

NORTH CAROLINA Department of Transportation

NC VRU MPO-RPO Crash Analysis Report

French Broad River Metropolitan Planning Organization

April 2023

Connecting people, products and places safely and efficiently with customer focus, accountability and environmental sensitivity to enhance the economy and vitality of North Carolina

A Introduction to the Report

This report summarizes all bicycle and pedestrian crashes in the French Broad River Metropolitan Planning Organization region in a 10-year period.

The crashes analyzed occurred between January 1st, 2012 and December 31st, 2021.

- In that 10-year period, there were 1218 total crashes. 890 were pedestrian crashes and 328 were bicycle crashes.
- Find more information here:
 - NCDOT Pedestrian and Bicyclist Crash Dashboard
 - <u>NCDOT VRU Data Viewer</u>





Definitions

What is a Vulnerable Road User (VRU)?

- FHWA defines a VRU as a nonmotorist with a fatality analysis reporting system (FARS) person attribute code for pedestrian, bicyclist, other cyclist, and person on personal conveyance or an injured person that is, or is equivalent to, a pedestrian or pedalcyclist. This includes highway workers on foot in a work zone. Please note that motorcyclists are not defined as VRUs. *Source: FHWA Vulnerable Road User Safety Assessment Guidance Memorandum*
- All VRU nonmotorist categories described as a VRU by the FHWA are captured as a bicycle or pedestrian crashes by NCDOT.
- For the purpose of this analysis, all bicycle and pedestrian crashes have been combined unless specified otherwise.
- The project team has analyzed VRU crashes in two groups:
 - All crashes (all KABCO injury classifications)
 - Fatality and serious Injury crashes (K & A injury classifications)
 - Crash data definitions pulled from the North Carolina DMV 349 Crash Report Instruction Manual

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Data Sources

- The data used in this analysis is NCDOT bicyclist and pedestrian crash geodata. It includes policereported bicycle-motor vehicle and pedestrianmotor vehicle collisions that have been coded and geolocated. Data and data dictionary can be accessed on the <u>NCDOT GIS portal</u>.
- Terms and definitions were drawn from the North Carolina Crash Report Instruction Manual, which is published by NCDOT's Division of Motor Vehicles.
- Regional demographic data is from the US Census 5-Year American Community Survey (ACS), 2017-2021.
- Roadway mileage values were calculated using the NCDOT Route Arc Characteristics feature class.



DMV-349 Crash Report Form

DMV-349 Instructional Manual

Injury Classification

KABCO Scale

The KABCO Injury Classification Scale was established by FHWA and is used to classify crash injuries in North Carolina.

- 14% of crashes were classified as K: Killed or A: Suspected Serious Injury
- 35% of crashes were classified as B: Suspected Minor Injury.
- 34% of crashes were classified as C: Possible Injury.

Crash Severity of Bicyclist and Pedestrian Crashes



Injury Classification Continued

Bicycle vs. Pedestrian Crashes

- In 12% of all bicyclist and pedestrian crashes, a ٠ pedestrian was killed (K) or seriously injured (A).
- In 2% of all bicyclist and pedestrian crashes, a ٠ bicyclist was killed (K) or seriously injured (A).



Bicyclist vs. Pedestrian Crash Severity

Context Characteristics

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Urban vs. Rural Areas

Crashes are classified as "urban" if they occurred within municipal boundaries.

- 69% of all bicycle and pedestrian crashes occurred in urban areas.
- 42% of KA crashes occurred in urban areas.

Not coded 2% Rural 29%

Urban vs. Rural for Bicyclist and Pedestrian Crashes (KA)

Rural Urban Not coded



Urban vs. Rural for Bicyclist and Pedestrian Crashes (All Severities)

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Development Level

Areas were classified according to their level of development based on the following criteria:

- Urban: More than 70% developed
- Mixed: Between 30% and 70% developed
- Rural: Less than 30% developed
- 68% of all bicyclist and pedestrian crashes occurred in urban areas.
- 45% of KA crashes occurred in urban areas.

