction_Manual_rev_2_2006_sub_2_9_2009.pdf. Updated February 2006. Accessed July 7 2014.

17. North Carolina Department of Transportation. Watch for Me NC. www.watchformenc.org. Accessed July 7 2014.

18. United States Department of Transportation, Federal Highway Administration. Pedestrian and Bicycle Information Center. www.pedbikeinfo.org/data/factsheet_crash.cfm. Accessed July 7 2014.