The epidemiology of police-reported pedestrian injuries treated in North Carolina emergency departments: A focus on health disparities and serious injuries

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Abbreviations

AA	African-American
ACS	American Community Survey
CCHI	Carolina Center for Health Informatics
Co.	Company
ED	Emergency department
NC	North Carolina
NC DETECT	NC Disease Event Tracking and Epidemiologic Collection Tool
NC DPH	NC Division of Public Health
NCALHD	NC Association of Local Health Departments
P-yrs	Person-years
SUV	Sport utility vehicle
UNC-CH	University of North Carolina Chapel Hill
UNC HSRC	UNC Highway Safety Research Center
US	United States

Data attribution & disclaimer

NC DETECT is a statewide public health syndromic surveillance system, funded by the NC Division of Public Health (NC DPH) Federal Public Health Emergency Preparedness Grant and managed through collaboration between NC DPH and UNC-CH Department of Emergency Medicine's Carolina Center for Health Informatics. The NC DETECT Data Oversight Committee does not take responsibility for the scientific validity or accuracy of methodology, results, statistical analyses, or conclusions presented.

Co-authors & acknowledgments

- Coauthors
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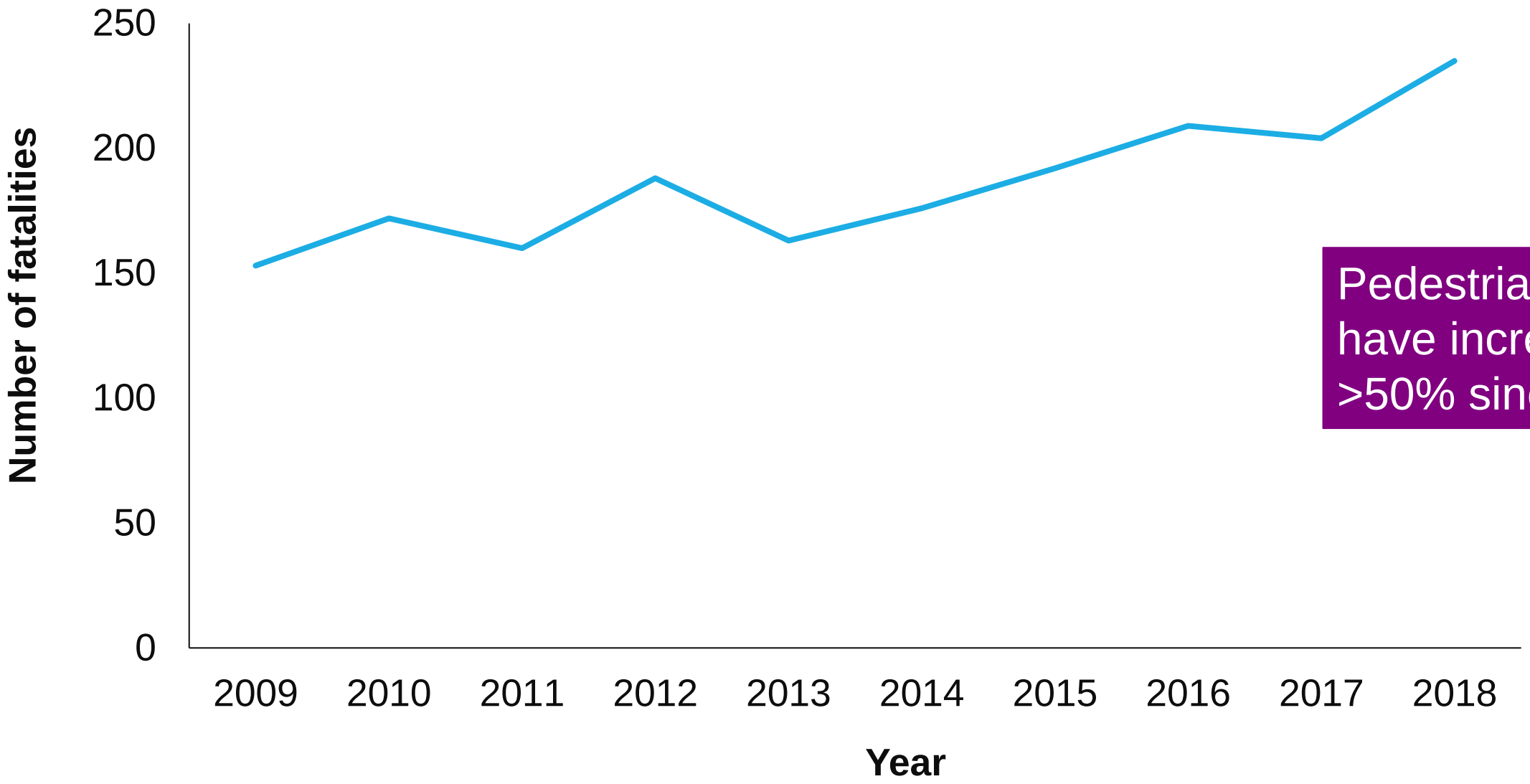
Background

RISING PEDESTRIAN FATALITIES

Rising pedestrian fatalities

- In the United States (US), the number and rate of pedestrian fatalities has increased.
- In 2018, 6,283 US pedestrians lost their lives on public trafficways, with a rate of 1.9 deaths per 100,000 person-years.
- North Carolina (NC) had the 13th highest fatality rate out of the 51 US states and District of Columbia, with a rate of 2.2 deaths per 100,000 person-years.[1]

Number of NC pedestrian fatalities: 2009-2018[2]