Development Context for Bicyclist and Pedestrian Crashes (All Severities)



Mixed (30% To 70% Developed)
Rural (<30% Developed)
Urban (>70% Developed)
Not coded

Development Context for Bicyclist and Pedestrian Crashes (KA)



Mixed (30% To 70% Developed)
Rural (<30% Developed)
Urban (>70% Developed)
Not coded

Land Use Context

Land use context, or the predominant type of development in the area in which the collision occurred, is divided into the following categories:

- Farms, woods, pastures
- Residential
- Commercial
- Institutional
- Industrial
- 26% of all bicyclist and pedestrian crashes occurred in residential areas, and 27% of KA crashes occurred in residential areas.
- 59% of all bicyclist and pedestrian crashes occurred in commercial areas, and 47% of KA crashes occurred in commercial areas.





Land Use Context for Bicyclist and Pedestrian Crashes (All Severities)

Intersection vs. Non-Intersection

An intersection crash is defined as a crash that occurred at or related to an at-grade junction of two or more roads or within 50 feet of the edge line or curb of the crossing street.

- 48% of all bicyclist and pedestrian crashes occurred at an intersection.
- 23% of KA crashes occurred at an intersection.
- 76% of KA crashes occurred outside of an intersection.

Intersection vs. Non-Intersection Bicyclist and Pedestrian Crashes (All Severities)



Intersection Non-Intersection Not coded/Unknown

Intersection vs. Non-Intersection Bicyclist and Pedestrian Crashes (KA)



Roadway Characteristics & Speed

Functional Classification

Roads were categorized into 7 classes based off the functional classification system.

- Class 1: Interstate •
- Class 2: Other Freeways and Expressways ٠
- **Class 3: Other Principal Arterial** ٠
- Class 4: Minor Arterial ٠
- Class 5: Major Collector ٠
- Class 6: Minor Collector ٠
- Class 7: Local •
- 34% of all bicyclist and pedestrian crashes occurred on • a local road.
- 26% of KA crashes occurred on a local road. •
- 23% of all bicyclist and pedestrian crashes occurred on • a principal arterial road.
- 31% of KA crashes occurred on a principal arterial road. •



Functional Classification for Bicyclist and Pedestrian Crashes (All Severities)



Functional Classification for Bicyclist and Pedestrian Crashes (KA)



Functional Classification

Comparing the percent of crashes occurring on roads with different functional classifications to the total road mileage with the same classification in the region can give us an idea of the types of roads that present a high crash risk for bicyclists and pedestrians.

In FBRMPO, crashes are more likely to occur on roads with higher functional classifications, which typically ha higher speeds, higher traffic volumes, and more travel lanes.

- 5% of all road miles are principal or minor arterials bu 41% of all bicyclist and pedestrian crashes and 48% of KA crashes occur on arterials.
- 86% of all road miles are local roads but 34% of all bicyclist and pedestrian crashes and 26% of KA crashes occur on local roads.



Percent Road Mileage by Functional Classification

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Roadway Configuration for Bicyclist and Pedestrian Crashes (All Severities)

Presence of Median – Roadway Configuration

Road configuration indicates if and where a roadway is divided. It also identifies if the roadway serves one or twoway traffic. For a roadway to be classified as divided, a median must be present.

- 73% of all bicyclist and pedestrian crashes occurred on two-way roads without road division.
- 74% of KA crashes occurred on two-way roads without road division.
- 14% of all bicyclist and pedestrian crashes occurred on two-way roads divided by an unprotected median.
- 11% of all KA crashes occurred on two-way roads divided by an unprotected median.



Roadway Configuration for Bicyclist and Pedestrian Crashes (KA)



One-Way, Not Divided
Two-Way, Divided, Positive Median Barrier
Two-Way, Divided, Unprotected Median
Not coded/Unknown

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Traffic Controls for Bicyclist and Pedestrian Crashes (All Severities)



- 41% of all bicyclist and pedestrian crashes occurred on roads where no traffic control was present.
- 48% of KA crashes occurred on roads where no traffic control was present.
- 21% of all bicyclist and pedestrian crashes occurred where there was a stop and go signal (traffic signal).
- 32% of KA crashes occurred where there was a double yellow line and no passing zone.







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Number of Travel Lanes

- 50% of all bicyclist and pedestrian crashes occurred on roads with 2 lanes.
- 41% of KA crashes occurred on roads with 2 lanes.
- 23% of all crashes occurred on roads with 3-4 lanes.
- 22% of KA crashes occurred on roads with 3-4 lanes.



