

Running the Numbers

*A Periodic Feature to Inform North Carolina Health Care Professionals
About Current Topics in Health Statistics*

North Carolina Pedestrian Crash Facts

National Highway Traffic Safety Administration data for 2009 showed that North Carolina ranked 12th among the states in pedestrian fatality rate with 1.56 pedestrian fatalities per 100,000 population [1]. Recent crash data for the state reveal that every year in North Carolina, on average, 159 pedestrians are killed and another 1,507 suffer some type of injury as a result of collisions between pedestrians and motor vehicles. In addition to fatality, there are 3 types of injury that can result from such collision (Table 1). Agencies at various levels of government are taking engineering, educational, and enforcement countermeasures to address the issue of pedestrian injury and fatality—a matter of public concern and safety. This report summarizes characteristics of the pedestrian-motor vehicle crashes that were reported statewide for the 5-year period from 2007-2011, and includes age, sex, and race/ethnicity of the people involved in the crashes, temporal and environmental factors, and type of roadway. Some of the findings that follow are undoubtedly related to exposure and the number of pedestrians, as well as to location, time of day, time of year, and pedestrian char-

acteristics. (Unless otherwise noted, data in this article are from the Division of Motor Vehicles Crash Database, North Carolina Department of Transportation. This database houses police crash reports. The data presented in this article are for all crashes classified as reportable pedestrian crashes (those that involve greater than \$1,000 in property damage and/or a personal injury), and include all road types (ie, state and local maintained roads). Collisions that occurred on either private property or in public vehicular areas (eg, parking lots) are not included.)

It is important to note that pedestrian collisions often go unreported. In a 1998 study, researchers at the Highway Safety Research Center, University of North Carolina at Chapel Hill compared cases of pedestrian injury collected at 8 hospital emergency rooms in 3 states with crashes reported in the motor vehicle files of the state in which the injury occurred. The researchers were able to match only 68% of the pedestrian-motor vehicle hospital cases with a pedestrian-motor vehicle crash record [2].

During the 5-year period we studied, roughly 68% of pedestrian collisions in North Carolina occurred in urban areas, with the remaining 32% occurring in unincorporated areas. These data are coded as having occurred within municipal boundaries (urban) or outside municipal boundaries (rural). The disparity between rural and urban crash percentages likely reflects greater exposure in urban areas, where sidewalks, transit use, compact development, and other opportunities for walking are typically greater than in rural areas of the state.

TABLE 1.
Categories of Harm Caused by Collisions Between Motor Vehicles and Pedestrians

Category	Definition
Fatality	Death occurred within 12 months of the crash.
A-type injury: disabling	Injuries were serious enough to prevent normal activity for at least 1 day, such as massive loss of blood, broken bones, or the like.
B-type injury: evident	Signs of injury were evident at the scene of the crash, such as bruises, swelling, limping, and the like.
C-type injury: possible	There were no visible injuries, but the person involved in the crash complained of pain or of momentary unconsciousness

Note. The categories of harm are those used in the Division of Motor Vehicles Crash Database, North Carolina Department of Transportation.

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TABLE 2.
The 10 North Carolina Counties with the Highest Numbers of Pedestrian-Motor Vehicle Crashes From 2007 Through 2011

County	Total no. of crashes over 5-year period	Percentage of total no. of crashes statewide (N = 9,298)	Estimated population in 2010	Mean yearly crash rate per 10K population
Mecklenburg	1,594	17.1	923,944	3.5
Wake	870	9.4	907,314	1.9
Guilford	671	7.2	490,371	2.7
Cumberland	523	5.6	326,673	3.2
Durham	419	4.5	268,925	3.1
New Hanover	313	3.4	203,439	3.1
Buncombe	273	2.9	239,179	2.3
Forsyth	233	2.5	351,798	1.3
Gaston	207	2.2	206,384	2.0
Robeson	179	1.9	134,502	2.7
Total for all 10 counties	5,282	56.8	4,052,529	2.6

Note. Data are from the Division of Motor Vehicles Crash Database, North Carolina Department of Transportation.

The 10 counties with the highest total numbers of pedestrian-motor vehicle crashes for all 5 years are shown in Table 2, in descending order of number of crashes. These 10 counties accounted for more than half (nearly 57%) of the total number of such crashes reported in the state during that time.

The 10 cities with the highest numbers of such crashes during those 5 years, in descending order of number of crashes, were as follows: Charlotte (1,478), Raleigh (639), Greensboro (472), Fayetteville (416), Durham (396), Wilmington (236), Asheville (209), Winston-Salem (181), High Point (149), and Gastonia (122). These 10 cities together accounted for approximately 46% of the state's pedestrian-motor vehicle crashes. Charlotte accounted for the greatest proportion (16%) of statewide pedestrian-motor vehicle crashes over the 5-year interval, followed by Raleigh (6.9%), Greensboro (5%), and Fayetteville (4.5%).

