Population Analysis: Safe Streets for WNC

This memo is a comprehensive population analysis describing spatial patterns, identifying demographic disparities, and contextual conditions associated with disparities in how different populations experience traffic safety in the Safe Streets for the WNC planning region. This analysis is used to inform engagement approaches during the safety plan's development and to inform strategies and targeted interventions for improving policy, partnerships, and outcomes in traffic safety.

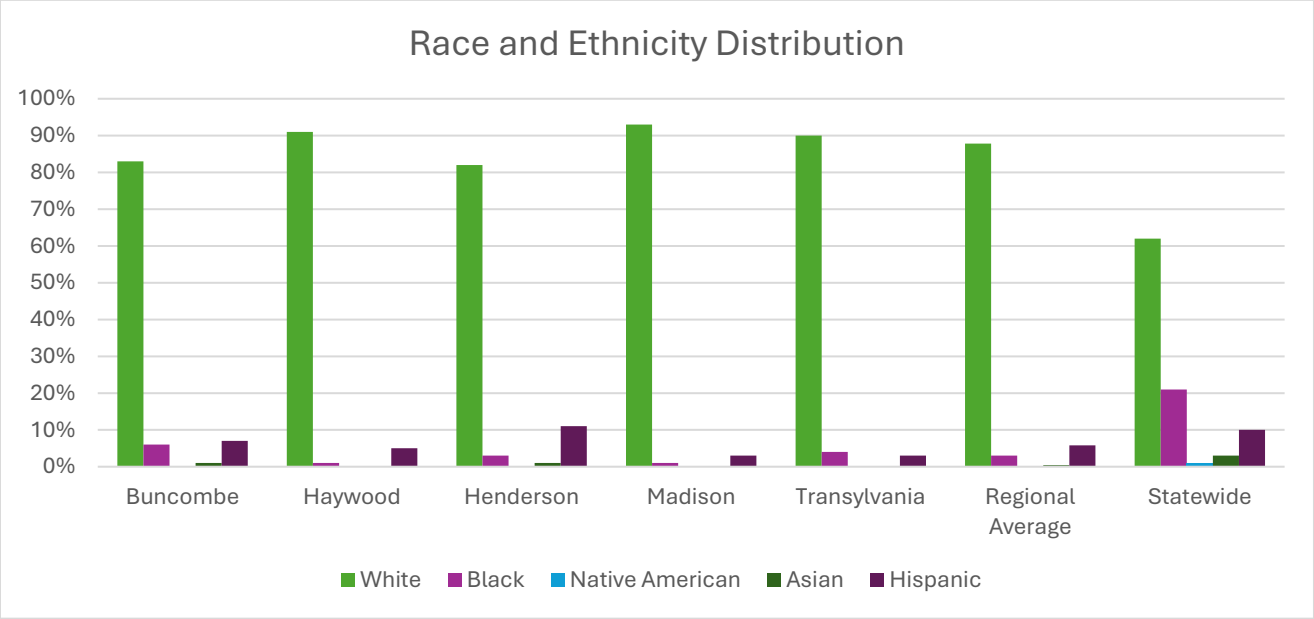
This memo identifies demographic disparities for indicators of traffic safety within the five-county region of Buncombe, Haywood, Henderson, Madison, and Transylvania counties. This involves assessing the unique needs and challenges different demographic groups face, such as low-income families, older adults, and people with disabilities. This memo references other data collected and analyzed in the Safe Streets for WNC plan, such as reported crash data, the High Injury Network (HIN), risk analysis and input gathered from the public and stakeholders during engagement activities.

The memo is organized in four sections. The first section reviews populations overrepresented in fatal and serious injury crashes and by classifications of crash types. The second section reviews all demographic groups – by age, race and gender – for populations overrepresented in reported fatal and serious injury crashes. The third section reviews three types of socioeconomic indicators – for both population overrepresentation by crash rates, and for specific areas of the region where these indicators overlap with high rates of fatal and serious crashes. The final section discusses how key themes or trends from the data can be utilized in the Safe Streets for WNC Plan and on an ongoing basis for the region.

Area Demographics

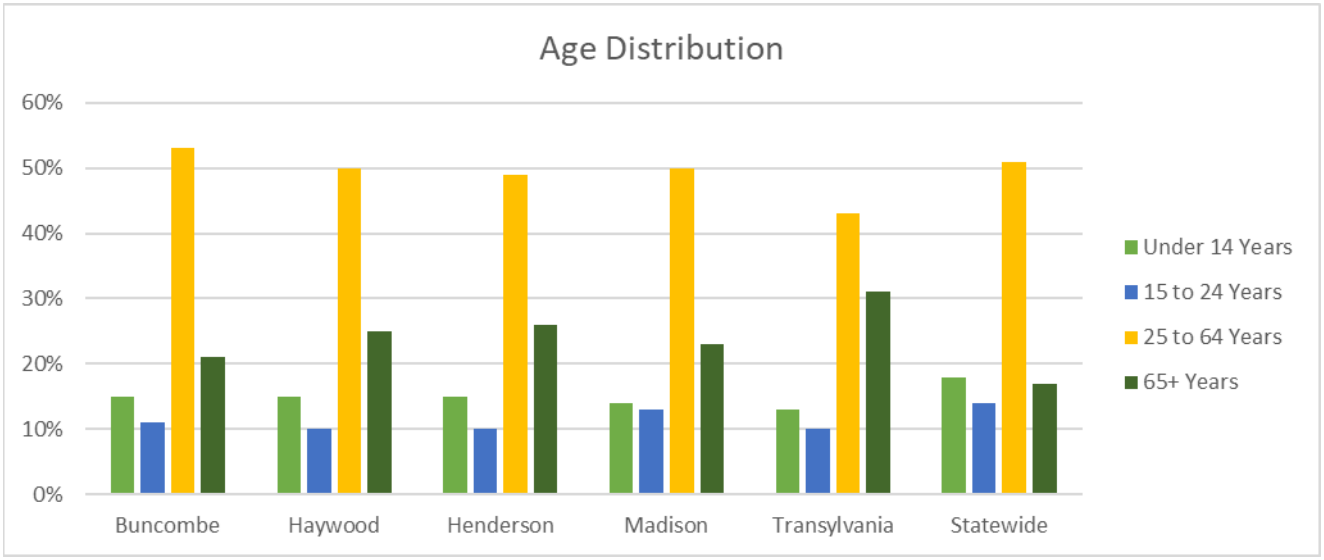
Race and Ethnicity

The chart *Race and Ethnicity Distribution* shows the racial and ethnic composition of the Region relative to statewide data. The region exhibits less racial and ethnic diversity than the state, with all counties reporting over 80% White population. Buncombe County has the highest percentage of Black population in the region, though the percentage is less than the state percentage. The percentage of Hispanic individuals is highest in Henderson County, where it is also higher than the statewide average.