Pedestrian fatalities have increased by >50% since 2009

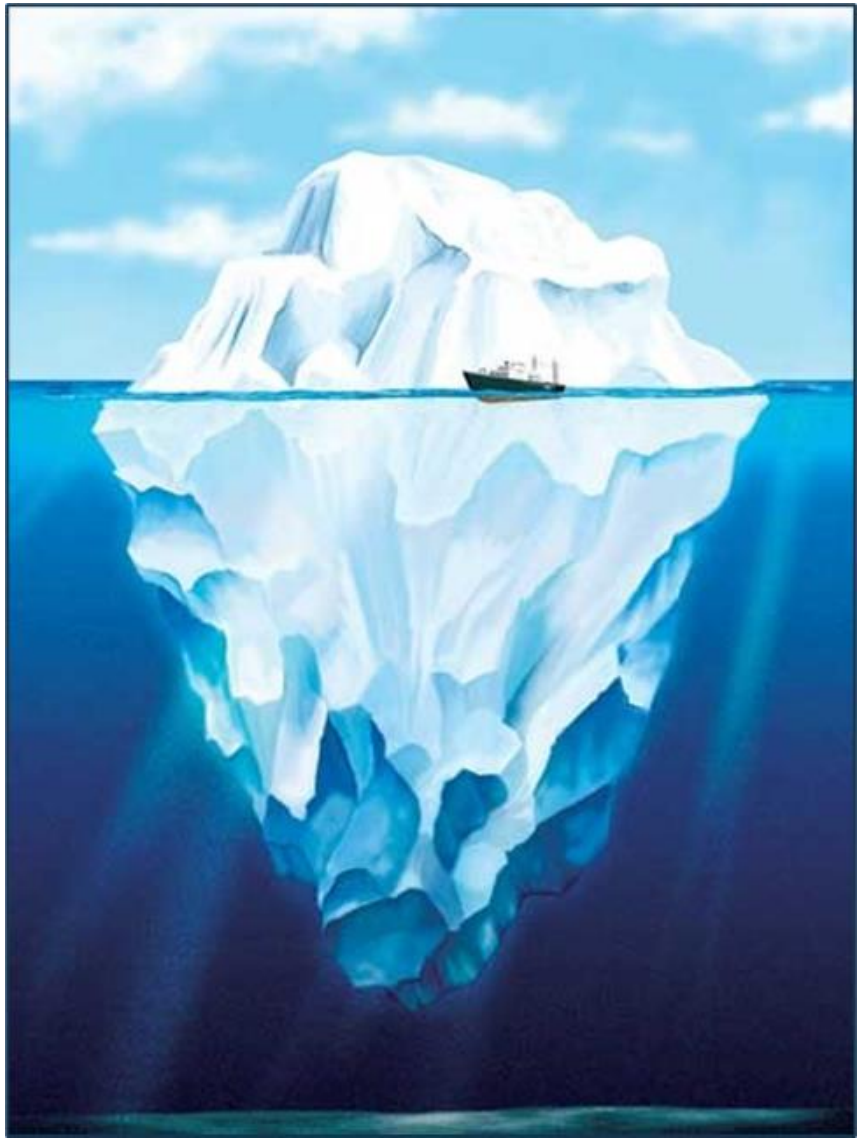
Health disparities among pedestrian fatalities

Young children, older adults, blacks/African-Americans, American Indians/Alaska Natives, pedestrians of Hispanic/Latino ethnicity, and residents of lower-income communities are at a greater risk of dying from pedestrian-motor vehicle collisions.[3-6]

Pedestrian fatalities are just part of the problem

For each pedestrian fatality,

7-10 pedestrians are treated in the emergency department (ED).[a,b]



[a]Police-reported crashes, only.

[b]Based on NC data linkages performed by study authors (estimate varies by ED visit data source).

Study objective

Perform a descriptive epidemiologic study examining the crash, health outcomes, and sociodemographic characteristics of pedestrians treated in NC EDs using linked crash, ED, and American Community Survey (ACS) data.

Methods

Study population

- Record-level information for all pedestrians involved in police-reported collisions[a] were linked to injury-related ED visits[b] captured by NC DETECT[c], NC's statewide syndromic surveillance system, for 2017.[7,8]
- Linked crash-ED visit records were then linked to 2013-2017 ACS 5-year estimates at the county level.[9]

[a]In NC, a reportable motor vehicle crash must involve a motor vehicle and take place on a public trafficway. In addition, it must meet one of the following criteria: result in a fatality, result in an injury, result in total property damage ≥$1,000, and/or involve a vehicle seizure.

[b]An injury-related ED visit was defined as an ED visit with an ICD-10-CM injury diagnosis or mechanism code (S00-T88, V00-Y99).

[c]NC DETECT is legislatively mandated to collect ED visit records from all 24/7 acute-care, hospital-affiliated, civilian NC EDs for public health surveillance and early event detection.

Data linkage

- NC crash and ED visit data were linked using hierarchical deterministic methods.
- Data linkage methods are described fully in the report titled *North Carolina Linkage Study for Motor Vehicle Crashes Involving Pedestrians and Bicyclists,* included as part of the presentation stack.[10]

Analyses

- Population-based incidence rates:
  - The incidence of police-reported pedestrian injuries treated in NC EDs were calculated using population-based denominators obtained from the National Center for Health Statistics.[11]
- Categorical analysis:
  - Used Pearson chi-square tests to compare differences in observed frequencies.
  - Set statistical significance at alpha = 0.05.

Case definition: Serious injury

- Defined a serious injury, based on a definition created by the National Transportation Safety Board (NTSB).[12]
- A serious injury was defined as an injury resulting in one or more of the following outcomes:
  - Death;
  - Hospital admission;
  - A diagnosis of an amputation, internal injury, crushing injury (except fingers and toes), fracture (except fractures of fingers, toes, or nose);
  - A diagnosis of an injury to the blood vessels, nerves, muscles, and tendons (except injuries to fingers and toes),
  - A diagnosis of a burn (except first degree burns and burns to fingers and toes);
  - A diagnosis of an air/fat embolism;
  - A diagnosis of traumatic shock;
  - Or a diagnosis of traumatic compartment syndrome.

