



North Carolina Motor Vehicle Crash Injury Surveillance: Pedestrians

Summary Data Based on a Pilot Study Linking 2017 Crash and Hospital Encounter Datasets

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Background

The North Carolina (NC) Governor's Highway Safety Program funded the Carolina Center for Health Informatics to link health outcome data with police crash report data to improve motor vehicle crash injury surveillance. This demonstration project focusing on pedestrians and bicyclists links 2017 NC police crash reports from the UNC Highway Safety Research Center with 2017 NC hospital encounter data from the North Carolina Healthcare Association.

For more information regarding this project, including a detailed overview of the data linkage methodology and study limitations, please see the "[North Carolina Linkage Study for Motor Vehicle Crashes Involving Pedestrians and Bicyclists Report](#)." More reports are available at the following link.

<http://cchi.web.unc.edu/transportation-health-data/>

Note about Statistics: This report displays summary counts and percentages. All percentages have been rounded to the nearest integer value; therefore, percentage totals may not sum to 100%.

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Key definitions

Crash report data are recorded by law enforcement officers for motor vehicle crashes involving a motor vehicle in transport resulting in an un-stabilized situation, which includes at least one harmful event. North Carolina crash records must meet at least one of the following criteria: The crash resulted in a fatality, a non-fatal personal injury, total property damage amounting to \$1,000.00 or more, property damage of any amount to a vehicle seized, or the vehicle has been seized and is subject to forfeiture under G. S. 20-28.3. In addition, a reportable motor vehicle traffic crash must occur on a trafficway (any land way open to the public as a matter of right or custom for moving persons or property from one place to another) or occur after the motor vehicle runs off the roadway but before events are stabilized.

Hospital encounter data at the North Carolina Healthcare Association are aggregated data of all hospital encounters (emergency department and inpatient) to 24/7 civilian acute care hospitals in North Carolina. A hospital encounter can refer to an emergency department visit and/or an inpatient encounter.

Pedestrian crashes represent any collision involving a motor vehicle in transport and a pedestrian. This includes a person afoot, sitting, lying, or working upon a land way or place or a person in or operating a pedestrian conveyance, including skateboards, roller skates, rollerblades, scooters (foot-powered), wheelchairs, and strollers.



Pedestrian Injury Incidence and Data Linkage Statistics

Total counts and data linkage for pedestrian records

In 2017, a pedestrian was struck by a motor vehicle in North Carolina approximately every **2.9 hours**.

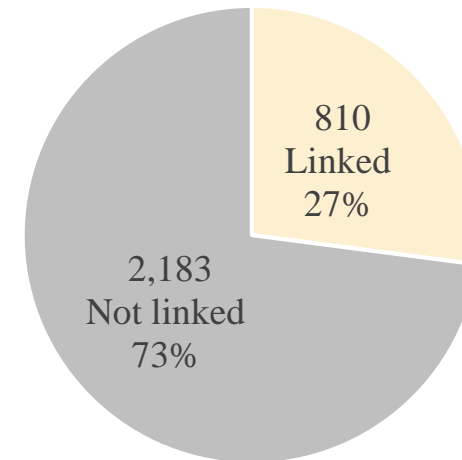
Linking **crash data** with **hospital encounter data** can increase our understanding of the injuries associated with pedestrian-involved traffic collisions.

Collisions in large central metropolitan areas* were the most likely to be linked (35%).

Rural areas were the least likely to be linked (18%).

*Rurality designation determined by county of crash event.

Percentage of Pedestrians from Crash Data Linked with Hospital Encounter Data (n=2,993)**



**Fatalities at the scene of the crash and persons who were uninjured or did not seek treatment at a hospital would not be present in hospital encounter data. The linkage rate may underrepresent the percentage of linkable records but is not expected to approach 100%.

The number of hospital encounter records indicative of pedestrian injuries which did not link with crash records is unknown.

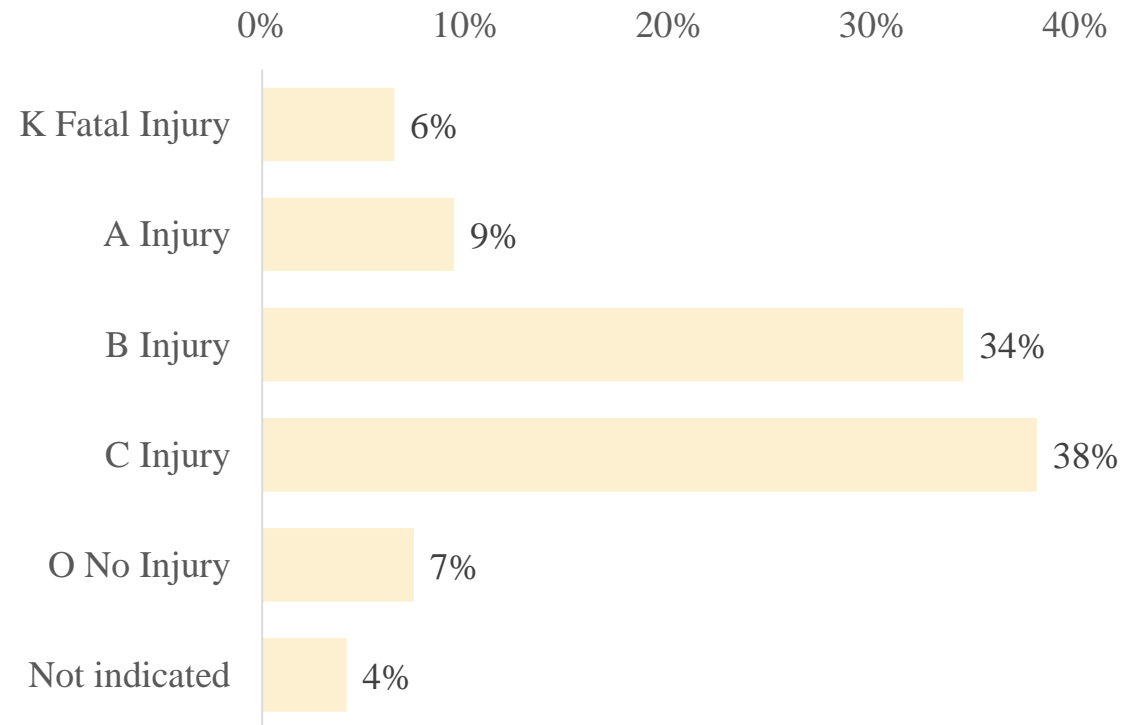
Injury Classification: KABCO

Police officers rate the level of injury for the persons involved using a five scale rating system, abbreviated 'KABCO':

- K: Killed
- A: Suspected serious injury
- B: Suspected minor injury
- C: Possible injury
- O: No injury

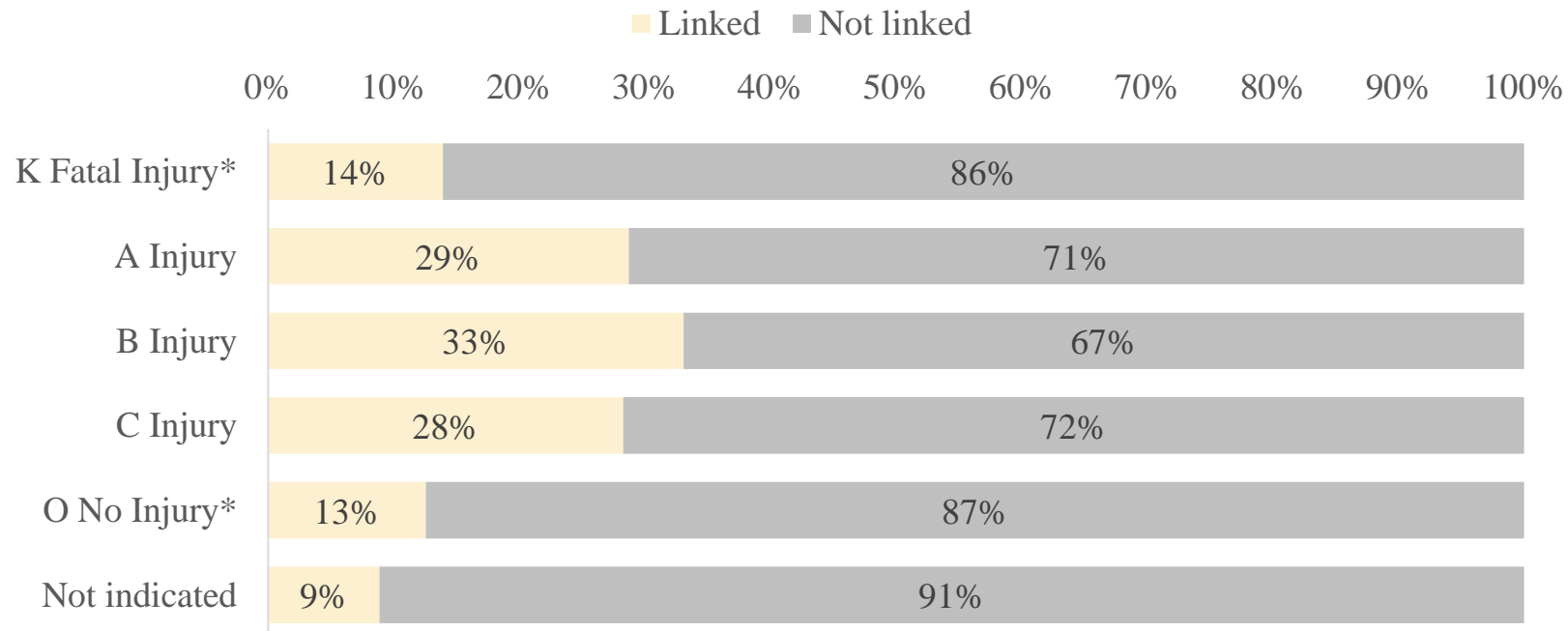
[See page 4 of the full report for more information.](#)