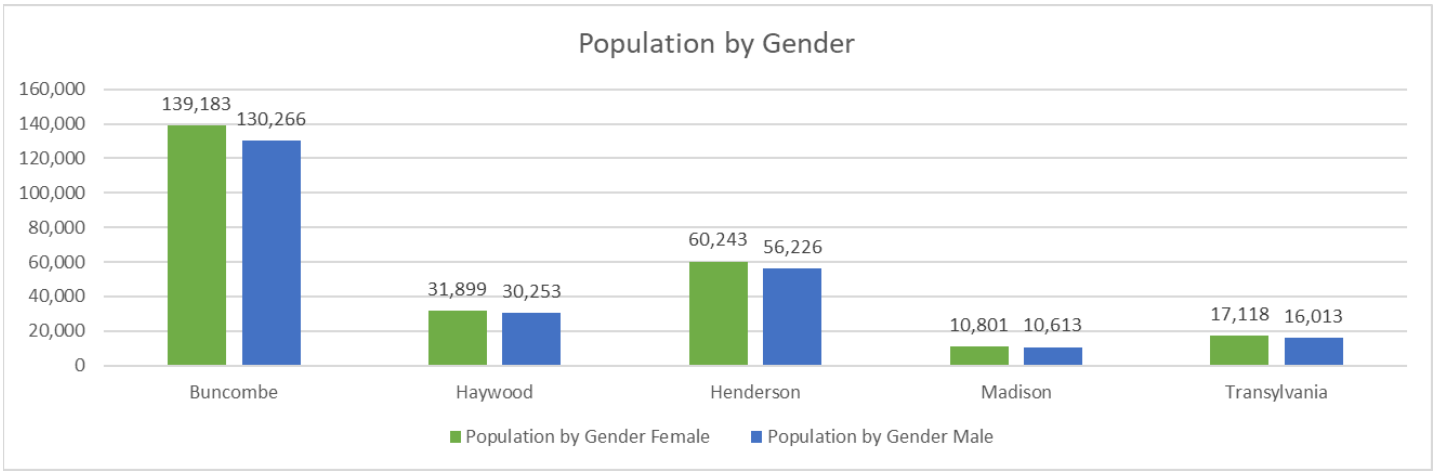
Age

The *Age Distribution* chart reveals the 25 to 64 years age group is the largest demographic across all counties and statewide, with percentages generally around or above 50%. The most notable insight is the high percentage of 65+ years group relative to the state percentage, indicating an overrepresentation of this group in each of the counties in the region.



Gender

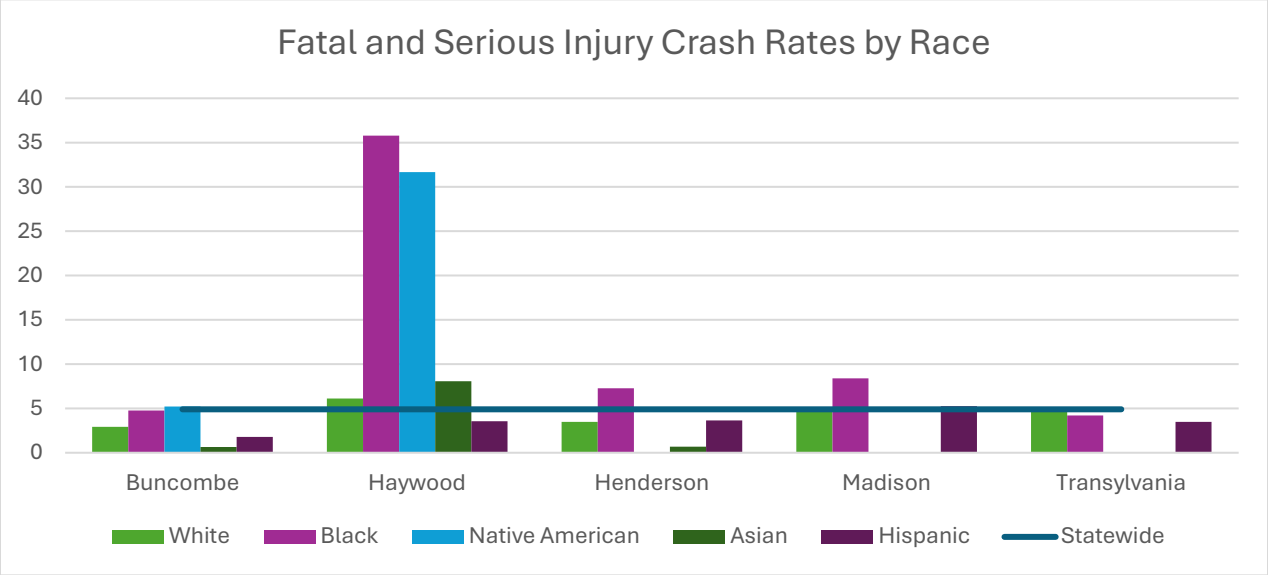
The *Population by Gender* graphic shows that females slightly outnumber males in all of the counties in the Region.



Who is Overrepresented in Crash Data?