Results

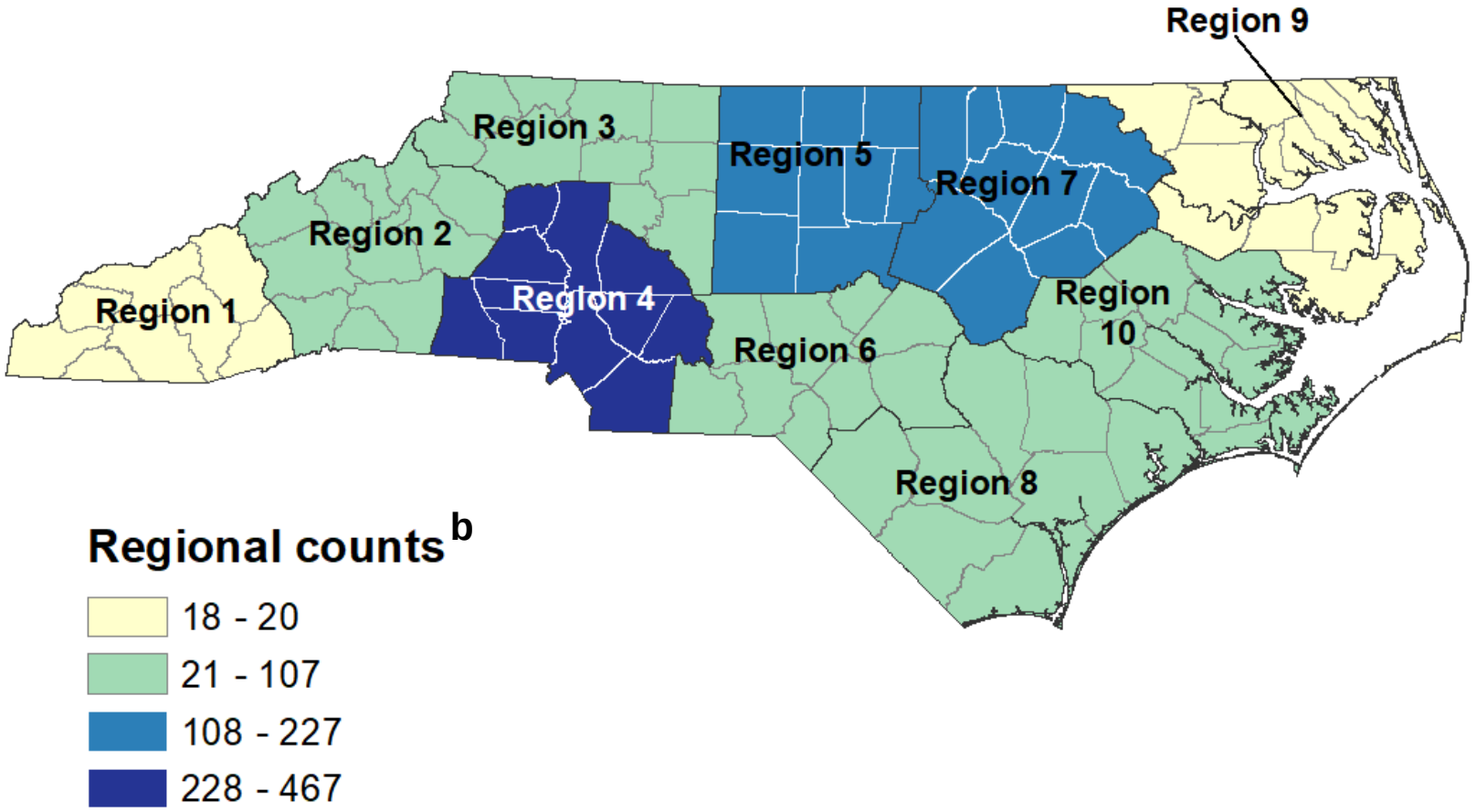
Linkage results

Linked 45% (N=1,383 linked crash-ED visit records) of NC pedestrian crash records (N=3,071 crash records) to injury-related NC ED visits (N=1,032,611 visit records).

Incidence of police-reported pedestrian injuries treated in NC EDs (N=1,383)

The incidence of police-reported pedestrian injuries treated in NC EDs was 13.6 ED visits per 100,000 person-years (p-yrs).

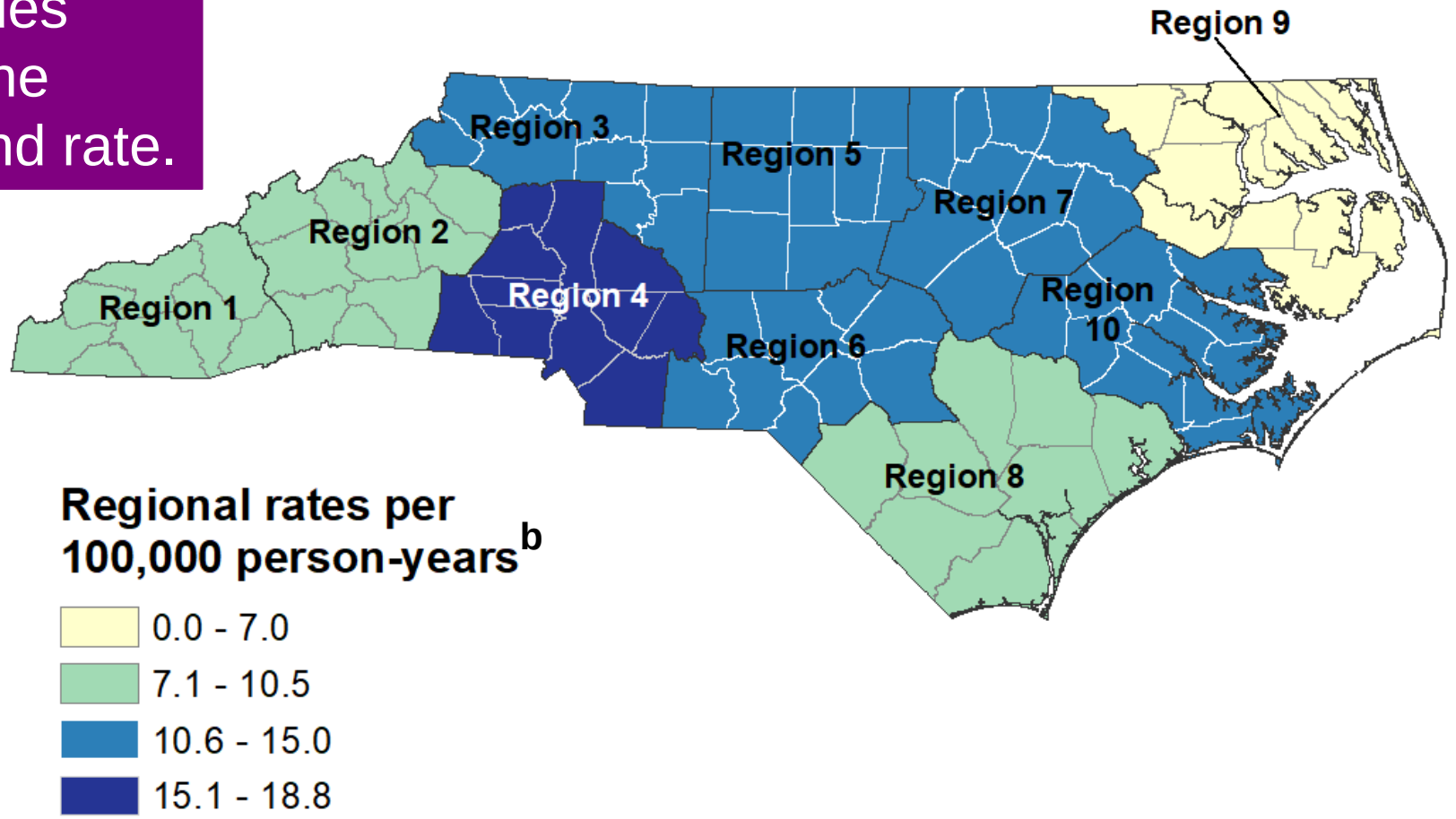
Geographic variation – Counts of pedestrians injured in police-reported crashes, by NCALHD region: NC, 2017[a]



[a]NC Association of Local Health Departments (NCALHD) Map of Regions: https://www.ncalhd.org/map.
[b]Regions classified according to “Natural Jenks” method.