Proportion of KABCO Designations for All 2017 Pedestrians (n=2,993)



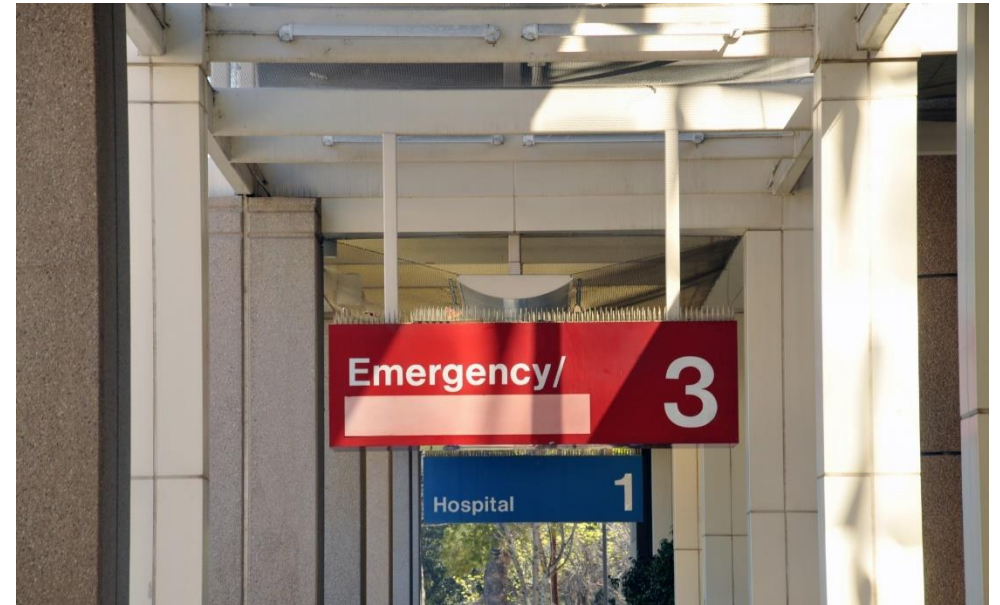
Data linkage and KABCO

Proportions of Pedestrian Records by KABCO and Linkage Status
(n=2,993)



* Fatalities at the scene of the crash and persons who were uninjured or did not seek treatment at a hospital would not be present in hospital encounter data. The linkage rate may underrepresent the percentage of linkable records but is not expected to approach 100%.

Pedestrian Crash Injury Linked Data Summaries



Pedestrian linked data: a breakdown

Crash report data represents each person involved in a motor vehicle crash. Crashes may injure multiple people.

Hospital encounter data represents each encounter a person has with a hospital. Patients may have multiple hospital encounters after a motor vehicle crash.



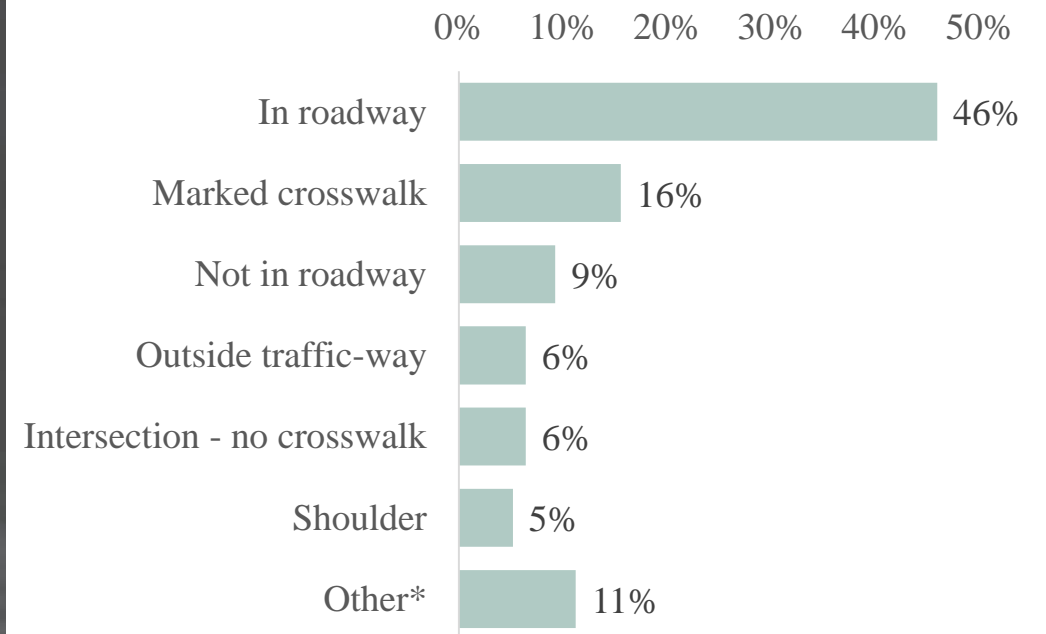
The most common circumstances of pedestrian crashes

The most common vehicle maneuvers prior to the crash (n=810):

1. Going straight ahead (47%)
2. Making a left turn (15%)
3. Making a right turn (7%)
4. Backing up (7%)

9% were other maneuvers and 14% were not indicated. Maneuvers not listed (2% or less of the total) include leaving a parked spot, changing lanes/merging, slowing/stopping or being stopped in lane.

Location of Pedestrian (n=810)

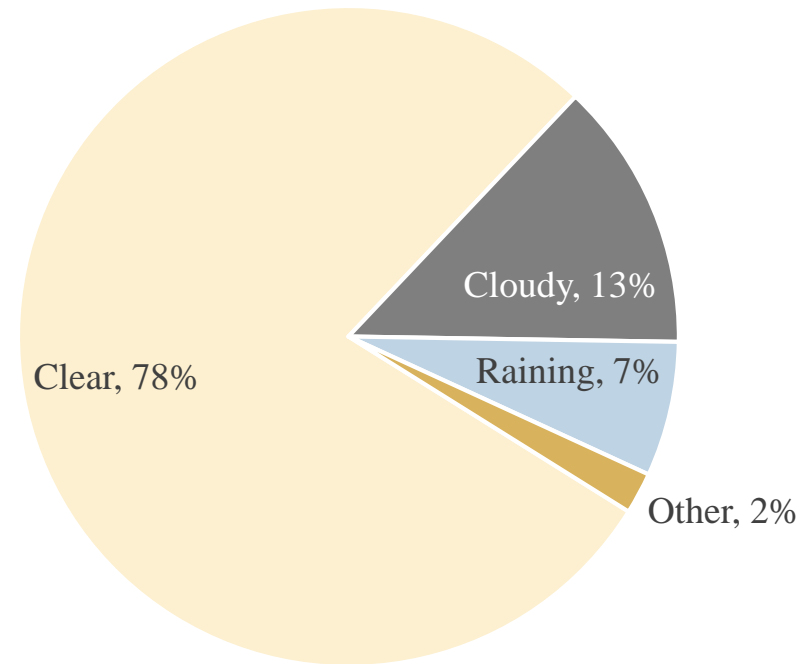


*The following 'other' locations were 3% or less of the total: sidewalk, within 10 feet - no shoulder, non-intersection crosswalk, and shared use path/trail.