Crash Rates by Population Group

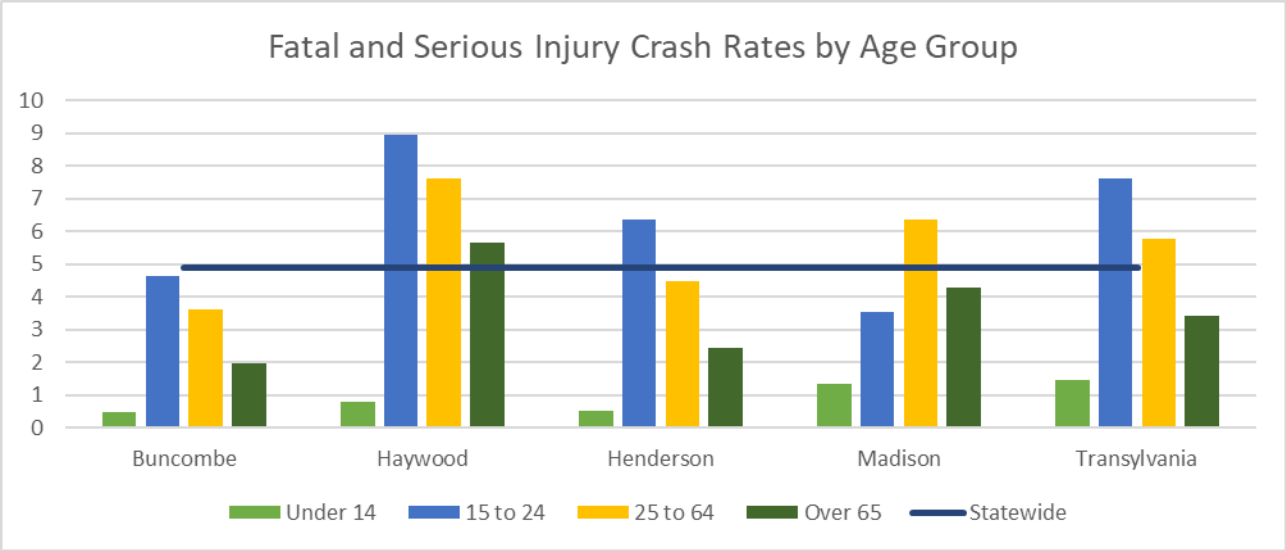
Race



The *Fatal and Serious Injury Crash Rates by Race* chart shows significant disparities in crash rates among different racial groups, particularly in Haywood County. Notably, in spite of their relatively low presence in the County, the crash rates for Black and Native American populations are substantially higher than the statewide rate. This disparity could indicate heightened transportation-related risks for these minority groups in Haywood County. Crash rates for Black populations in Henderson and Madison Counties are also higher than the state rate, though not as markedly as in Haywood County. Despite the prevalence of the White population in all of the counties in the region, the fatal and serious injury crash rates for this group is comparable to or below the state rate.

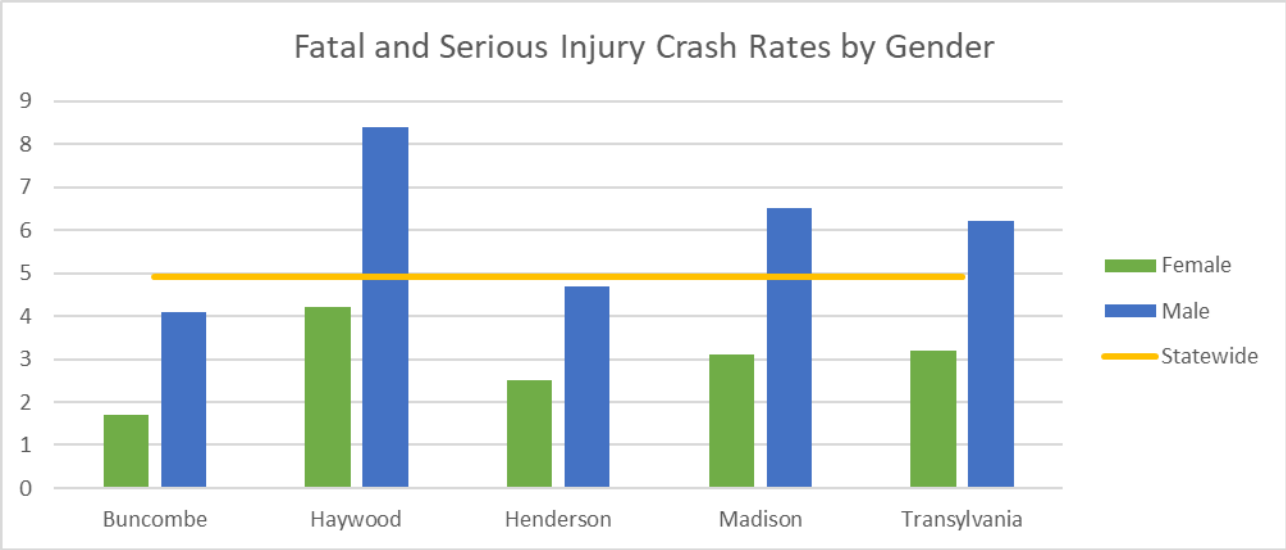
Age

The chart Fatal.and.Serious.Injury.Crash.Rates.by.Age Group illustrates that the 15 to 24 years age group faces markedly higher fatal and serious injury crash rates, particularly in Haywood and Transylvania counties. Both counties exhibit rates well above the statewide crash rate. Similarly, the "25 to 64" age group also shows elevated crash rates in Haywood, Madison and Transylvania Counties. In spite of the overrepresentation of the 65+ age group in the counties relative to the group's presence in the state, their fatal and serious injury crash rate in lower than the state rate in all counties, except Haywood.



Gender

The chart Fatal.and.Serous.Injury.Crash.Rates.by.Gender shows that males consistently exhibit higher crash rates than females in all the counties in the region. Haywood County has the highest crash rate for males, which significantly exceeds the statewide rate. Crash rates for males in Madison and Transylvania Counties also exceed the state rate. The data underscore a clear pattern where males are more prone to fatal and serious injury crashes than females.



Overrepresentation in Specific Crash Types

“Over-representation” is defined, for the purpose of this section, as a higher percentage of the population group impacted by a crash type compared to the percentage of that population in the region (based on Census data). Tables 1 and 2 show the percent of a crash type by race or ethnicity and age, respectively, of persons involved in the fatal or serious injury crash. Males are consistently overrepresented in all crash types so a table for gender was not prepared.

Race.

Table 1: Population Representation Among Crash Types (Race)

Crash Types	Native American	Asian	Black	Hispanic	Other	Unkown	White
Animal					20.0%		80.0%
Bicyclists			2.9%		2.9%	2.9%	91.4%
Distracted	0.5%	0.5%	3.6%	5.0%	1.4%	1.4%	87.7%
Heavy Truck		2.6%	11.5%	3.9%	2.6%		79.5%
Impaired	0.6%	0.3%	7.4%	5.8%	0.6%	1.6%	83.7%
Intersection	0.2%	0.2%	5.7%	3.9%	1.1%	0.9%	87.9%
Lane Departure	0.6%	0.2%	6.7%	5.6%	0.9%	0.2%	85.9%
Motorcycle	0.3%		4.4%	2.1%	0.3%		93.0%
Older Driver	0.2%	0.2%	4.2%	1.1%	0.9%	0.7%	92.7%
Pedestrian			6.1%	6.8%	1.5%	15.2%	70.5%
Seat Belts and Car Seats	0.8%	0.3%	8.0%	6.5%	1.0%		83.4%
Speed	1.0%	0.3%	9.7%	7.9%	1.4%		79.7%
Younger Driver			7.5%	6.0%	1.5%	0.5%	84.5%
Regional Population Share	**0.0%**	**0.0%**	**3.0%**	**6.0%**	**0.0%**	**3.0%**	**88.0%**

Compared with the total share of the regional population, Black individuals are overrepresented in all crash types, except for Bicyclists. Most notable is the share of Heavy Trucks, Speed-related, Seat Belts, and Younger Driver crashes. Native Americans are overrepresented in several fata and serious crash types, most notably Seat Belts and Speed-related crashes. Hispanic individuals are overrepresented in Pedestrian, Seat Belt and Speed-related crashes. Asian individuals are overrepresented in Distracted and Heavy Truck crashes. White individuals are overrepresented in Bicyclists, Motorcycle, and Older Driver crashes. The smaller percentages for Other and Unknown groups across most categories might indicate potential underreporting or smaller population sizes, necessitating a cautious interpretation.