Number of Travel Lanes for Bicyclist and Pedestrian Crashes (All Severities)



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Posted Speed Limit

- 35% of all bicyclist and pedestrian crashes occurred where the posted speed limit was between 30 and 35 mph.
- 27% of KA crashes occurred where the posted speed limit was between 30 and 35 mph.
- 22% of all bicyclist and pedestrian crashes occurred where the posted speed limit was between 40 and 45 mph.
- 39% of KA crashes occurred where the posted speed limit was between 40 and 45 mph.





Speed Limit for Bicyclist and Pedestrian Crashes (KA)



Demographic Characteristics

Demographics

This section contains three types of demographic breakdown for the MPO.

- 1. Demographic breakdowns for the entire MPO based on the US Census 5-Year American Community Survey (ACS), 2017-2021 for:
 - Race
 - Ethnicity
 - Sex
 - Age
 - Limited English-speaking households
 - Poverty
 - Vehicle availability
- 2. Demographics of bicyclists and pedestrians involved in crashes as reported on the DMV-349 Crash Report.
- 3. A comparison of the demographics of the Census block groups where crashes occurred to demographics for the MPO to identify disparities in communities where crashes occur.

Race and Ethnicity

MPO Demographics

- 4% of the MPO population is Black and 88% of the MPO population is White.
- 12% of the MPO population is non-White.
- 6% of the MPO population is Hispanic or Latino.



Planning Organization Demographics: Ethnicity



Sex MPO Demographics

- 52% of the MPO population is female.
- 48% of the MPO population is male.

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Planning Organization Demographics: Sex



Female Male

Planning Organization Demographics: Age



Age MPO Demographics

- 20% of the MPO population is under the age of 20.
- 31% of the MPO population is over 60 years old.

Language

MPO Demographics

Limited English-speaking households are those with household members over the age of five that speak English less than very well.

• Only 2% of households in the MPO are limited English-speaking. Planning Organization Demographics: Limited English Speaking Households



Limited English Speaking
English Speaking

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Planning Organization Demographics: Poverty Status



Under 150% Federal Poverty Level Above 150% Federal Poverty Level

Poverty

MPO Demographics

• 21% of households in the MPO are under 150% of the Federal poverty level.

Vehicle Ownership

MPO Demographics

• 5% of households in the MPO have no vehicle available for use.

Planning Organization Demographics: Vehicle Available



Race & Ethnicity

Pedestrians

- 62% of all pedestrian crashes involved a White pedestrian.
- 10% of all pedestrian crashes involved a Black pedestrian
- 72% of KA pedestrian crashes involved a White pedestrian.
- 7% of KA pedestrian crashes involved a Black pedestrian.



Race & Ethnicity

Bicyclists

- 83% of all bicyclist crashes involved a White bicyclist.
- 6% of all bicyclist involved a Black bicyclist.
- 88% of KA bicyclist crashes involved a White bicyclist.
- 8% of KA bicyclist crashes involved a Black bicyclist.



Race or Ethnicity of Bicyclist in Bicyclist Crashes (All Severities)

White

Black

Asian

Other

Hispanic

Native American

Not coded/Unknown



Sex

Pedestrians

- 50% of all pedestrian crashes involved a male pedestrian.
- 63% of KA pedestrian crashes involved a male pedestrian.



Sex of Pedestrian in Pedestrian Crashes (All Severities)



Sex of Pedestrian in Pedestrian Crashes (KA)

Sex

Bicyclists

- 74% of all bicyclist crashes involved a male bicyclist.
- 82% of KA bicyclist crashes involved a male bicyclist.

Sex of Bicyclist in Bicyclist Crashes (All Severities)



Sex of Bicyclist in Bicyclist Crashes (KA)



Age

Pedestrians

- 23% of pedestrians involved in pedestrian crashes were between 20 and 29 years old, and 15% were between 40 and 49 years old.
- 23% of pedestrians in KA pedestrian crashes were between ages 20 and 29.



Age of Pedestrian in Pedestrian Crashes (All Severities)



Age of Pedestrian in Pedestrian Crashes (KA)

Age

Bicyclists

- 23% of bicyclists involved in a bicyclist crash were between the ages of 20 and 29.
- 27% of bicyclists involved in a KA bicyclist crash were between the ages of 50 and 59.





Age of Bicyclist in Bicyclist Crashes (All Severities)

Overrepresentation by Census Block Group

The demographics of the locations (i.e., Census block groups) where bicyclist and pedestrian crashes occurred in FBRMPO were compared to the demographics of the MPO as a whole to identify disparities in communities where crashes have taken place in the last ten years.