Weather conditions

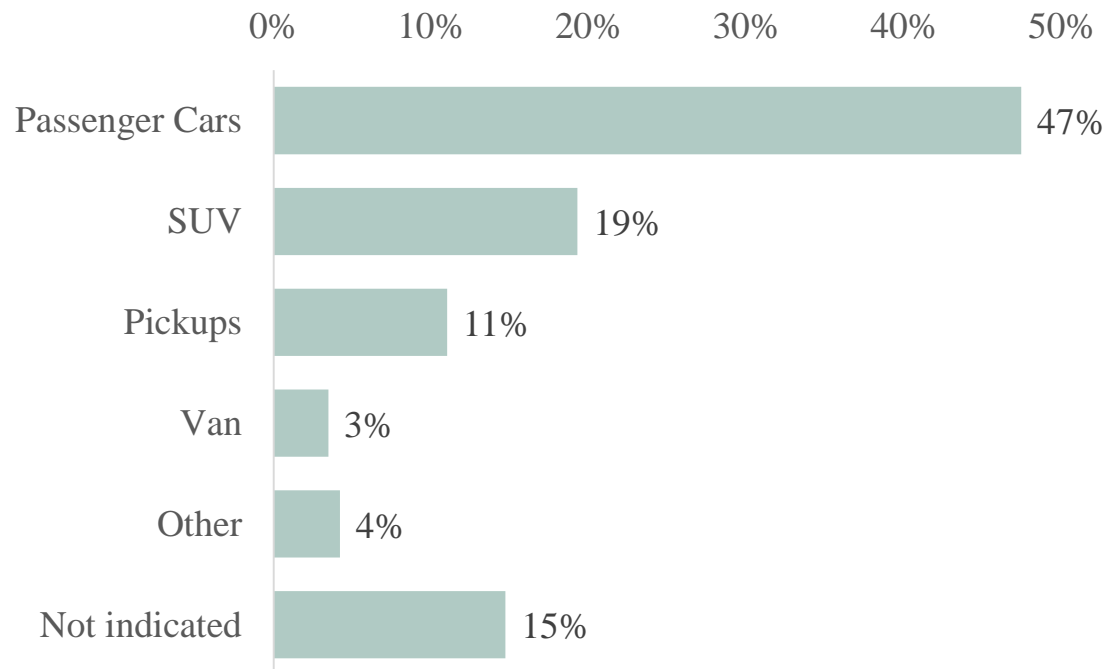
Only **3%** of linked pedestrian crashes indicated weather was a contributing factor in the crash. For that 3% in which weather was a contributing factor, most indicated it was raining (57%) or clear (19%).

Weather Conditions of Pedestrian Crashes (n=788)

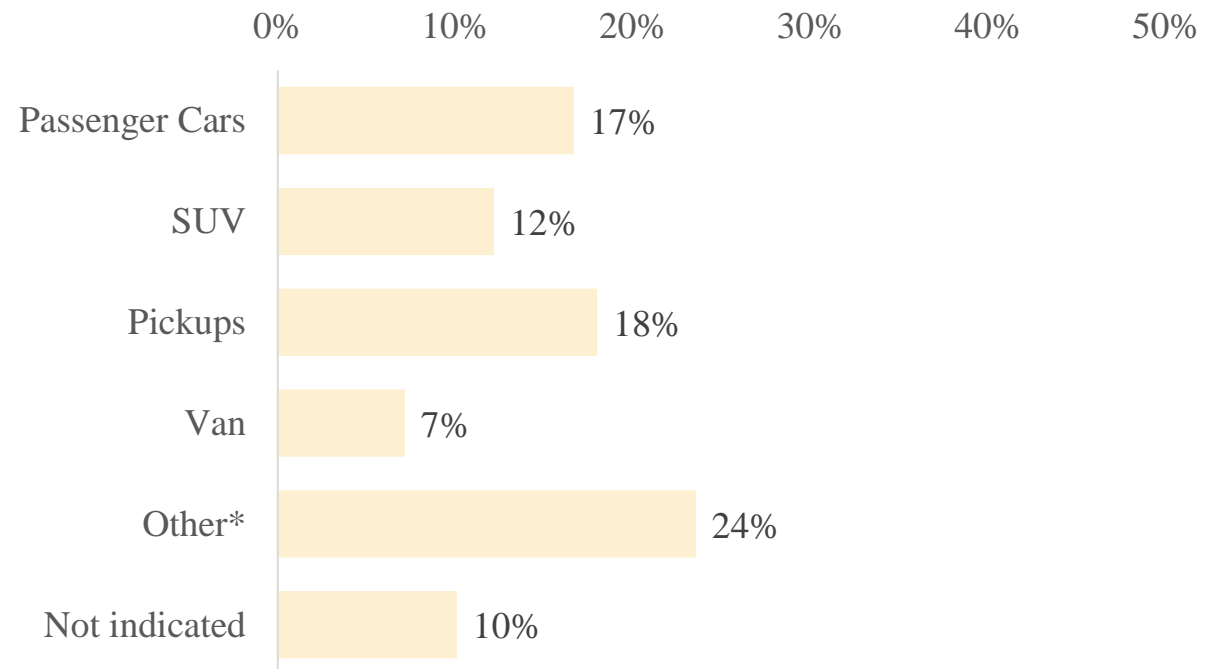


Striking vehicle type in pedestrian crashes

Percentage of Striking Vehicle Types for Pedestrian Crashes (n=810)



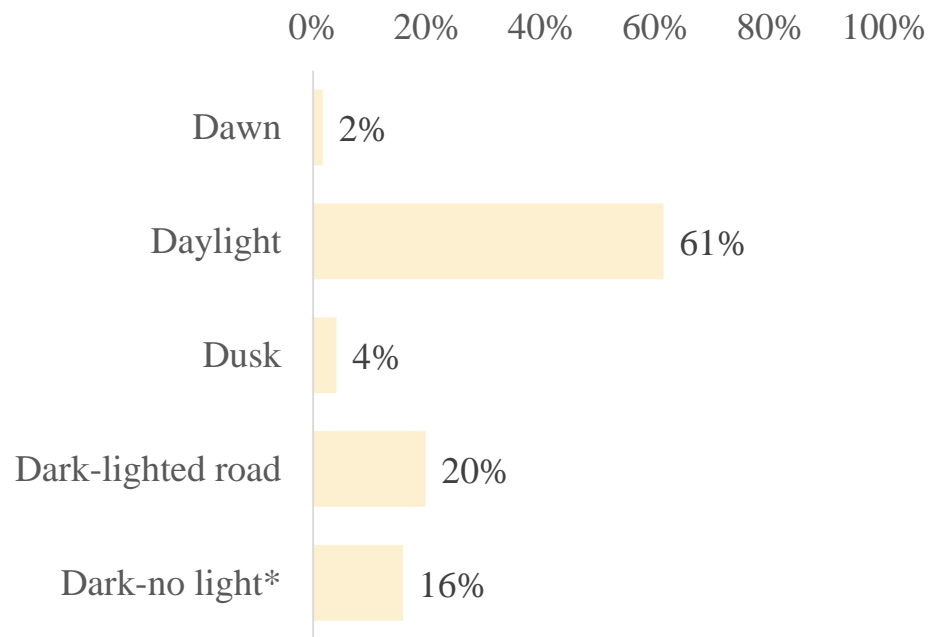
Pedestrian Hospital Admittance by Striking Vehicle Type (n=810)