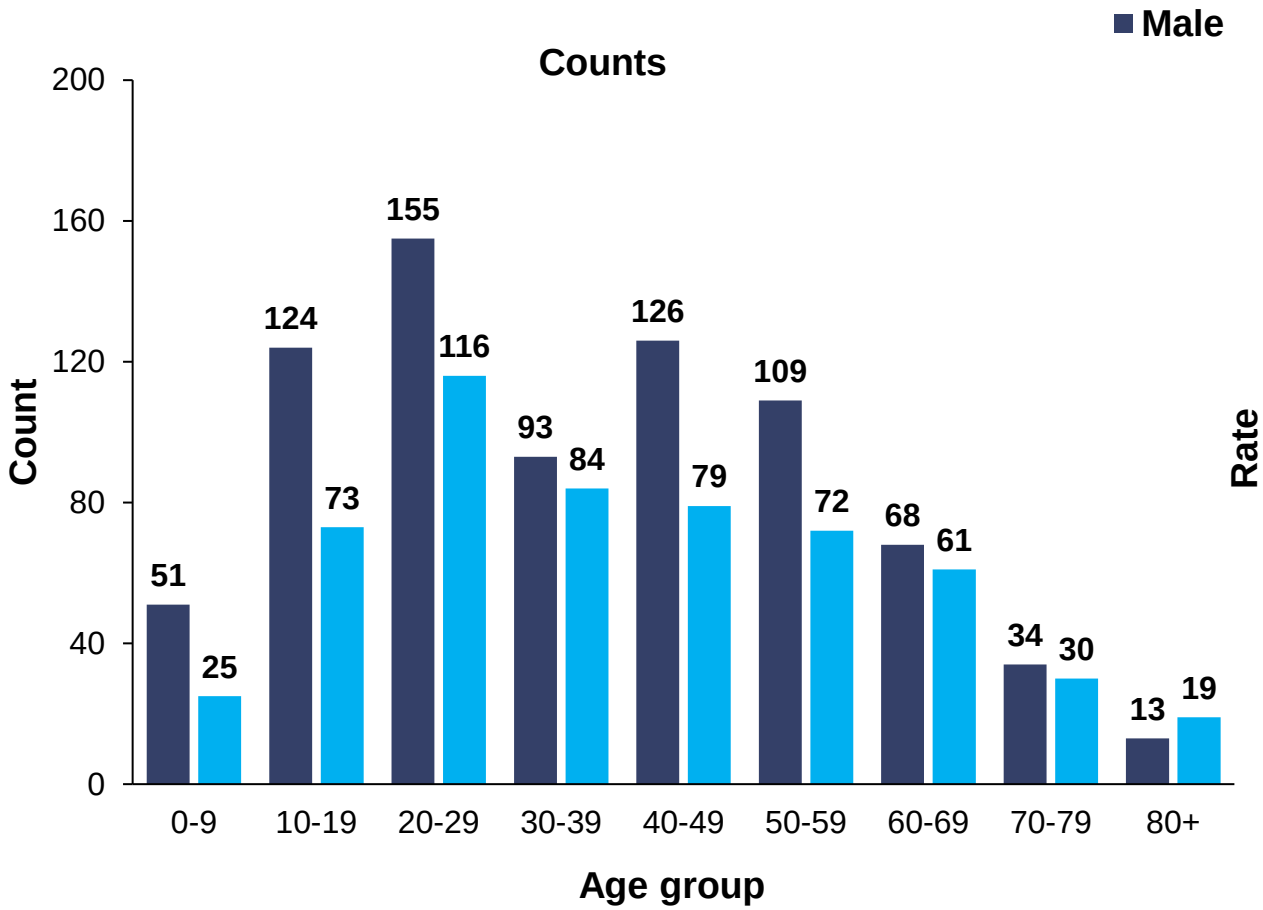
Geographic variation – Rates (per 100,000 p-yrs of pedestrians injured in police-reported crashes, by NCALHD region: NC, 2017