Pedestrian Characteristics

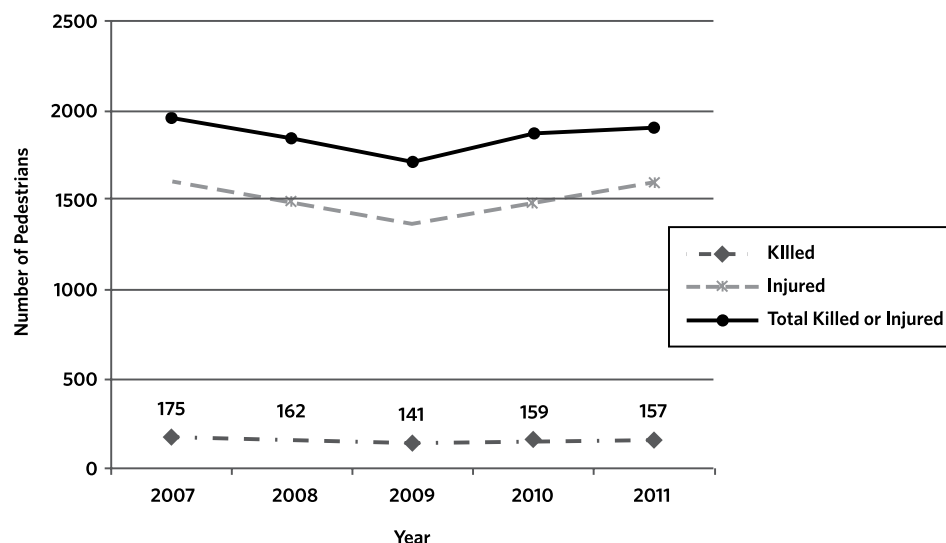
Crash involvement by pedestrian age group reflects, among other risk factors, both the size of the age group and exposure (amount of walking done by people in the age group). Older teens (aged 16-20 years) and young adults (aged 21-25 years) account for the greatest number and proportion of pedestrian crashes. During the 5-year interval studied, the 2 groups combined accounted

for more than 25% of crashes. Approximately 65% of the pedestrians involved in crashes were males.

Pedestrian crashes in North Carolina during this period were most likely to involve pedestrians whose race was reported to be white (48%). However, 41% of the pedestrians involved were reported to be African American. Considering that blacks or African Americans comprised approximately 21% of persons living in the state during this general period [3], they were clearly over-represented in pedestrian crashes based on population. These proportions may, however, reflect greater amounts of walking by African Americans, as well as other exposure factors. Those identified on crash report forms as Hispanic or as persons of Asian descent have accounted for approximately 7% and approximately 1%, respectively, of pedestrians involved in crashes each year. Native American pedestrians were involved in 1.4% of the total number of crashes over the 5 years.

Pedestrian crashes tend to be especially serious. During this 5-year interval, more than 9% of pedestrians struck by a motor vehicle in North Carolina were killed, whereas the fatality rate for all crash-involved people (mostly drivers and passengers) was only 0.3% over the same time period. (This latter statistic includes all crashes, regardless of pedestrian involvement.) An additional 9% of pedestrians suffered disabling (A-type)

FIGURE 1.
Number of Pedestrians Killed and Injured in North Carolina From 2007-2011 as a Result of Reported Collisions With Motor Vehicles



Note. Data are from the Division of Motor Vehicles Crash Database, North Carolina Department of Transportation. The numbers of pedestrians listed here as killed or injured include only the first pedestrian mentioned in a crash report. A few crashes each year involve multiple pedestrians, and some of those result in more than 1 pedestrian being injured or killed.

injuries over the 5 years. In approximately 16% of the pedestrian-motor vehicle crashes during this 5-year period, the investigating officer indicated that the pedestrian was using alcohol.

Driver Characteristics

Younger drivers aged up to 24 years accounted for approximately 23% of collisions with pedestrians over this time period. Those aged 20-24 accounted for approximately 14% of such collisions. Male drivers accounted for 57% of the pedestrian-motor vehicle crashes over the 5 years, and female drivers for approximately 43%.

According to police crash reports, approximately 58% of the crashes with pedestrians involved white drivers, 34% involved black drivers, and approximately 4% involved Hispanic drivers; Asians and Native Americans each accounted for approximately 1% of the crashes. Only 3% of drivers involved in collisions with pedestrians over this time period were reported to have been killed or to have received a disabling or evident (A-type or B-type) injury. Another 5% of drivers were listed as possibly injured (C-Type). Only 0.4% of drivers in crashes involving pedestrians were reported to

have experienced fatal or serious (A-type) injuries. Crashes in which driver injury occurred may have also involved other vehicles or objects. The investigating officer detected or suspected alcohol use by the drivers involved in pedestrian crashes in approximately 4% of all crashes over the 5 years.

Temporal and Environmental Factors

For this 5-year period, the months with the highest average numbers of crashes were October, November, and December. Pedestrian crashes in North Carolina were most likely to occur on a Friday, with the second and third highest numbers of crashes occurring on Saturdays and Thursdays, respectively. The ranking of Friday and Saturday as the highest crash days is due to the numerous crashes that occur between 8 P.M. and midnight, likely reflecting higher pedestrian exposure levels at those times, as well as alcohol as a contributing factor. These results were fairly consistent from year to year.