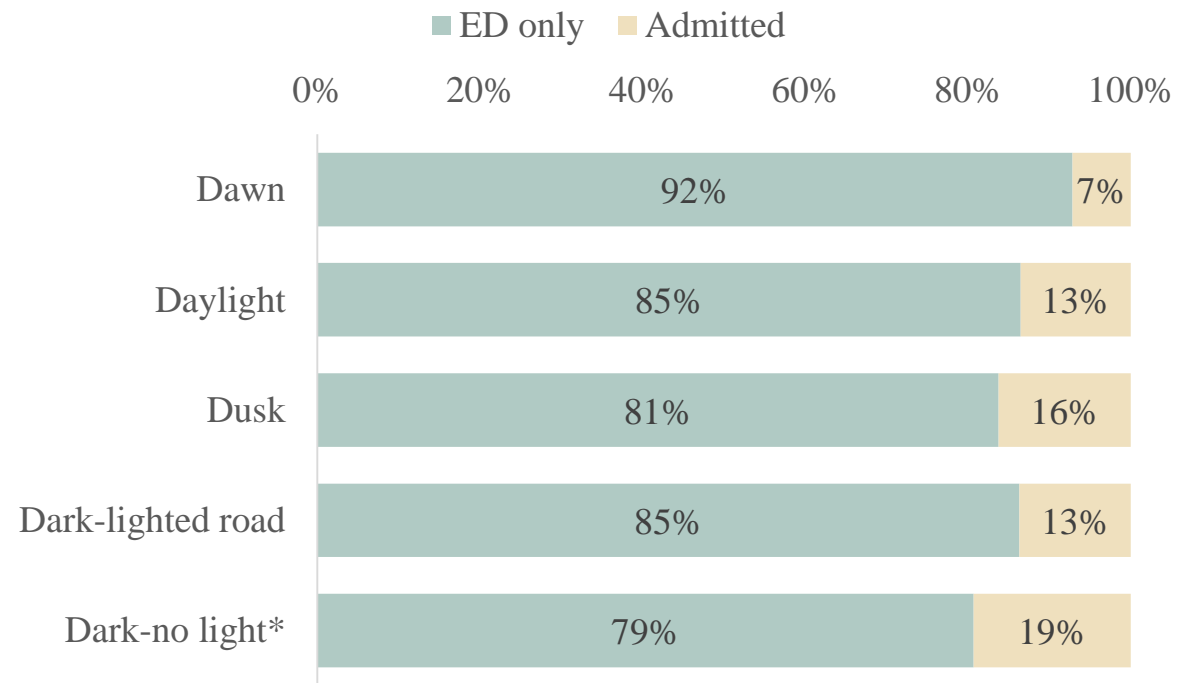
* Although rare (less than 5 hospital encounters), the following striking vehicle types had hospital admittance rates greater than 30%: tractor/semi-trailers, motorcycles, truck/trailers, and 3 axle trucks.

Light conditions

Light Conditions for Linked Pedestrian Crashes (n=810)



Percentage of Pedestrians Admitted to the Hospital by Light Condition (n=810)

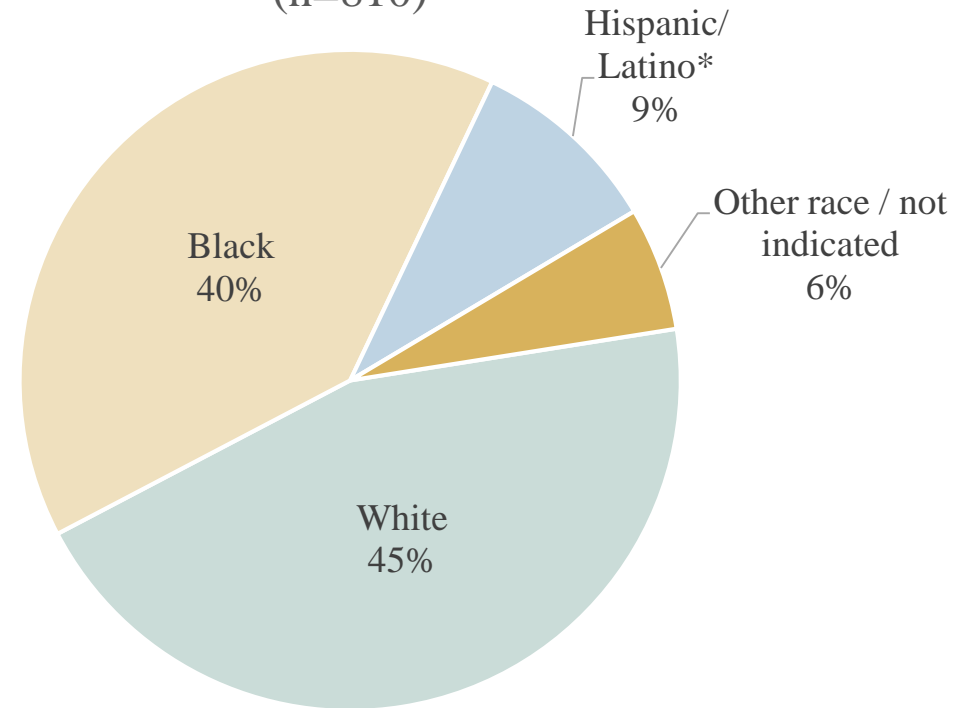


*Category includes 'Dark-unknown light' designation.

Race/ethnicity of pedestrian crash victims

Black North Carolinians make up only 22% of the NC population, but 40% of pedestrian crash victims.

Proportion of Injured Pedestrians by Race/Ethnicity (n=810)



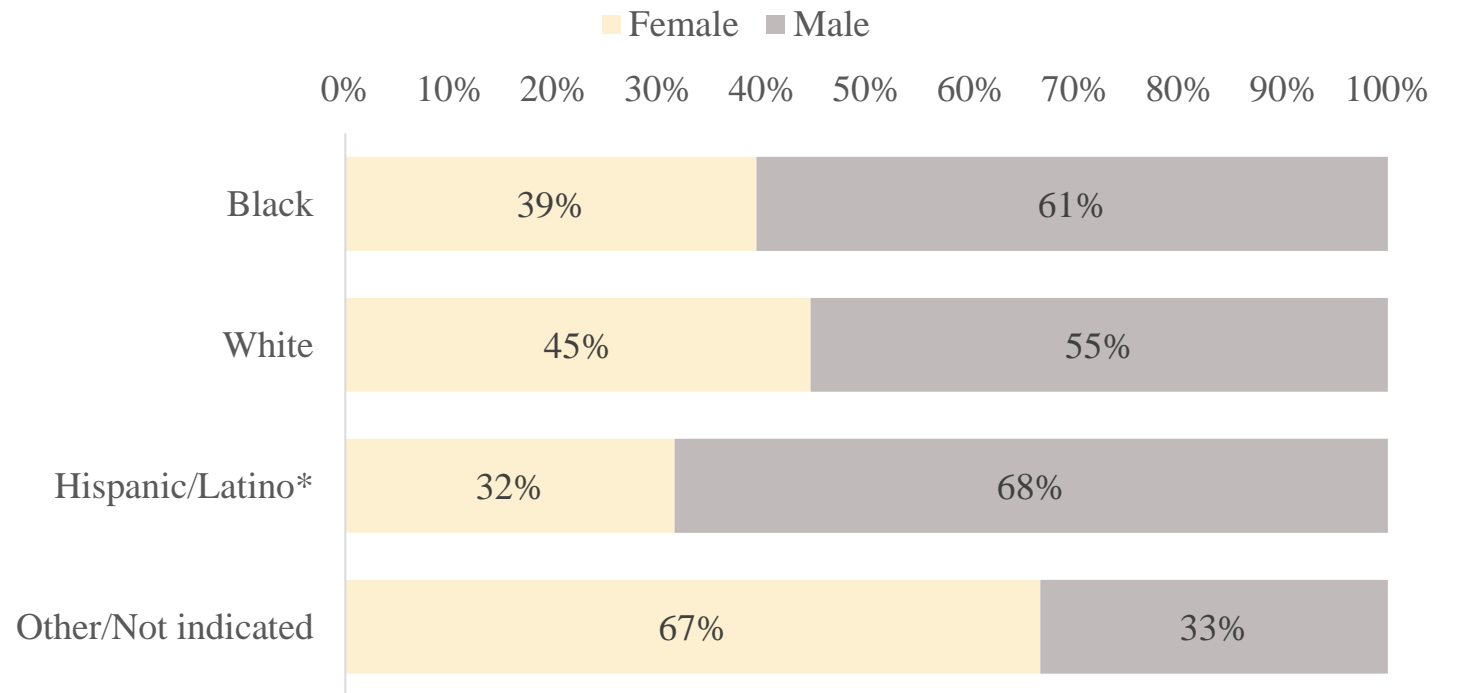
Source: <https://www.census.gov/quickfacts/nc>

*Ethnicity is not disaggregated from race in the crash data.

Sex of pedestrian crash victims

Male North Carolinians make up 50% of the NC population, but 62% of pedestrian crash victims.