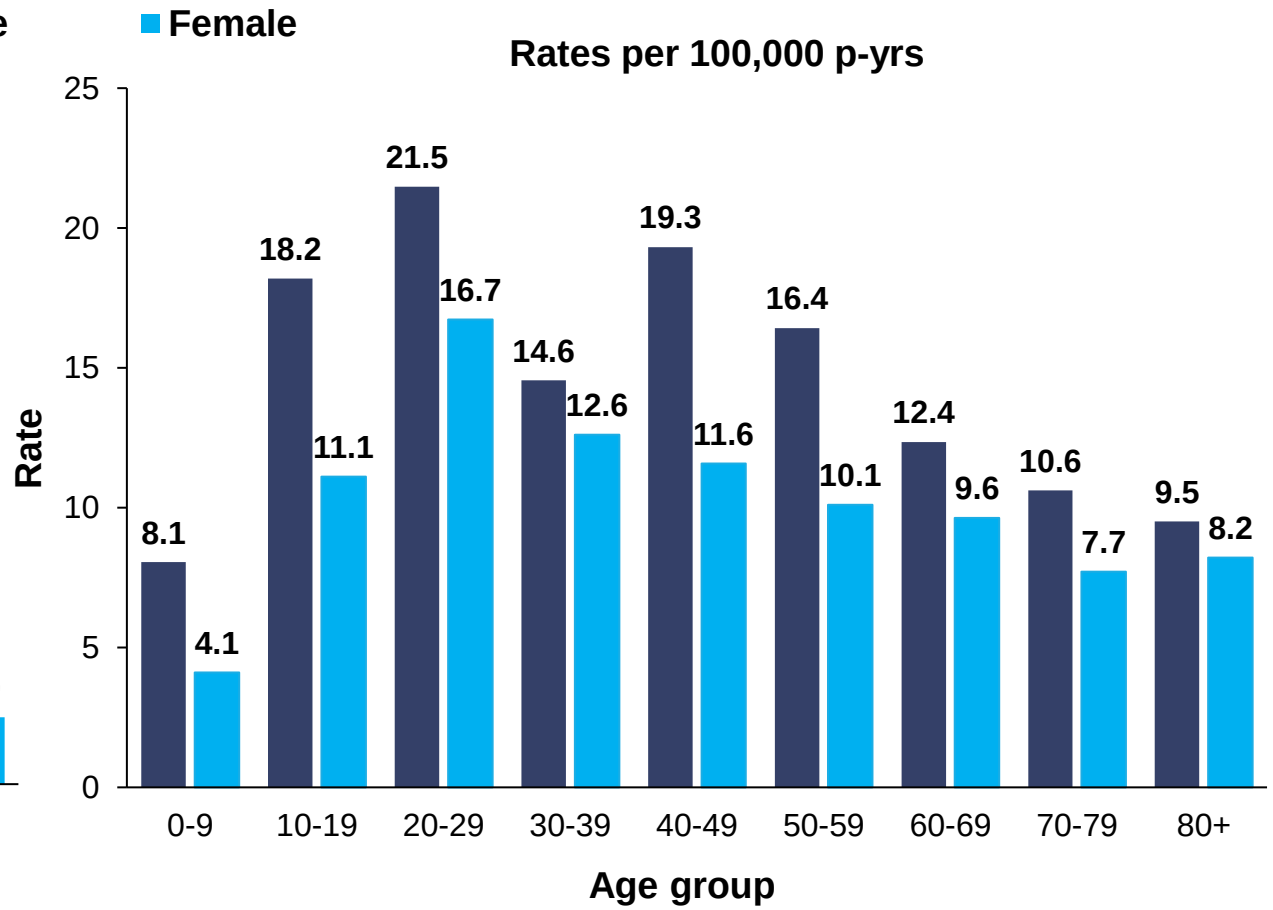
Region 4 (includes Charlotte) has the highest count and rate.



[a]NCALHD Map of Regions: https://www.ncalhd.org/map.
[b]Regions classified according to "Natural Jenks" method.

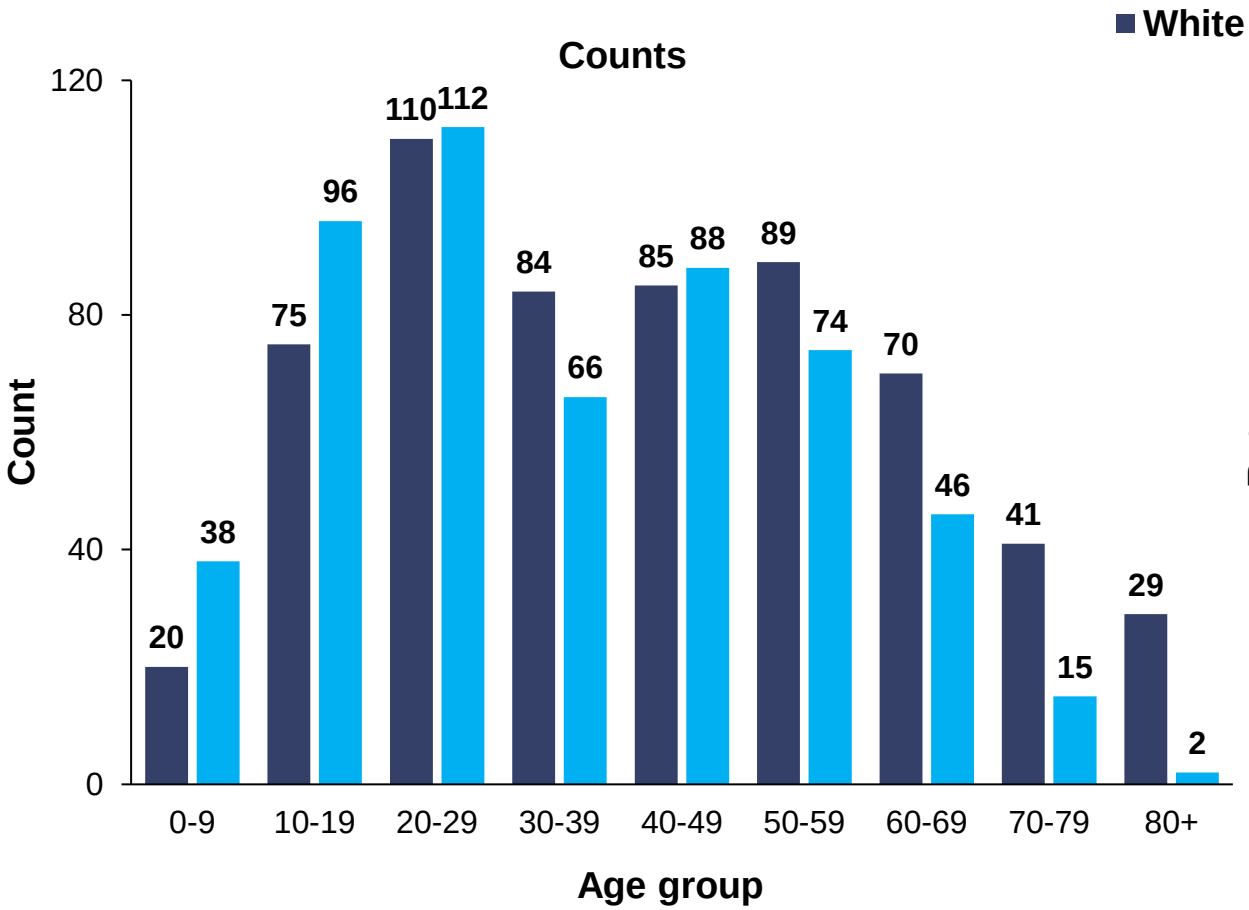
Demographic differences – Counts & rates (per 100,000 p-yrs) of pedestrians injured in police-reported crashes by sex: NC, 2017