Age

Table 2: Population Representation Among Crash Types (Age)

Crash Type	Under 14	15-24	25-64	65+
Animal		20.00%	80.00%	
Bicyclists	5.71%	14.29%	71.43%	8.57%
Distracted	1.82%	11.82%	60.91%	25.45%
Heavy Truck		17.95%	66.67%	15.38%
Impaired	2.56%	19.17%	70.93%	7.35%
Intersection	2.73%	13.67%	59.23%	24.37%
Lane Departure	2.23%	18.27%	64.19%	15.31%
Motorcycle	0.26%	10.18%	76.24%	13.32%
Older Driver	0.66%	5.95%	29.30%	64.10%
Pedestrian	2.27%	14.39%	65.15%	18.18%
Seat Belts and Car Seats	1.55%	19.95%	62.44%	16.06%
Speed	0.34%	26.21%	65.52%	7.93%
Younger Driver	4.50%	63.00%	20.50%	12.00%
Regional Population Share	**14.4%**	**10.8%**	**49.0%**	**25.2%**

Compared with the total share of the regional population, Teens and young adults (15-24) are overrepresented in all fatal and serious injury crash types, except Motorcycle and Older Driver crashes. Most notable is the share of Younger Driver crashes. Mid-aged adults (ages 25-64) are overrepresented in all crash types, except Younger and Older Drivers. Older adults (ages 65+) are overrepresented in Older Driver crashes.

Where are Crashes Occurring Relative to Measures of Vulnerability?

Social Vulnerability Index

The Social Vulnerability Index (SVI) is a tool developed by the Centers for Disease Control and Prevention (CDC) to help identify communities needing support before, during, and after human-made and natural disasters. Although traditionally used for disaster preparedness, the SVI's comprehensive assessment of socioeconomic and infrastructure factors also makes it a valuable tool for transportation planning, as it also helps to identify communities that are more susceptible to traffic incidents. It uses a range of socioeconomic and infrastructure factors to assess a community's resilience. The total score for the Social Vulnerability Index was found to be a statistically significant risk factor for Lane Departure, Speed, Bicyclist, Pedestrian, and Motorcyclist crashes resulting in fatalities or serious injuries in the WNC region.

Inputs:

- Socioeconomic status: Income, poverty, employment, and education levels.
- Household composition: Age, single-parent households, and disability status.
- Minority status and language: Race, ethnicity, and English proficiency.
- Housing and transportation: Housing type, crowding, and vehicle access.

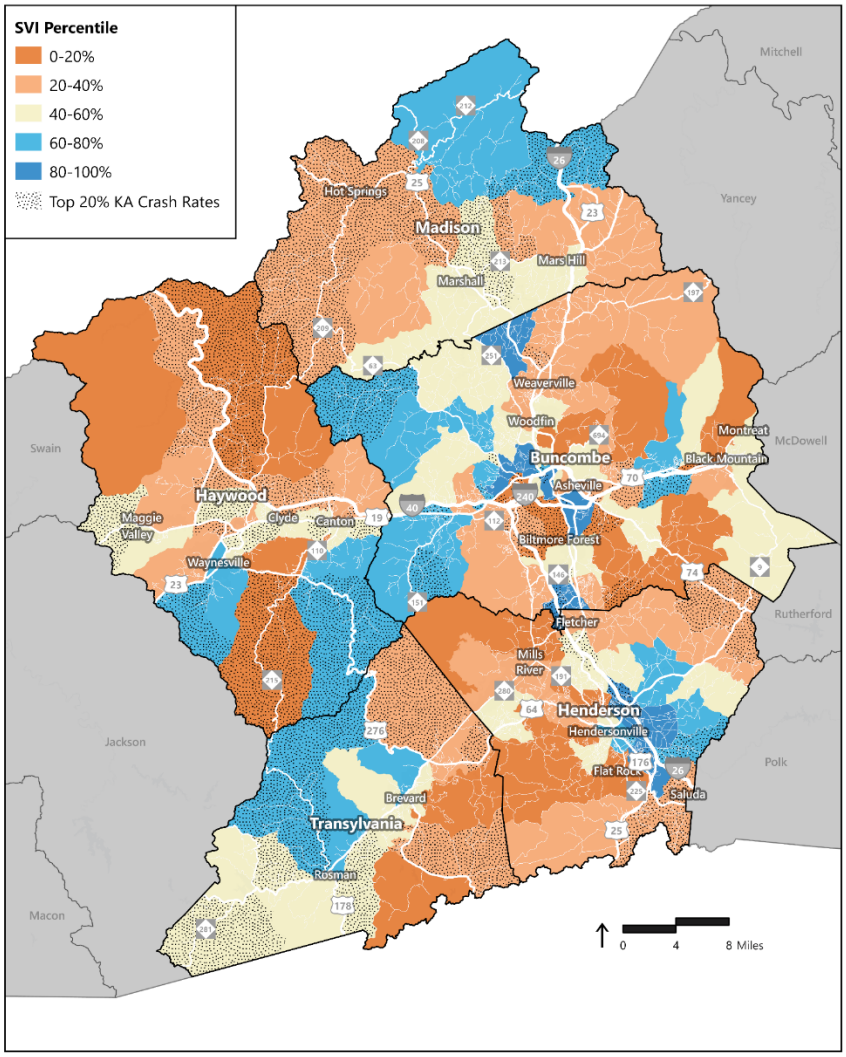
Caveats:

- Data aggregation: Aggregated data may mask vulnerabilities at a local level.
- Updated Data: This may not reflect current conditions depending on when the data was collected.

The chart Social.Vulnerability.Index compares social vulnerability and crash rates involving fatalities and serious injuries (Top 20% KA crash rates). It shows no clear correlation between the two. The 20-40% SVI percentile (relatively low vulnerability) and the 60-80% SVI percentile (relatively high vulnerability) are the only categories showing overrepresentation of fatal and serious injury crashes. Despite the lack of a definitive overall trend, it is important to pay attention to where this trend is occurring (seen on the map SVI.Percentile), to guide focused interventions aimed at reducing the overrepresentation.