Proportion of Injured Pedestrians by Sex and Race/Ethnicity (n=810)

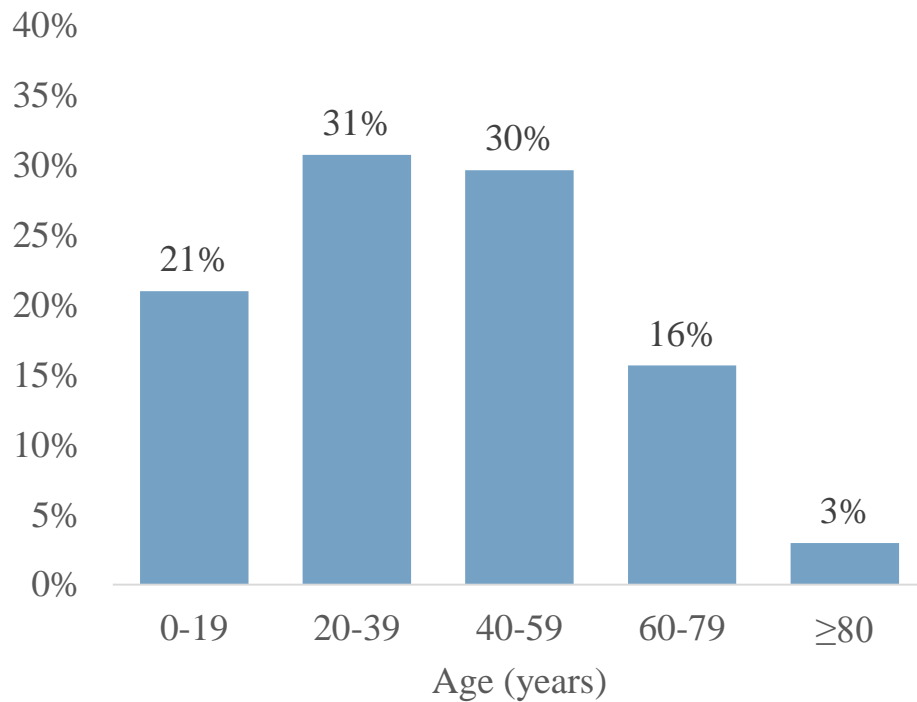


Source: <https://www.census.gov/quickfacts/nc>

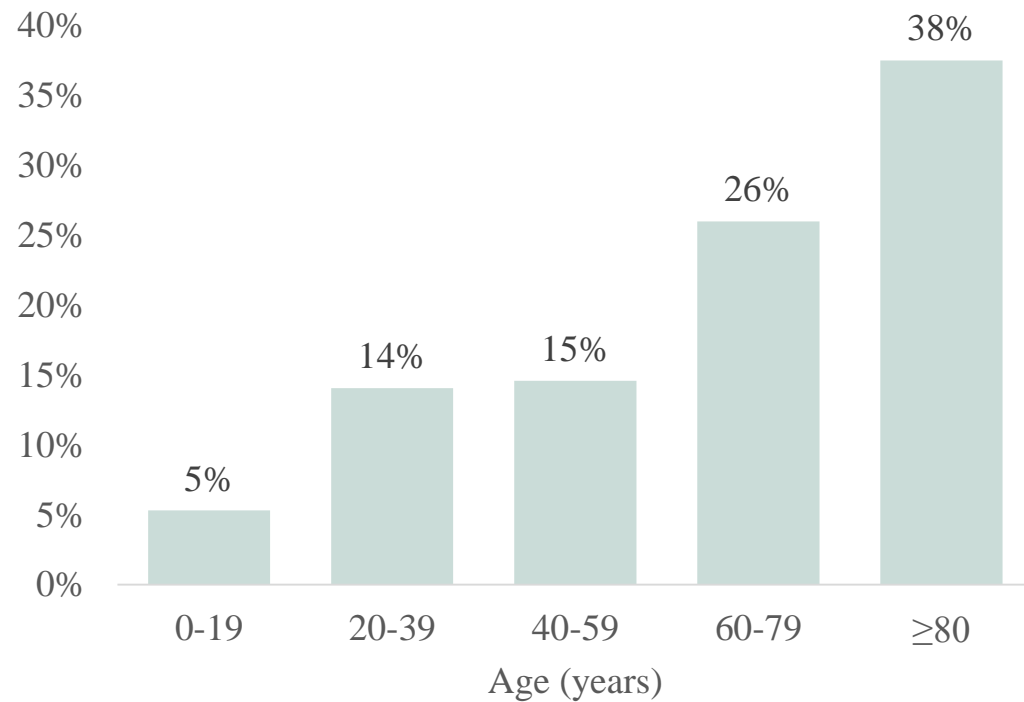
*Ethnicity is not disaggregated from race in the crash data.

Age and hospital admittance for injured pedestrians

Proportion of Injured Pedestrians by Age (n=810)

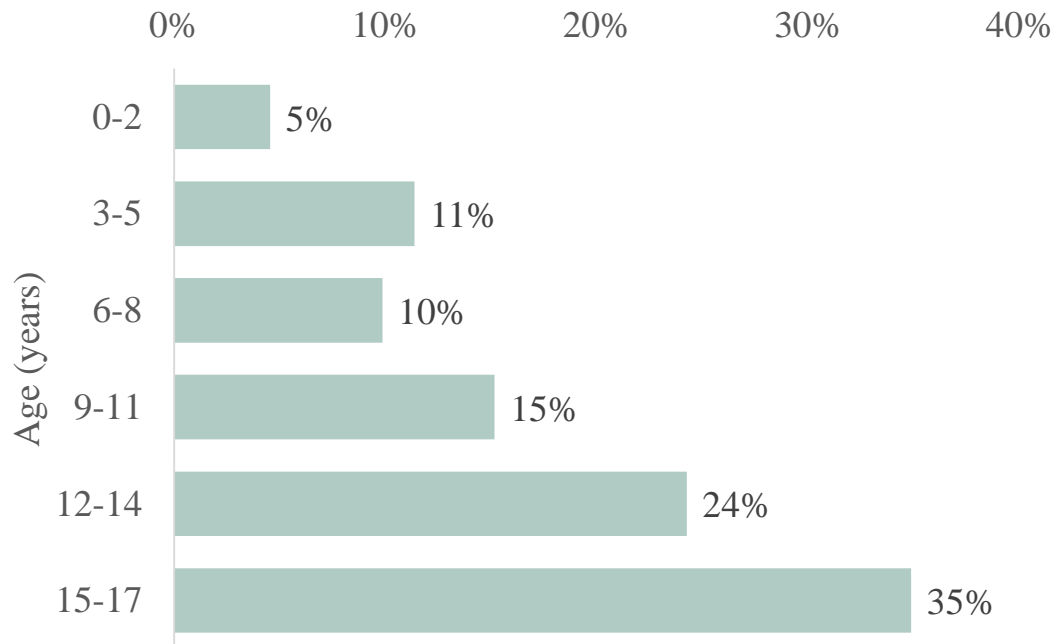


Proportion of Pedestrians Admitted to Hospital by Age (n=810)

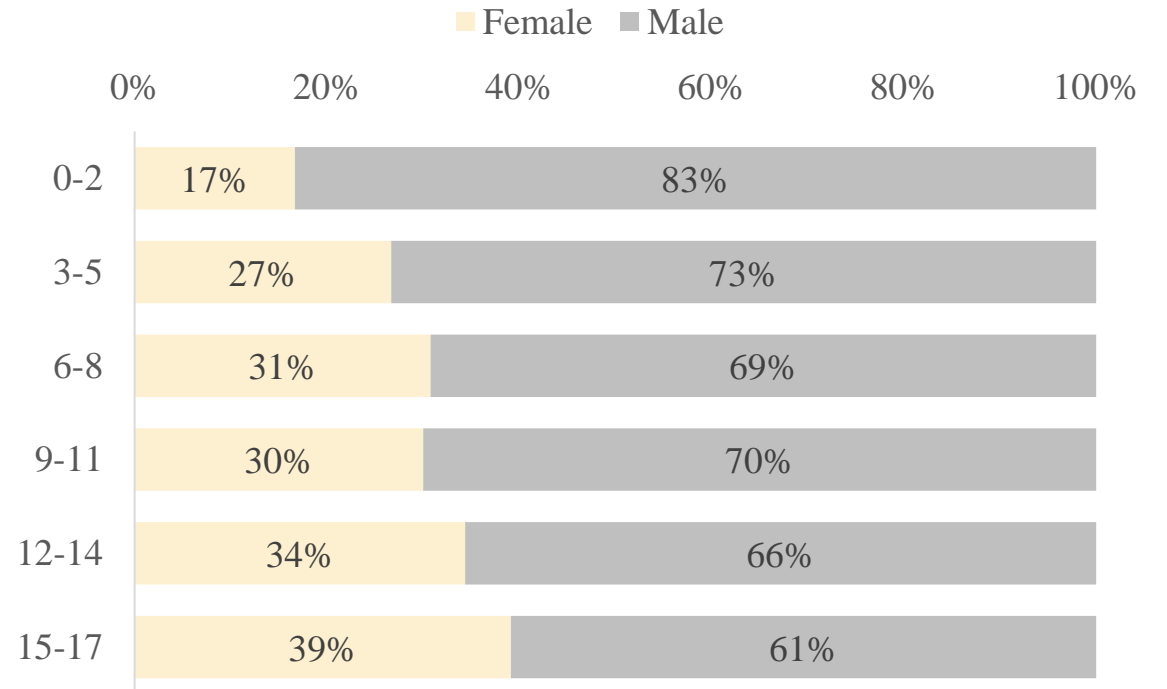


Injured Pedestrians: Children

Ages of Injured Pedestrian Children
(n=132)