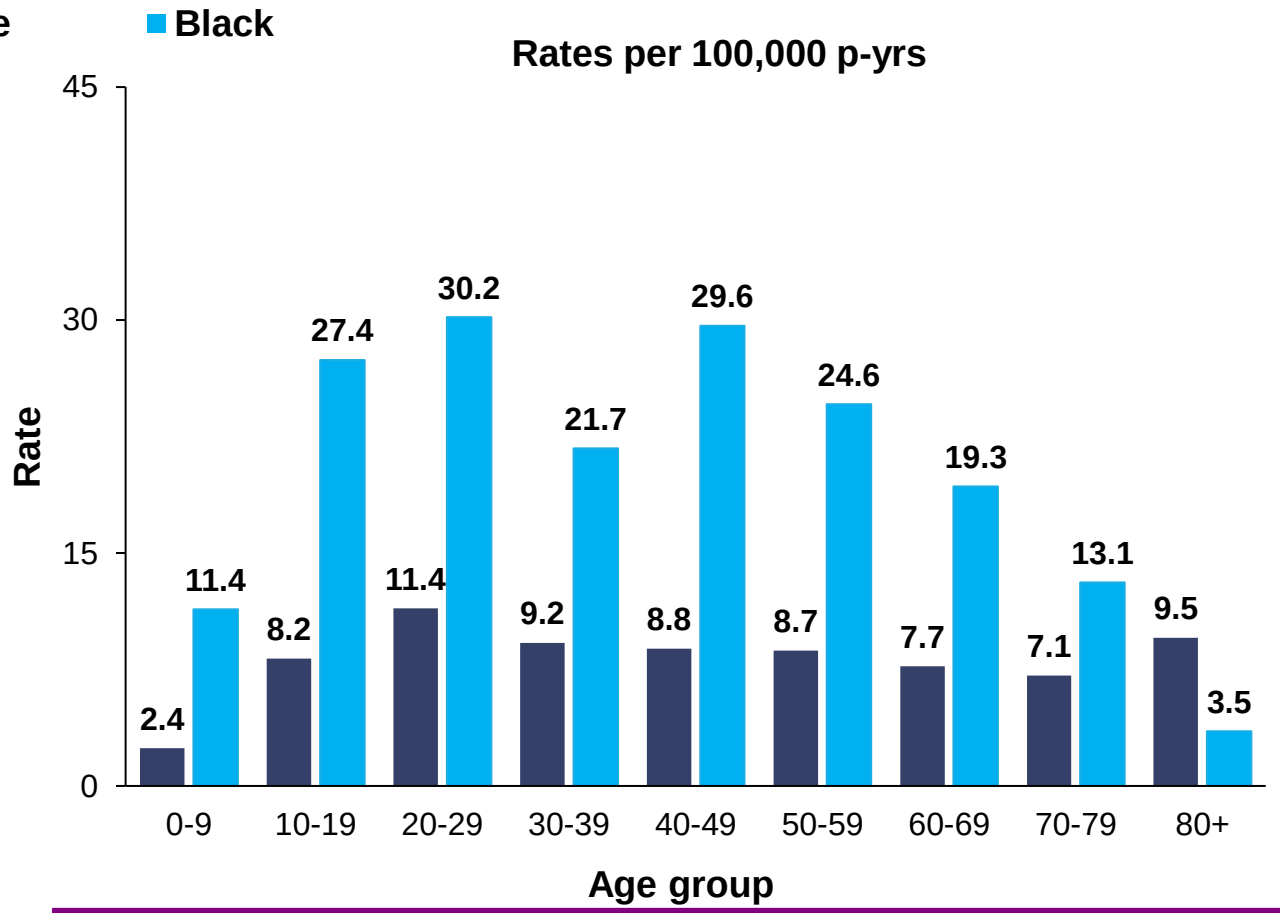




Men had higher rates for all age groups.

Demographic differences – Counts & rates (per 100,000 p-yrs) of pedestrians injured in police-reported crashes by race: NC, 2017



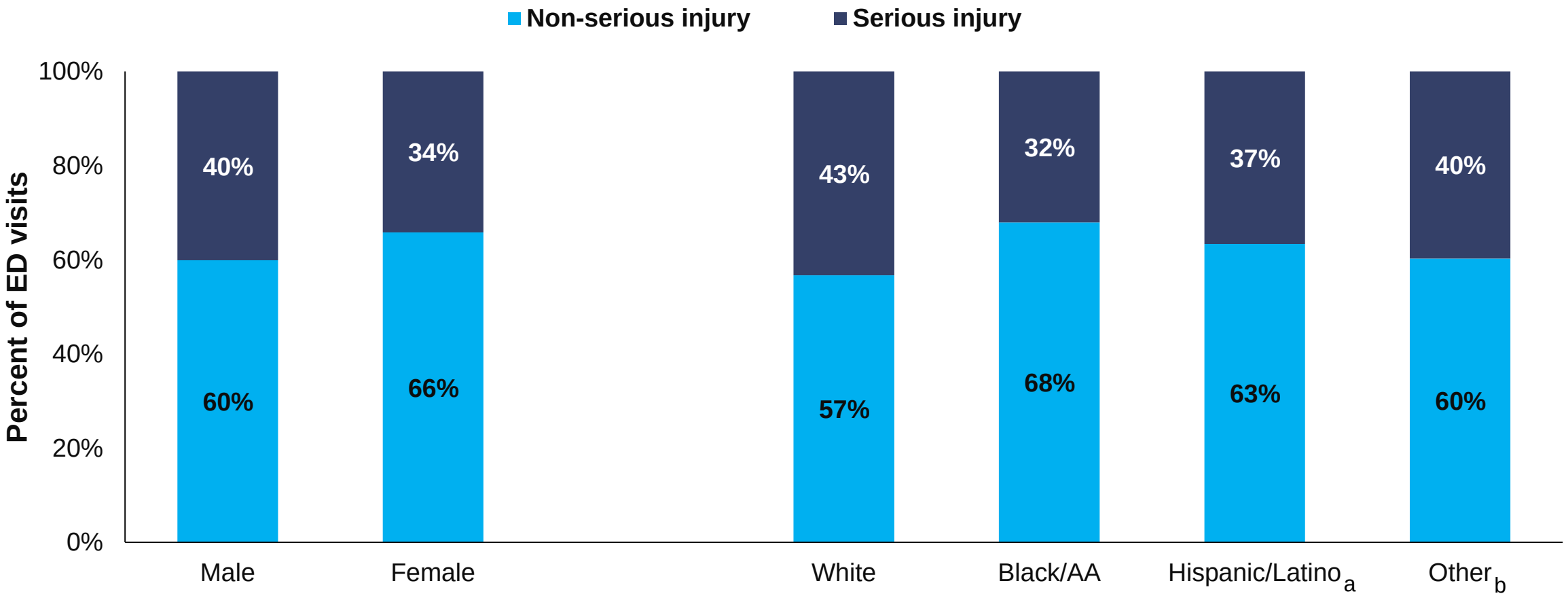


Black/African-American pedestrians had higher injury rates for all age groups, except among adults ≥80 years.