Social Vulnerability Index
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Fatal and Serious Injury Crashes
Total Population
0-20%
20-40%
40-60%
60-80%
80-100%

The map Social.Vulnerability.Index.(SVI) Percentiles shows the Social Vulnerability Index (SVI) Percentiles and the top 20% of fatal and serious injury crash rates. The SVI Percentiles are color-coded, ranging from the lightest shade of blue (0-20%) to the darkest shade of blue (80-100%). High SVI areas, indicated by the darkest blue (80-100% SVI), are observed in regions such as Fletcher, parts of Hendersonville, and areas to the west of Buncombe County. These regions exhibit the highest levels of social vulnerability. Moderate SVI areas, represented by medium to dark blue (40-80% SVI), are scattered throughout the county, notably clustering around central and western regions, including parts of Marshall and Hot Springs. Low SVI areas, seen in the lightest blue (0-40% SVI), predominantly occupy the northeastern and southwestern parts of the map, such as Flat Rock and Cedar Mountain areas, indicating lower social vulnerability in these regions.



Hatched areas represent the top 20% of crash rates. Analyzing the correlation, regions such as Fletcher and parts of Hendersonville show both high social vulnerability and high fatal and serious injury crash rates, suggesting a potential correlation where areas with higher social vulnerability experience higher rates of severe traffic accidents. Moderate SVI regions, such as areas around Marshall and Hot Springs, also display high fatal and serious injury crash rates, indicating that moderate vulnerability regions are not exempt from high accident rates. There are few instances where low SVI areas overlap with high KA crash rates, such as parts of the northeastern and southwestern regions, suggesting that lower vulnerability does not guarantee low accident rates.

The map highlights areas where higher Social Vulnerability Index (SVI) scores overlap with high crash rates within the region. Areas in Haywood County show significant overlaps of high SVI percentiles (60-80%, 80-100%) with top 20% fatal and serious injury crash rates. Madison County's central area similarly exhibits overlaps of high SVI percentiles (60-80%, 80-100%) with higher crash rates, particularly along major roads. In Buncombe County, overlaps of high SVI areas with high crash rates are found, especially in the central, eastern, and southeastern regions around Asheville. South-central Henderson County, particularly around Hendersonville, shows overlapping high SVI values and crash rates, with moderate SVI values (20-60%) also coinciding with high crash rates in peripheral areas. Transylvania County's southeastern region exhibits high SVI percentiles overlapping with high crash rates, while central zones exhibit moderate SVI values and high crash rates. Notably, major highways and roads such as I-26, US 23, US 25, and US 276 in these counties traverse through many of the areas with high SVI percentiles and top 20% fatal and serious injury crash rates.

Transportation Disadvantage Index

The Transportation Disadvantage Index (TDI) was created by the North Carolina Department of Transportation (NCDOT) to measure the concentration of populations facing barriers to transportation access. TDI uses data from the 2020 ACS 5-year estimates to measure the presence of seven indicators within a block group and gives each group a score based on the concentration of the indicators. The indicator for zero-vehicle households included in TDI, was found to be statistically significant as a risk factor for bicycle and pedestrian crashes resulting in serious injuries and fatalities in the WNC region.

Indicators:

- Race (Black, Indigenous, and Persons of Color)
- People with low income
- Personal vehicle access (zero-vehicle households)
- People with mobility impairments
- older people (seniors 65+)
- Youth (aged 15 and under, unable to drive)
- Populations with Limited English Proficiency (LEP)

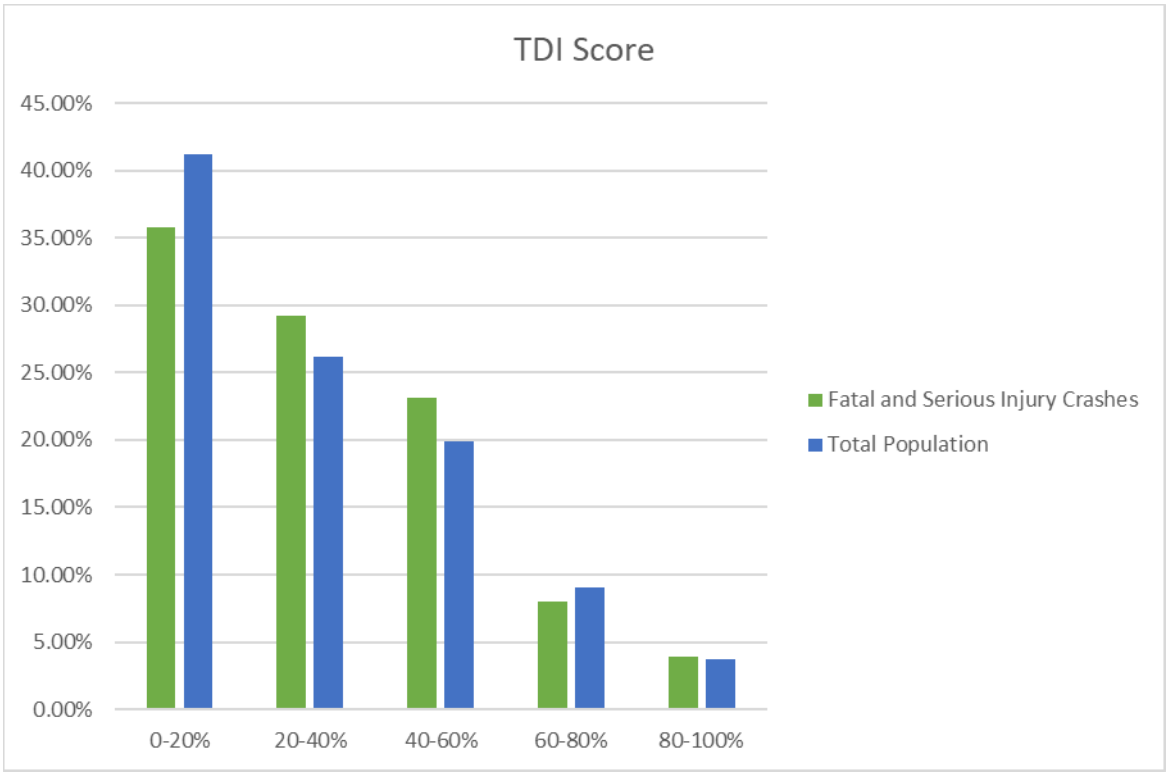
Caveats:

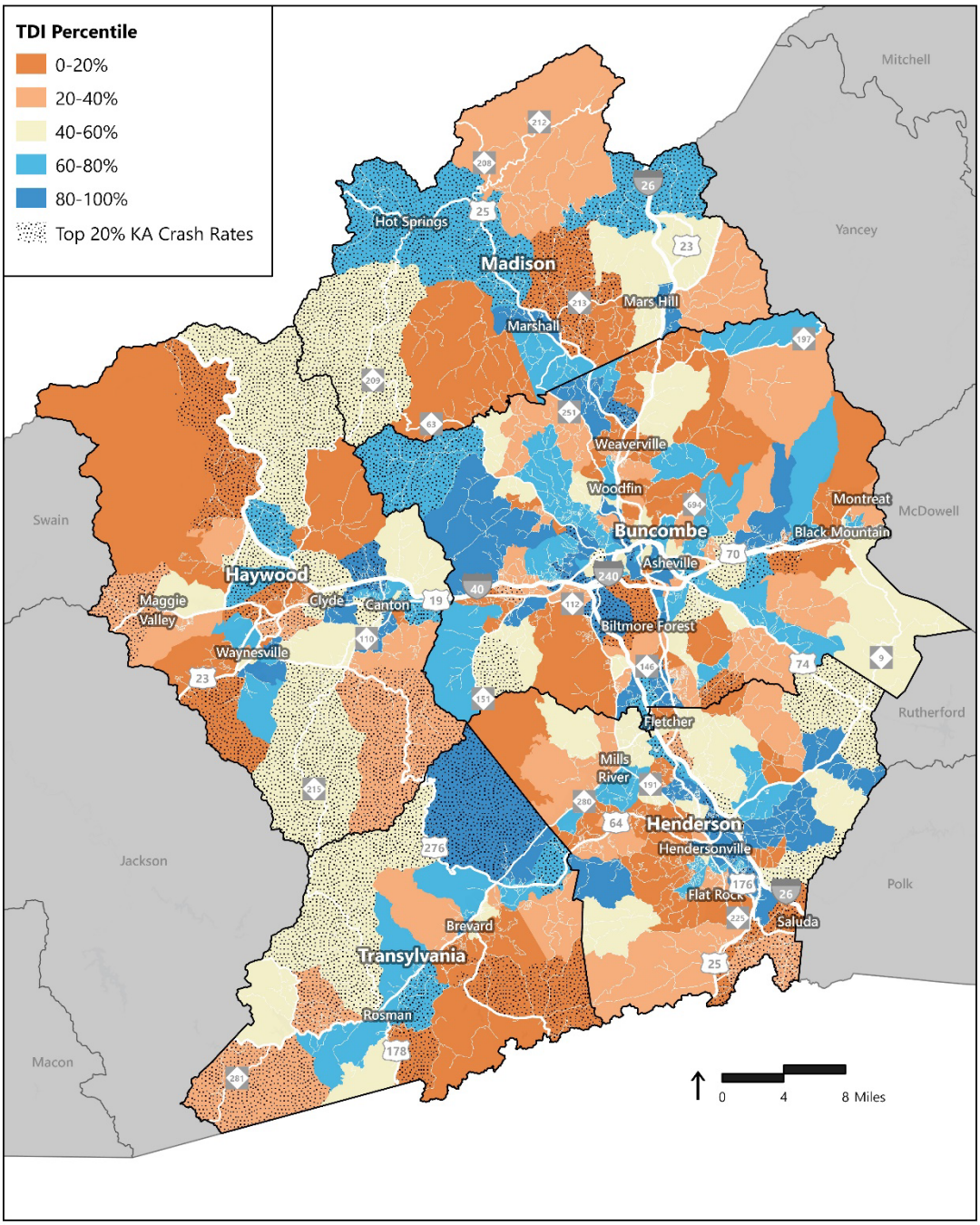
- Data limitations: May not capture recent transit changes or real-time availability.
- Subjective weighting: The relative importance of different factors can be subjective.
- Regional differences: Challenges and solutions vary widely between urban and rural areas.

The chart Transportation.Disadvantage.Index shows the relationship between fatal and serious injury crashes and the total population across various TDI score intervals: 0-20%, 20-40%, 40-60%, 60-80%, and 80-100%.

High TDI Score (60-80%, 80-100%): This indicates a higher degree of transportation disadvantage. People in these areas may have limited access to reliable or efficient transportation, leading to difficulties in commuting to work and accessing healthcare, education, or other essential services. High TDI scores often correlate with poorer socio-economic conditions, fewer transportation options, longer travel times, higher transportation costs, and greater dependency on public transit or non-motorized transport.

Low TDI Score (0-20%, 20-40%): This represents a lower level of transportation disadvantage. Areas with low TDI scores typically have better access to various transportation options, including private vehicles, efficient public transit systems, and more extensive infrastructure that supports easy and quick commutes. Residents in these areas generally experience fewer transportation hurdles and better connectivity to essential services and employment opportunities.


TDI Score
45.00%
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
0-20%
20-40%
40-60%
60-80%
80-100%
Fatal and Serious Injury Crashes
Total Population



Key Insights:

The map and bar chart show a visible correlation between higher TDI scores and elevated fatal and serious injury crash rates. The map displays the Transportation Disadvantaged Index (TDI) Score Percentiles alongside the Top 20% fatal and serious injury crash rates across multiple areas in the region. The TDI scores range from 0-20% (lightest shade, lowest disadvantage) to 80-100% (darkest shade, highest disadvantage), while areas with hatching indicate the highest fatal and serious injury crash rates.

In the northwestern portion of the region, multiple areas exhibit high TDI scores (60-80% and 80-100%) combined with high fatal and serious crash rates, indicating areas with both high transportation disadvantage and significant road safety risks. The south-central portion of the region, particularly near Brevard, also shows substantial overlaps between the higher TDI percentiles (60-80% and 80-100%) and high crash rates. Similarly, the central portion of the region, particularly around Asheville, demonstrates notable overlaps with high TDI scores (60-80% and 80-100%) and the highest fatal and serious injury crash rates, marking it as an area of critical concern.

The eastern portion of the region displays smaller, yet significant, overlaps within the 40-60% and 60-80% TDI score ranges with high crash rates. Lastly, the northeastern portion of the region includes specific localities with overlaps in the 60-80% and 80-100% TDI scores, indicating concurrent transportation and road safety challenges.

Median Household Income

Median Household Income (MHI)

Median Household Income (MHI) represents the middle point of household earnings in a specific area, with half of households earning more and half earning less. It serves as an indicator of economic health.