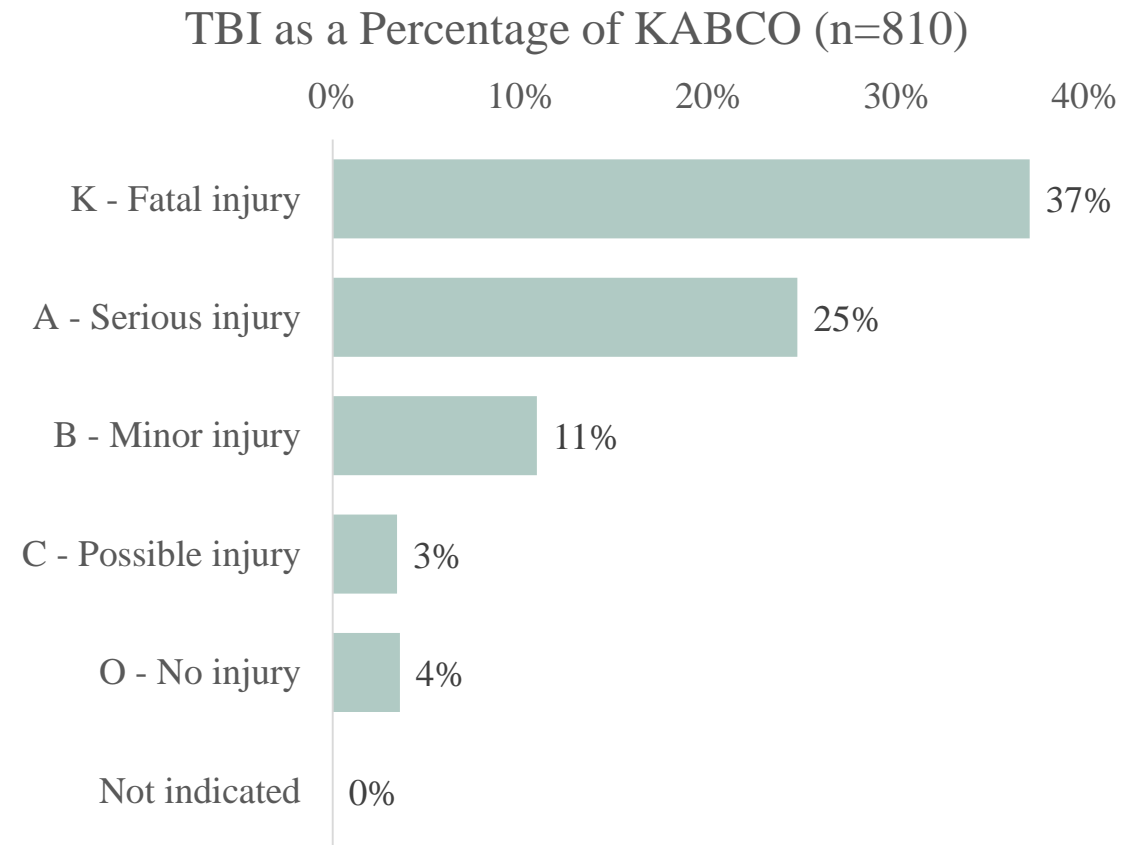
Proportion of Injured Pedestrian Children by
Age and Sex (n=132)



Traumatic brain injuries in pedestrians

10% of injured pedestrians met the 2016 CDC proposed definition* for traumatic brain injuries (TBIs).

*Hedegaard H, Johnson RL, Warner M, et al. Proposed framework for presenting injury data using the International Classification of Diseases, Tenth Revision, Clinical Modification diagnosis codes. National health statistics reports; no 89. Hyattsville, MD: National Center for Health Statistics. 2016



KABCO and Maximum Abbreviated Injury Scale (MAIS) for pedestrians in hospital encounter data (n=664)*

The **Maximum Abbreviated Injury Scale (MAIS)** is a recognized injury severity ranking system, developed by the Association for the Advancement of Automotive Medicine (AAAM). The MAIS maps injury severity to ICD-10-CM injury diagnosis codes. The MAIS is the highest (i.e. most severe) AIS severity score in a patient with multiple injuries.

The linked data show similar distributions for the KABCO and MAIS injury severity scales:

- 14% of injured pedestrians had a law enforcement officer-assigned KABCO score of “K” or “A.”
- 12% of injured pedestrians had a MAIS ≥ 3 , indicating that the injury was serious to critical.

Injury Severity Rating Based on Law Enforcement Assessment		
KABCO	N	%
K - Fatal injury	18	3%
A - Serious injury	77	12%
B - Minor injury	300	45%
C - Possible injury	248	37%
O - No injury	21	3%

Injury Severity Rating Based on ICD-10-CM Injury Diagnosis Codes in Hospital Encounter Data		
MAIS	N	%
6 - Not survivable	0	0%
5 - Critical	12	2%
4 - Severe	4	1%
3 - Serious	64	10%
2 - Moderate	174	26%
1 - Minor	362	55%
0 - No injury	48	7%

*146 pedestrians were excluded from analysis due to missing KABCO designations (n=8), missing classifiable injury diagnosis codes (n=135), or missing both (n=3).