Pedestrian injury severity

Based on the NTSB definition of injury severity, 515 pedestrians treated in NC EDs had serious or fatal injuries (37%), 868 pedestrians had injuries categorized as non-serious (63%).

Pedestrian injury severity: demographic characteristics

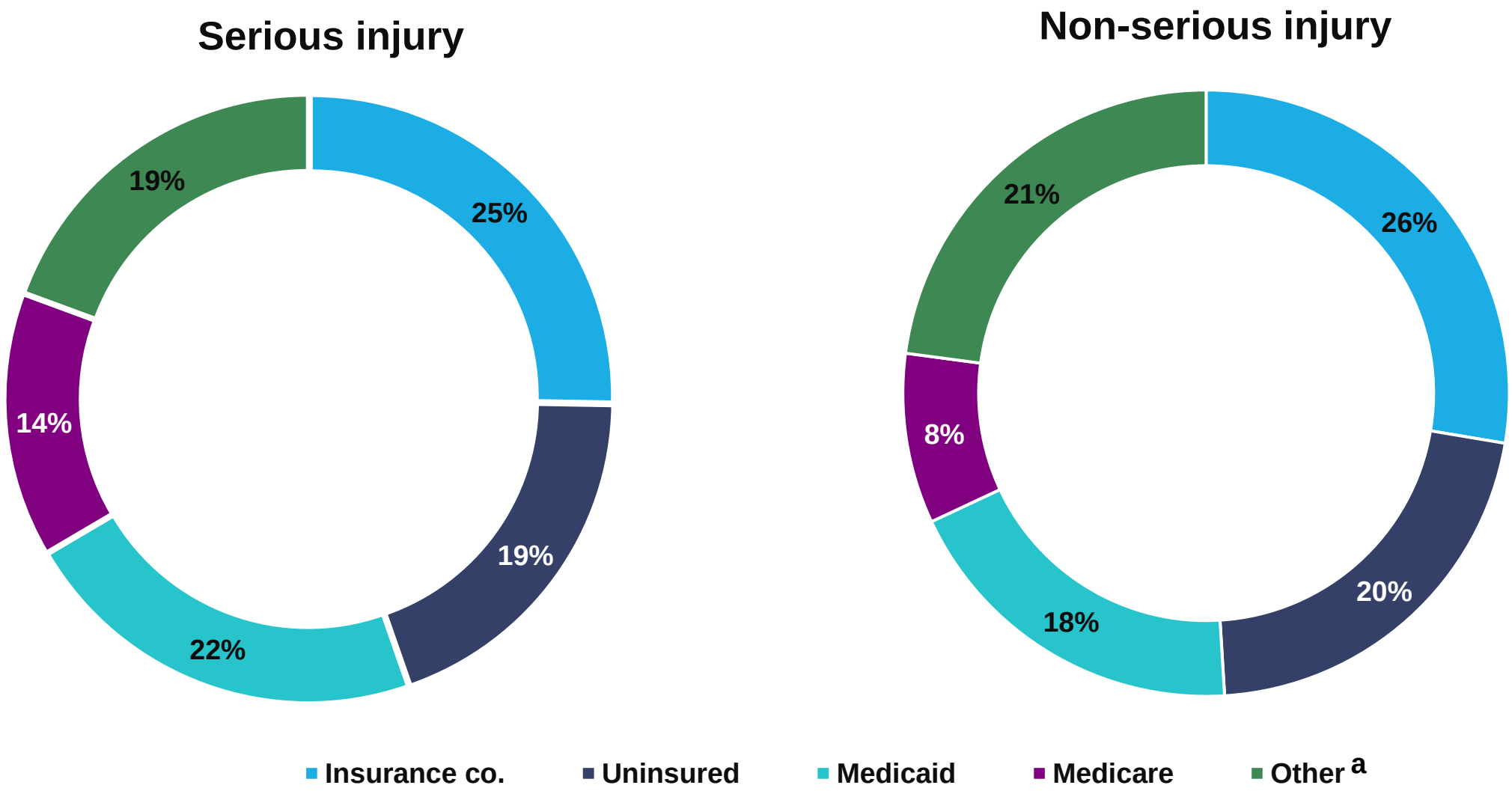


Abbreviation: AA, African-American

[a]NC crash data does not disaggregate race and ethnicity.

[b]Other race contains Asian, American Indian/Alaskan Native, and other race.

Pedestrian injury severity: Expected source of payment



Abbreviation: Co., company

[a]Other expected source of payment contains workers' compensation, other type of governmental payment, and other type of payment.