- 55% of all bicycle and pedestrian crashes and 53% of KA crashes occurred in census block groups where the non-White population is greater than the MPO average.
- 55% of all bicyclist and pedestrian crashes and 58% of KA crashes occurred in census block groups where the population between 20-29 years old is greater than the MPO average.
- 53% of all bicycle and pedestrian crashes occurred in census block groups where the percent of households with no vehicle available is greater than the MPO average.

Time & Weather

Year

- The highest percentage of all crashes occurred in 2014 and 2018.
- The highest percentage of KA crashes occurred in 2012 and 2020.



Bicyclist and Pedestrian Crashes by Year (All Severities vs. KA)

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Month

- 11% of all bicyclist and pedestrian crashes occurred in October, with 10% of all bicyclist and pedestrian crashes occurring in both December and September.
- 11% of KA crashes occurred in October as well as in December.

11%^{11%} 11% 10% 10% 10% _{9%} 10% 9% 9% 9% 8% 8% 8% 8% 8% 8% 7% 7% 6% 6% ^{6%} 6% 5% ^{0%} 0% January February March April May June July August September October November December Not coded All Crashes KA Crashes

Bicyclist and Pedestrian Crashes by Month (All Severities vs. KA)

Day of the Week

- For all bicyclist and pedestrian crashes, collisions most often occurred on Thursday, representing 17% of all crashes occurring during the week.
- For KA crashes, collisions most often occurred on Tuesday, representing 19% of all KA crashes that have occurred during the week.

Bicyclist and Pedestrian Crashes by Day of the Week (All Severities vs. KA)



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Time for Bicyclist and Pedestrian Crashes (All Severities)

Hour

- Bicyclist and pedestrian crashes of all severities most often occurred between 3 PM and 7 PM (38%).
- KA crashes most often occurred between 6 PM and 8 PM (26%).



Time for Bicyclist and Pedestrian Crashes (KA)



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Time of Day for Bicyclist and Pedestrian Crashes (All Severities)

Time of Day

Light conditions were determined by the type of light that existed at the time of the crash. Extremely cloudy conditions may be classified as dawn (or dusk) if the ambient light conditions are similar.

- 56% of all bicyclist and pedestrian crashes occurred during daylight conditions.
- 61% of KA crashes occurred during dark conditions.





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Light Conditions

- 56% of all crashes occurred at daylight.
- 45% of KA crashes occurred on dark roadways that were not lit.









Weather Conditions

Weather conditions are defined as general atmospheric conditions present at the time of the crash.

- 77% of all bicyclist and pedestrian crashes • occurred during clear weather conditions.
- 80% of KA crashes occurred during clear ٠ weather conditions.
- 12% of all bicyclist and pedestrian crashes • occurred during cloudy conditions.
- 10% of KA crashes occurred during cloudy ٠ conditions.



Weather Conditions for Bicyclist and Pedestrian Crashes (All Severities)





Weather Conditions for Bicyclist and Pedestrian Crashes (KA)

Road Conditions

Road condition describes the roadway surface conditions at the time and place of the crash.

- 85% of all bicyclist and pedestrian crashes occurred on dry roadway surfaces.
- 13% of all bicyclist and pedestrian crashes occurred on wet roadway surfaces.
- 85% of KA crashes occurred on dry roadway surfaces.
- 14% of KA crashes occurred on wet roadway surfaces.





Road Condition for Bicyclist and Pedestrian Crashes (KA)



Crash Type & Other Factors

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Vehicle Type

- Vehicle type describes the kind of vehicle that was involved in the collision with a bicyclist or pedestrian. Vehicle types were classified as:
 - Small: motorcycles, mopeds, motor scooters or motor bikes, pedal cycles, pedestrians, all-terrain vehicles.
 - Mid: passenger cars, taxicabs.
 - Large: pickups, light trucks (mini-van, panel), sport utility vehicles, vans.
 - Bus/Truck: all buses, single unit trucks, truck/trailers, tractor/semi-trailers, tractor/doubles, unknown heavy trucks, motor homes, recreational vehicles.
 - Industrial: farm equipment, farm tractors.
 - Government: firetrucks, EMS vehicles, ambulances, military, police.
 - Other: other vehicle not listed above.
- 81% of all bicyclist and pedestrian crashes involved a mid or large size vehicle (46% and 35% respectively).
- 85% of KA crashes involved a mid and large size vehicle (46% and 39% respectively).