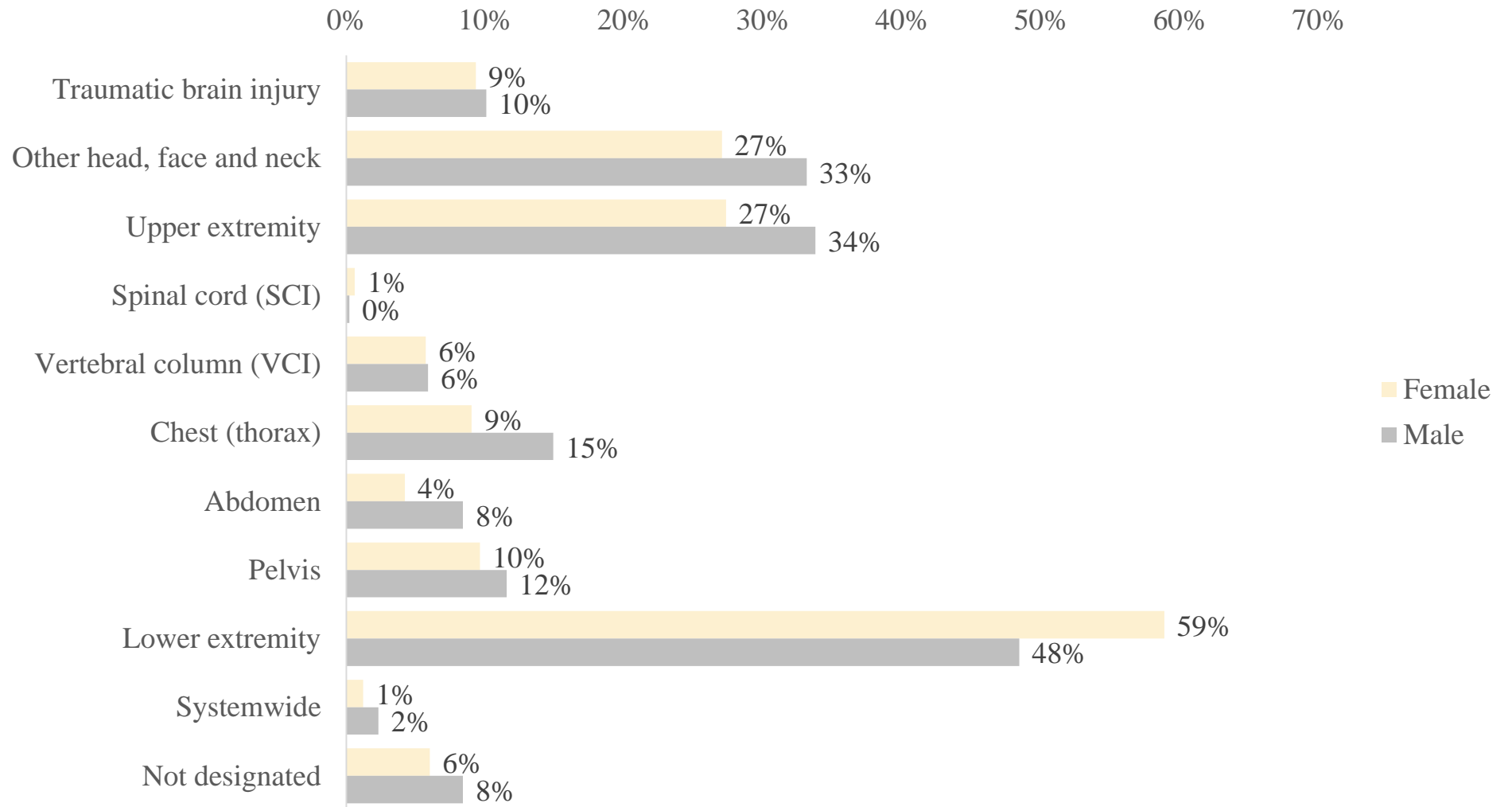
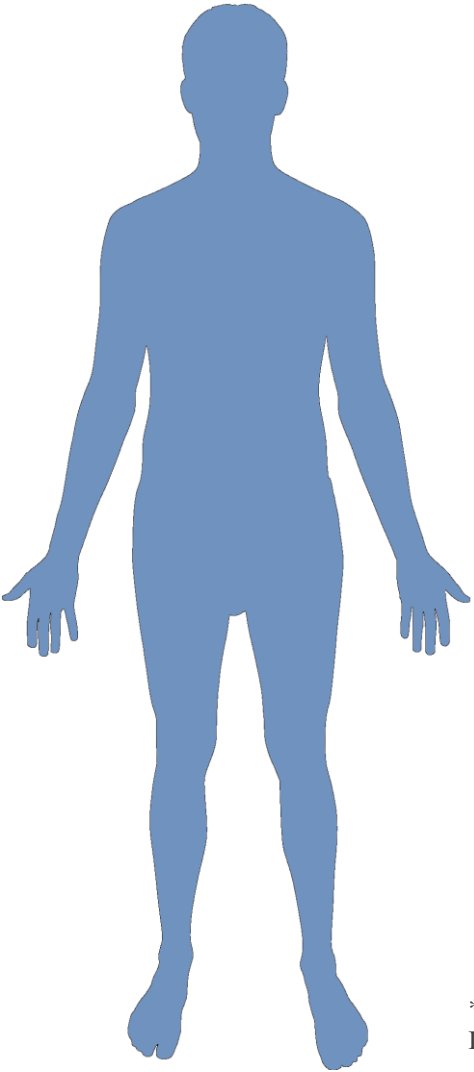
Most common injury diagnosis codes* for pedestrians per KABCO designation, (n=799)

K: Fatality, n=27	A: Suspected serious injury, n=81	B: Suspected minor injury, n=341	C: Possible injury, n=322	O: No injuries, n=28
S066X9A: Traumatic subarachnoid hemorrhage with loss of consciousness of unspecified duration, initial encounter (30%)	S0101XA: Laceration without foreign body of scalp, initial encounter (16%)	S0990XA: Unspecified injury of head, initial encounter (14%)	S0990XA: Unspecified injury of head, initial encounter (8%)	S0990XA: Unspecified injury of head, initial encounter (14%)
S065X9A: Traumatic subdural hemorrhage with loss of consciousness of unspecified duration, initial encounter (26%)	S270XXA: Traumatic pneumothorax, initial encounter (10%)	S80212A: Abrasion, left knee, initial encounter (7%)	S7002XA: Contusion of left hip, initial encounter (5%)	S40022A: Contusion of left upper arm, initial encounter (14%)
	S2242XA: Multiple fractures of ribs, left side, initial encounter for closed fracture (9%)	S0101XA: Laceration without foreign body of scalp, initial encounter (7%)		

*Using the Carolina Center for Health Informatics 'Trauma' case definition: ICD-10-CM diagnosis codes starting with S - Injury, poisoning, and certain other consequences of external causes

Injury Percentages by Area of Injury and Sex*

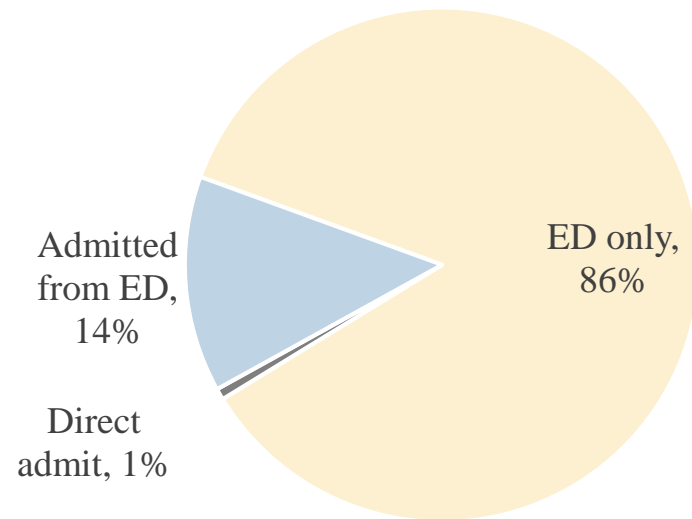
(2,350 diagnosis codes for 810 pedestrians)



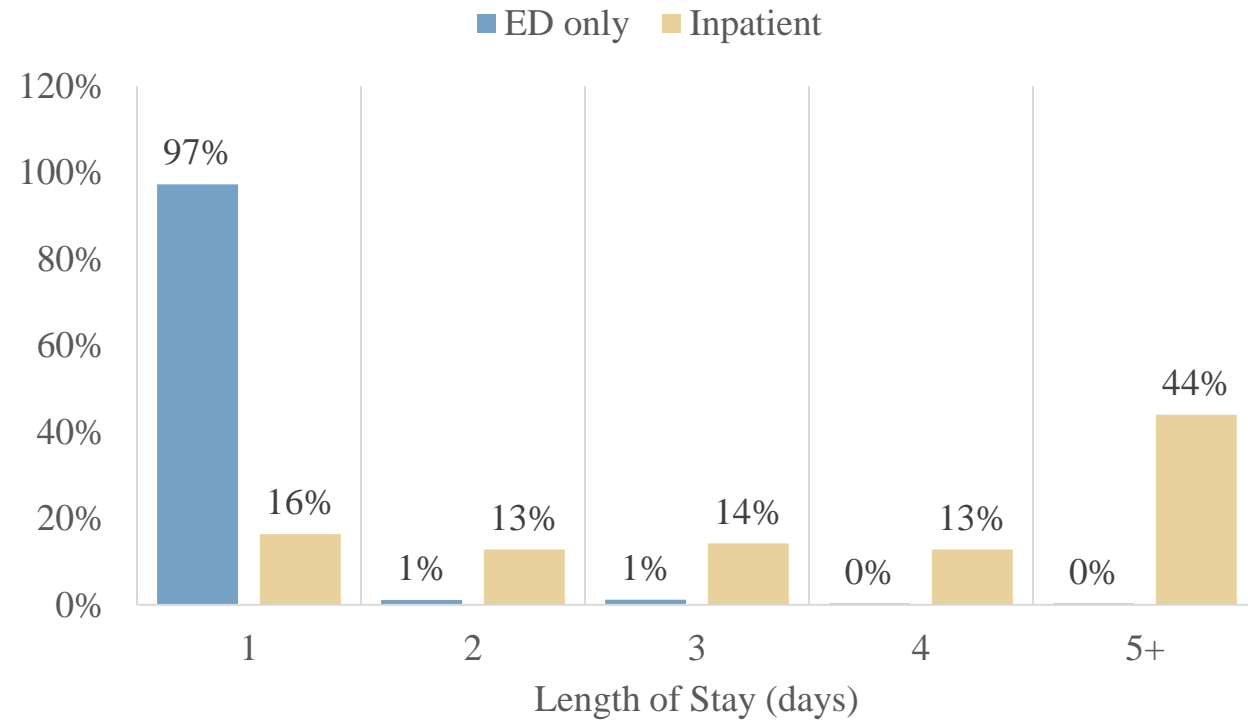
*Data do not add up to 100%. Mapped using S and T diagnosis codes using CDC injury mapping: Injury Data and Resources - Tools and Frameworks. (n.d.). Retrieved February 4, 2019, from https://www-cdc-gov.libproxy.lib.unc.edu/nchs/injury/injury_tools.htm