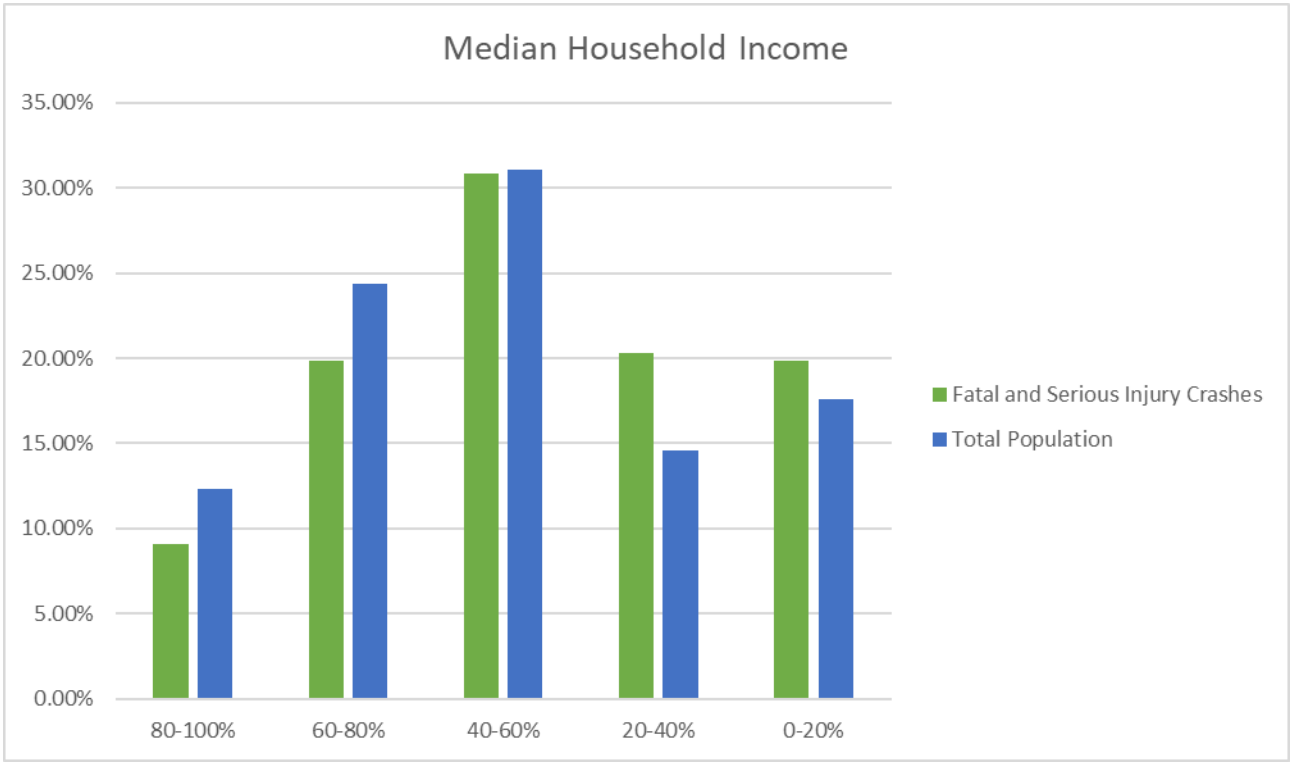
Inputs:

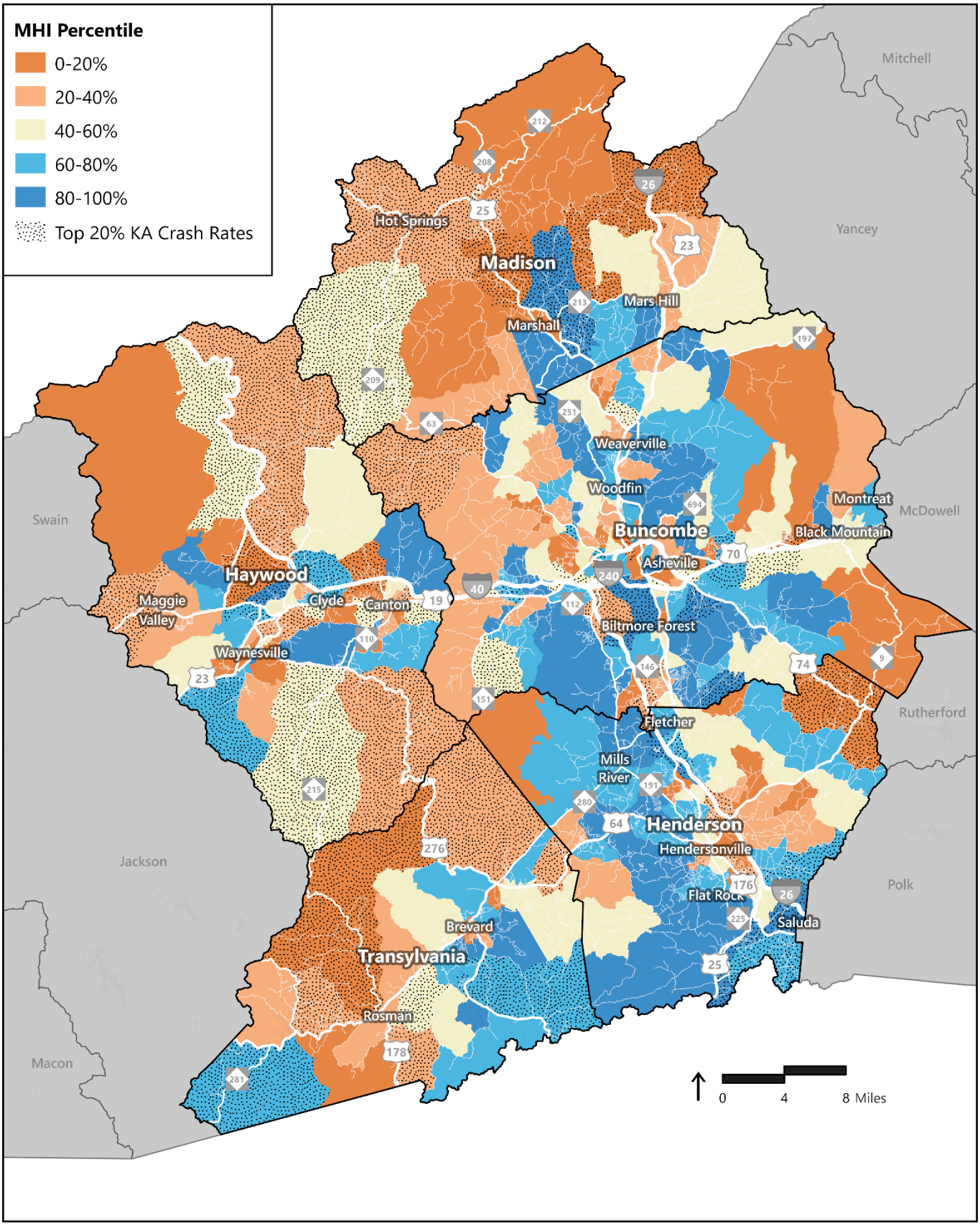
- Household income data: In the US, this data is typically collected through surveys like the 2023 American Community Survey (ACS).