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Pedestrian Crashes

Pedestrian Position

In 58% of all pedestrian

In 77% of KA pedestrian

in the travel lane.

in the travel lane.

crashes, the pedestrian was

crashes, the pedestrian was

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Pedestrian Position for Pedestrian Crashes (All Severities)

Pedestrian Position for Pedestrian Crashes (KA)



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Crash Group

Pedestrian Crashes

Crash Group describes the circumstances of the crash.

- In 21% of all pedestrian crashes, the collision occurred while the pedestrian was crossing the roadway and the vehicle was not turning.
- In 28% of KA pedestrian crashes, the pedestrian was crossing the roadway and the vehicle was not turning.
- In 15% of all pedestrian crashes, the pedestrian was walking along the roadway.
- In 15% of KA pedestrian crashes, the pedestrian was walking along the roadway.
 - More details about the "Walking Along the Roadway" crash group in the next slide.









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Walking Along the Roadway

Pedestrian Crashes

The crash group "Walking Along the Roadway" can be broken down into several crash types that provide more detail about the circumstances of the crash.

- In all crashes where pedestrians were hit while walking along the roadway, 74% of pedestrians were walking with the flow of traffic and struck from behind.
- In KA crashes where pedestrians were hit while walking along the roadway, 59% of pedestrians were walking with the flow of traffic and struck from behind.

Walking Along the Roadway for Pedestrian Crashes (All Severities)



Walking Along the Roadway for Pedestrian Crashes (KA)



Bicycle Crashes

lane.

lane.

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Bicyclist Position in Bicyclist Crashes (All Severities)

Crash Group

Bicycle Crashes

Crash Group describes the circumstances of the crash.

- In 20% of all bicyclist crashes, the collision occurred as a result of the motorist overtaking the bicyclist (bicyclist swerved, the motorist misjudged space, the bicyclist was undetected by the motorist, etc.).
- In 42% of KA bicyclist crashes, the collision occurred as a result of the motorist overtaking the bicyclist (bicyclist swerved, the motorist misjudged space, the bicyclist was undetected by the motorist, etc.).

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Crash Group for Bicyclist Crashes (All Severities)



Crash Group for Bicyclist Crashes (KA)



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Hit and Run

In cases where a vehicle involved in the crash leaves the scene, it is classified as a hit and run.

- 22% of all bicyclist and pedestrian crashes were a hit and run.
- 14% of KA crashes were a hit and run.

Hit and Run for Bicyclist and Pedestrian Crashes (All Severities)



Hit and Run for Bicyclist and Pedestrian Crashes (KA)



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Work Zone

Work Zone crashes are defined as crashes that occurred in or near a construction work area, maintenance work area, utility work area, or other road work area.

- 1% of all bicyclist and pedestrian crashes occurred in a work zone.
- 2% of KA crashes occurred in a work zone.

Work Zone for Bicyclist and Pedestrian Crashes (All Severities)



Work Zone for Bicyclist and Pedestrian Crashes (KA)



Pedestrian Impairment

Pedestrian Crashes

- In 77% of all pedestrian crashes, the pedestrian was not impaired.
- In 65% of KA pedestrian crashes, the pedestrian was not impaired.
- In 13% of all pedestrian crashes, the pedestrian was suspected to be under the influence of alcohol.
- In 20% of KA pedestrian crashes, the pedestrian was suspected to be under the influence of alcohol.

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Pedestrian Impairment for Pedestrian Crashes (All Severities)





Bicyclist Impairment

Bicyclist Crashes

- In 93% of all bicyclist crashes, the bicyclist was not impaired.
- In 88% of KA bicyclist crashes, the bicyclist was not impaired.
- In 2% of all bicyclist crashes, the bicyclist was suspected to be under the influence of alcohol.
- In 4% of KA bicyclist crashes, the bicyclist was suspected to be under the influence of alcohol.





Bicyclist Impairment for Bicyclist Crashes (All Severities)

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Driver Impairment

- In 77% of all bicyclist and pedestrian crashes, the vehicle driver was not impaired.
- In 78% of KA crashes, the vehicle driver was not impaired.
- In 3% of all bicyclist and pedestrian crashes, the vehicle driver was suspected to be under the influence of alcohol.
- In 5% of KA crashes, the vehicle driver was suspected to be under the influence of alcohol.



Contact Us

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Thank you!