Admittance to hospital and length of stay for pedestrians

Proportion of Pedestrians with Emergency Department (ED) Visits vs. Hospital Admissions (n=986)

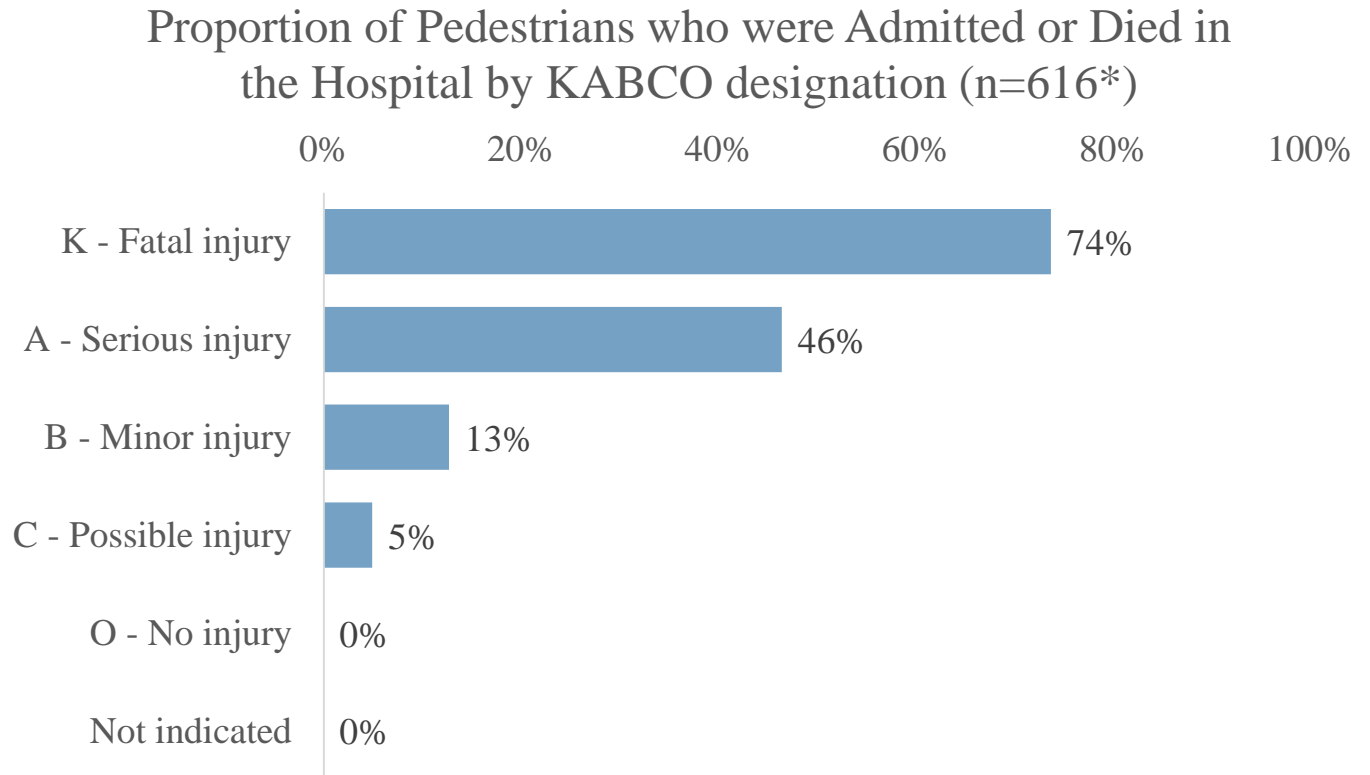


Pedestrian Length of Stay by Admittance Type (n=986)



Pedestrian hospital admittance by KABCO

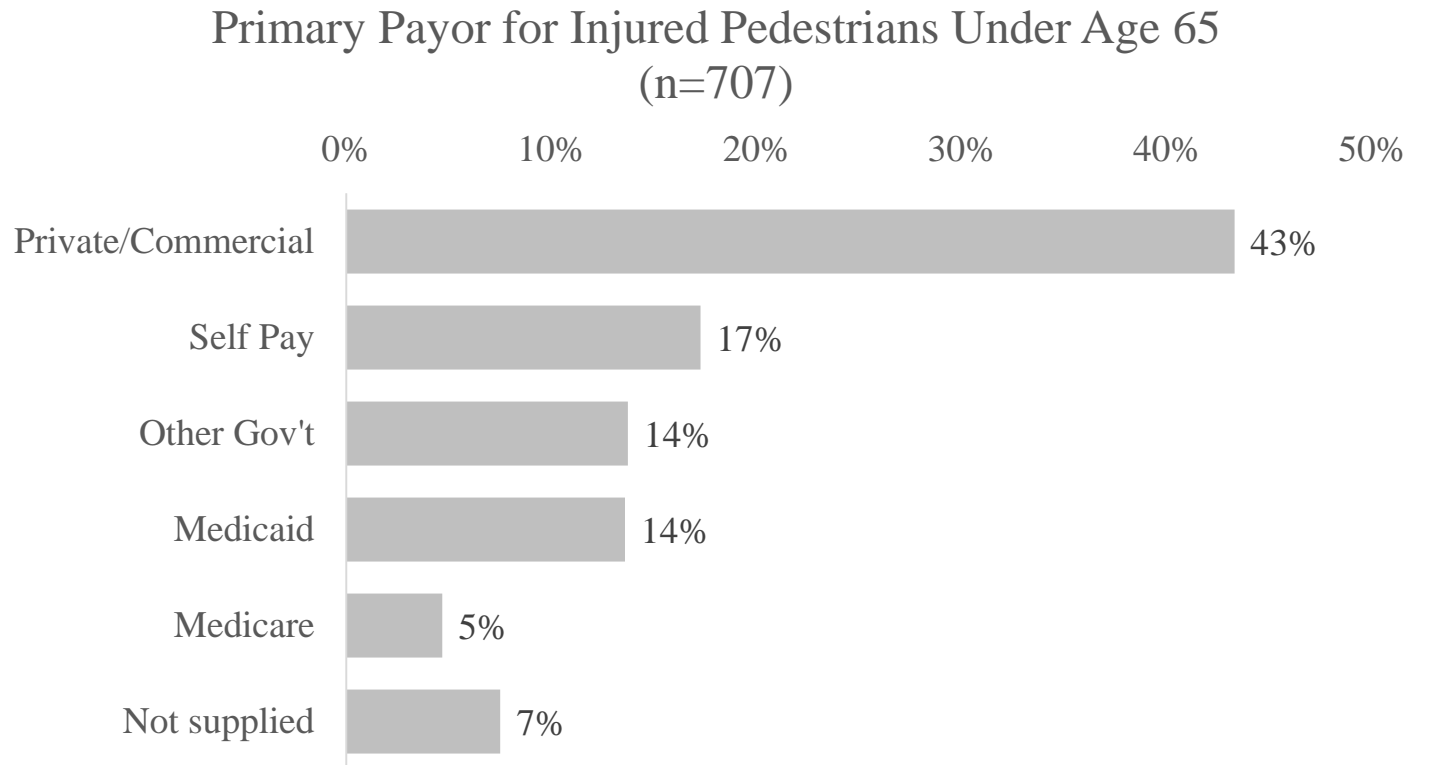
74% of the pedestrian crash hospital encounters coded by law enforcement officers as “K-Fatality” were admitted or died in the hospital. The remaining 26% were discharged home or left against medical advice.



*370 hospital encounter records were excluded from analysis due to disposition codes which could not be mapped.

Insurance used by injured pedestrians

13% of the North Carolina population was uninsured in 2018. However, 17% of pedestrian crash victims under age 65 needing treatment were self pay.



*Discharges with the expected primary payer of self-pay, charity, and no charge are classified as uninsured by the Healthcare Cost and Utilization Project (HCUP) of the Agency for Healthcare Research and Quality.

Source: <https://www.census.gov/quickfacts/nc>

Funding and Acknowledgements

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Images:

Crosswalk: <https://pixabay.com/en/crosswalk-in-street-ped-crossing-1242780/>

Feet walking: <https://pixabay.com/en/walk-shoes-shoe-leg-pavement-2021/>

Hospital signs: <https://www.publicdomainpictures.net/en/view-image.php?image=114690&picture=hospital-entrances>

Person in road: <https://pixnio.com/wallpapers/ecology-person-wood-landscape-road-tree-forest-path-outdoor-grass>

Human body: https://commons.wikimedia.org/wiki/File:Human_body_silhouette.svg