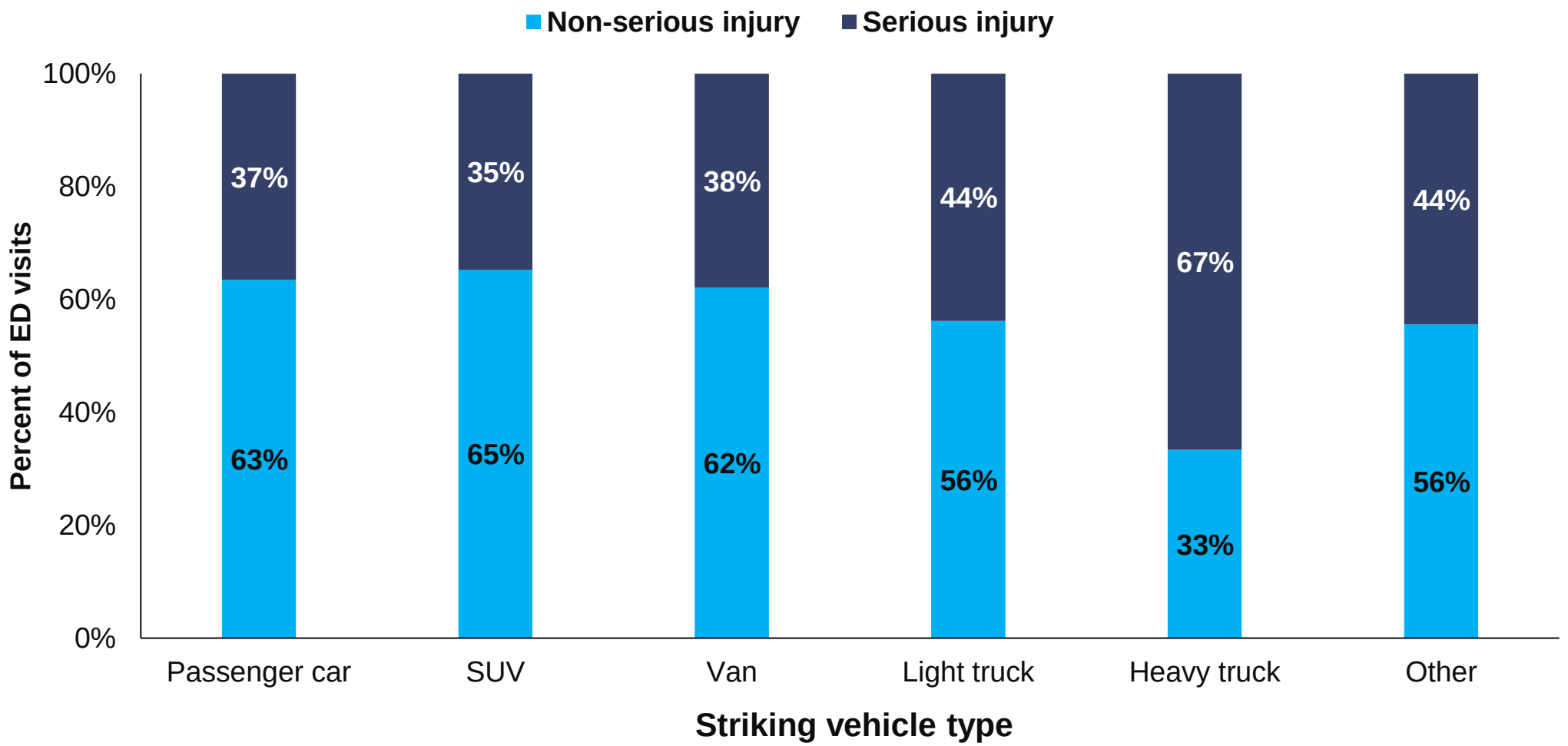
P=.026

Pedestrian injury severity: County of crash

Urban/rural county[a] of crash was not identified as being associated with injury severity; however, poverty level was associated with injury severity, with 35% of pedestrians sustaining serious injuries in NC counties with poverty levels above the 75th percentile, as compared to 27% of pedestrians injured in counties with lower poverty levels (*P*=.003).

[a]Based on US Department of Agriculture's categorization: https://www.ers.usda.gov/data-products/rural-urban-continuum-codes

Pedestrian injury severity: Striking vehicle type



Abbreviation: SUV, sport utility vehicle

[a]Other striking vehicle type contains buses, motor homes, motorcycles, mopeds, police cars, and ambulances.

P=.033

Pedestrian injury severity: Crash characteristics

- In addition to striking vehicle type, other crash characteristics associated with serious injuries among pedestrians treated in NC EDs were:
  - Hour of crash (serious injuries were more common in nighttime crashes)
  - Ambient light level of crash (serious injuries were more common under dark conditions)
  - Number of lanes (serious injuries were more common on roads with more lanes)
  - And posted speed limit (serious injuries were more common on roads with higher posted speed limits).

Conclusion

Conclusion

- Pedestrian injuries are not distributed evenly across the NC population. Communities of color and counties with higher levels of poverty are disproportionately impacted.
- In addition to sociodemographic factors, certain crash characteristics, such as striking vehicle type, are associated with pedestrian injury severity.

Pedestrian injury prevention

- Programs like NC Vision Zero, Robeson County Vision Zero, Vision Zero Charlotte, Vision Zero Durham, and Vision Zero Greensboro are working towards reducing traffic injury deaths and injuries to zero in NC.
- Learn more here: https://ncvisionzero.org/about-us/.

Study limitations

- Secondary analysis of NC ED and crash data.
- Rates were population-based, rather than exposure based (not available at the state/county level in NC).
- Not all pedestrians injured in police-reported crashes are treated in EDs and not all pedestrians treated in EDs are reported to the police. This study only examined injured pedestrians who had records in both datasets (and that were linkable).

Thank you!

Questions?

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References

1. NHTSA. 2018 Ranking of state pedestrian fatality rates. FARS. https://www-fars.nhtsa.dot.gov/States/StatesPedestrians.aspx. Updated 2020. Accessed Apr 23, 2020.
2. NC DOT. NC Bicycle and Pedestrian Crash Data Tool. Division of Bicycle and Pedestrian Transportation. http://www.pedbikeinfo.org/pbcat_nc/_pedtypefacts2.cfm. Updated 2019. Accessed Jan 2, 2020.
3. Malek M, Guyer B, Lescohier I. The epidemiology and prevention of child pedestrian injury. *Accid Anal Prev*. 1990; 22(4): 301-313.
4. Chong S, et al. Epidemiology of pedestrian-motor vehicle fatalities and injuries, 2006-2015. *AJPM*. 2018; 55(1):98-105.
5. Kaufman E, Wiebe DJ. Racial disparities in pedestrian deaths in the United States, 1999–2015. *Inj Prev*; 23(Supp 1): A38-A39.
6. Morency P, et al. Neighborhood social inequalities in road traffic injuries: The influence of traffic volume and road design. *Am J Public Health*; 102(6): 1112-1119.
7. NC DOT. *DMV-349 Instructional Manual*. Raleigh, NC: NC DMV, 2018.
8. CCHI. NC DETECT. https://ncdetect.org. UNC-Chapel Hill. Updated 2020. Accessed Apr 23, 2020.
9. US Census Bureau. GCT1701 - Percent of people below poverty level in the past 12 months. 2013-2017 ACS 5-Year Estimates. 2019.
10. Harmon KJ, Peticolas K, Waller AE. *North Carolina Linkage Study for Motor Vehicle Crashes Involving Pedestrians and Bicyclists*. Chapel Hill, NC: CCHI, 2019.
11. NCHS. Bridged-Race Population Estimates, 2017 Results. CDC WONDER. 2019. https://wonder.cdc.gov/Bridged-Race-v2018.html. Accessed Oct 1, 2019.
12. NTSB. Pilot/Operator Aircraft Accident/Incident Report. Washington, DC: NTSB; 2013.