Caveats:

- Income inequality: Does not reveal information on income distribution.
- Cost of living: Does not adjust for regional cost-of-living variations.
- Updated Data: Data may not reflect current economic conditions.

The chart Median.Household.Income shows the relationship between median household income and fatal and serious injury crashes compared to the total population. The MHI data is divided into five intervals: 0-20%, 20-40%, 40-60%, 60-80%, and 80-100%. MHI increases as the intervals increase from 0-100%. The chart show that the highest percentages for both fatal and serious injury crashes and total population, around 30%, are observed in the 40-60% MHI interval. The highest income interval (80-100%) shows the lowest percentages of fatal and serious injury crashes and total population. A pattern emerges where intervals with lower median household incomes (0-20%, 20-40%) correspond to higher percentages of serious injury crashes relative to the total population, indicating a potential correlation between lower income levels and higher crash rates.



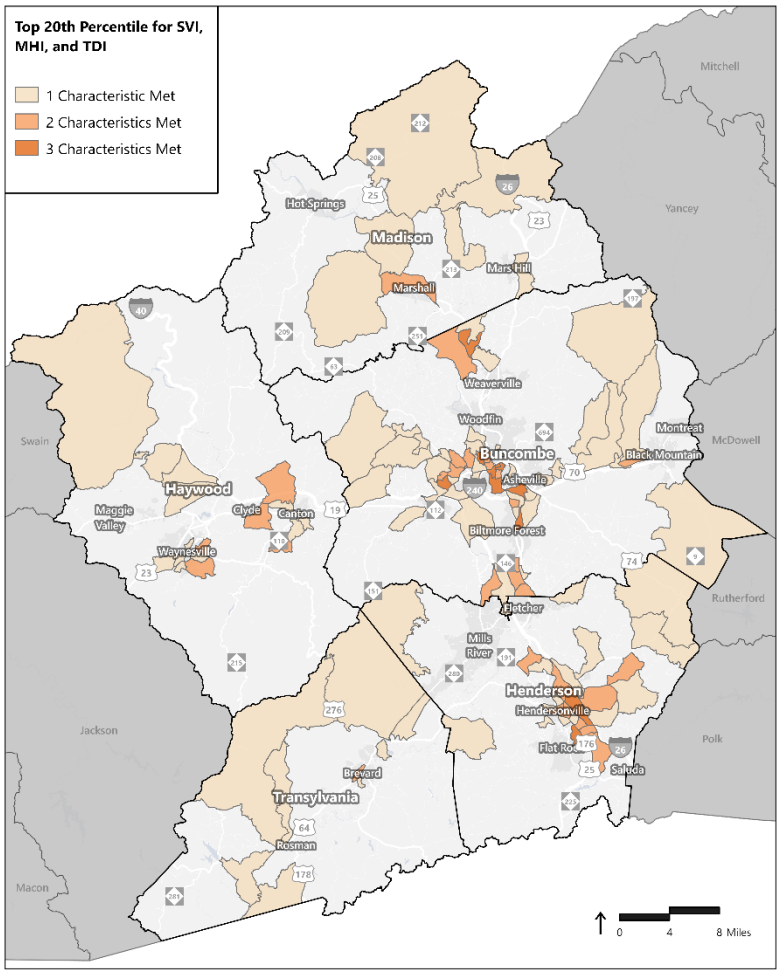

MHI Percentile
0-20%
20-40%
40-60%
60-80%
80-100%
Top 20% KA Crash Rates
Mitchell
Yancey
McDowell
Rutherford
Polk
Swain
Jackson
Macon
Hot Springs
Madison
Marshall
Mars Hill
Weaverville
Woodfin
Montreat
Black Mountain
Buncombe
Asheville
Haywood
Maggie Valley
Clyde
Canton
Waynesville
Biltmore Forest
Fletcher
Mills River
Henderson
Hendersonville
Flat Rock
Saluda
Brevard
Transylvania
Rosman
0
4
8 Miles

As with the chart, the map indicates a possible correlation between economic disparities and crash rates. Regions with the lowest incomes (dark blue) often coincide with the areas experiencing the highest fatal and serious injury crash rates (hatched areas), suggesting that lower income areas are disproportionately affected by severe crashes. This phenomenon is observed in western and northwestern portions of the region. Conversely, areas with the highest incomes (light blue), like Asheville, generally show lower fatal and severe injury crash rates.

These observations suggest a possible relationship between lower median household incomes and higher fatal and serious injury crash rates, although the map alone does not establish causality. This pattern prompts further investigation into factors contributing to higher crash rates in lower-income areas, including infrastructure, access to safe transportation, and other socio-economic elements. In general, there appears to be greater exposure to risks in areas with lower MHI.

Overlapping Population Metrics

Previous sections of this memo focused on individual population metrics (SVI, TDI, and MHI). In reality, vulnerable areas rarely exhibit only one of these characteristics. This section highlights areas within the region that exhibit overlapping high levels of social vulnerability, transportation disadvantage, and lower median household incomes. The map shows the parts of the region that meet one or more criteria of three criteria. The areas with more overlap (shaded with darker colors) may require more focused interventions and resources to improve social population, transportation access, and economic opportunities. For example, there are dark orange areas around north Asheville, north of Weaverville, and near Hendersonville and Flat Rock. This means that all three population metrics notably overlap in these areas. It is also important to note the high concentrations of 2 characteristics in Waynesville, Clyde, Hendersonville, Flat Rock, Asheville, and north of Weaverville.



Summary and Future Implications

The study area's demographic profile reveals a less racially and ethnically diverse population compared to statewide data, with notable overrepresentations in certain age groups and genders. In particular, the 15 to 24 years age group and males exhibit higher rates of fatal and serious injury crashes. Black and Native American populations show significant disparities in crash rates, especially in Haywood County. These findings highlight the need for interventions tailored to these specific groups to mitigate transportation safety problems and risks.

Customized community education initiatives, agency training programs, and partnerships with community organizations are critical components derived from the population analysis. These aspects ensure that educational programs are accessible and culturally sensitive, agency staff are well-equipped to handle population considerations, and collaborations address broader social determinants impacting traffic safety.

Future transportation safety initiatives should consider incorporating the population analysis as a tool for agency training and education programs. Additionally, forging partnerships with non-transportation agencies—such as those in healthcare, education, and housing—can address the broader and more complex population issues that often contribute to greater exposure and higher risks of traffic incidents for certain populations.