Pedestrian crashes were most likely to occur in the afternoon (from 3-6 P.M.) or early evening (from 6-9 P.M.). More than 37% of pedestrian collisions occurred during those 6 hours. Although 51% of col-

lisions occurred during daylight hours, few occurred at dawn (1%) or at dusk (3%). More than 45% of pedestrian crashes over the 5-year interval occurred during dark conditions, either on a lighted or an unlighted roadway. Because the exposure levels of pedestrians have historically been shown to be dramatically lower after dark than during daylight hours (fewer pedestrians walk at night), the high percentage of crashes occurring during dark conditions may reveal a need for pedestrians walking at night to take increased safety precautions. The vast majority (92%) of pedestrian crashes occurred when the weather was clear (79%) or cloudy, but not raining (14%), no doubt reflecting exposure.

Roadway Characteristics

More than half (59%) of all pedestrian-motor vehicle crashes occurred on local (mostly city) streets, reflecting higher levels of walking and greater numbers of pedestrians in cities and neighborhoods. Approximately 17% occurred along state secondary roads. Approximately 9% of pedestrian crashes occurred on North Carolina routes, approximately 10% on US routes, and approximately 3% on interstate routes. Crashes occurring in parking lots, public driveways, or other public vehicular areas are not included in these statistics, but historically, these represent roughly 25% of total pedestrian-related crashes.

The majority (56%) of reported on-roadway pedestrian crashes occurred on 2-lane roads; this finding was fairly consistent from year to year. Approximately 32% occurred on multilane roadways with 4 or more travel lanes. Three-lane roadways accounted for another 6% of crashes, and 1-lane roads accounted for 2%.

More than half (57%) of pedestrian crashes took place on roads indicated to have speed limits of ≤ 35 mph, likely reflecting speeds on urban streets, where more walking takes place. Roadways with a speed limit of 40-45 mph account for nearly a quarter (22%) of pedestrian collisions, and those with a speed limit >45 mph account for another 17%. For 3% of the reported crashes, the speed limit on the roadway on which the crash occurred was unknown or had been incorrectly coded.

Improving Pedestrian Safety

Pedestrian safety can be improved through the use of engineering countermeasures and street

redesign, as well as through safety-related programs. The literature shows a number of engineering risk factors that influence pedestrian crashes. For example, pedestrian crash risk increases with higher motor vehicle speeds and volumes and increased width of roadways. Pedestrians have more difficulty safely crossing intersections with multiple turn lanes, wide turning radii, wide crossing distances, or traffic signals that are perceived to be complex or confusing. Drug or alcohol use by motorists and pedestrians, lack of suitable nighttime road lighting, and lack of sidewalks also contribute to pedestrian crashes and severity [4].

In addition, roadways without crossings provisions provided at regular intervals can contribute to pedestrian crashes, as pedestrians may cross these roadways at unsafe locations, particularly those pedestrians who are unable or unwilling to walk a long distance to reach a signalized intersection. Land use decisions can also have an impact upon pedestrian safety. For example, when residential areas are separated from shopping areas by high-volume, high-speed multi-lane roads, some pedestrians may choose to cross streets in unsafe locations.

Some of the most frequent pedestrian crash types occurring in the state from 2005-2009 encompassed a mix of typical roadway crashes such as pedestrian crossing midblock where there is no marked crosswalk and pedestrian dash into the roadway when driver's view of pedestrian is not obstructed, walking along and in the roadway crashes, and motorists striking pedestrians while making left turns. These crash types are provided in the Pedestrian and Bicycle Crash Analysis Tool, which is a crash typing software product intended to assist engineers, planners, and others, with improving walking and biking safety through crash analysis. Knowing the behaviors that may contribute to or lead up to a crash is helpful in identifying interventions. In addition to engineering treatments, educational programs can play an important role in the process of improving pedestrian safety. Such programs allow all road users to improve their abilities to respond to the roadway environment, and thus improve safety. Pedestrian safety programs may employ the assistance of enforcement officers to encourage all road users to obey traffic laws and share the road safely and to deter unsafe driver and pedestrian behavior.

An example of an educational program to improve pedestrian safety is currently underway at the North Carolina Department of Transportation. The department is working with agency partners to launch a pedestrian safety campaign in the Triangle region called Watch For Me NC (more information available at <http://www.watchformenc.org>). The campaign will run from August through October of 2012. It focuses upon improving pedestrian safety by influencing the behaviors of pedestrians and drivers through education and enforcement activities. The campaign will educate drivers about crosswalk laws, which require drivers to yield the right of way to pedestrians crossing in the crosswalk at all marked midblock crosswalks, unmarked crosswalks, and signalized intersections when the light is in the pedestrian's favor. The campaign also educates pedestrians to use the facilities that are provided to them, including sidewalks and crosswalks, and seeks to educate pedestrians and drivers on how to walk and drive safely in various contexts including in parking lots, near bus stops, and in nighttime conditions. **NCMJ**

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