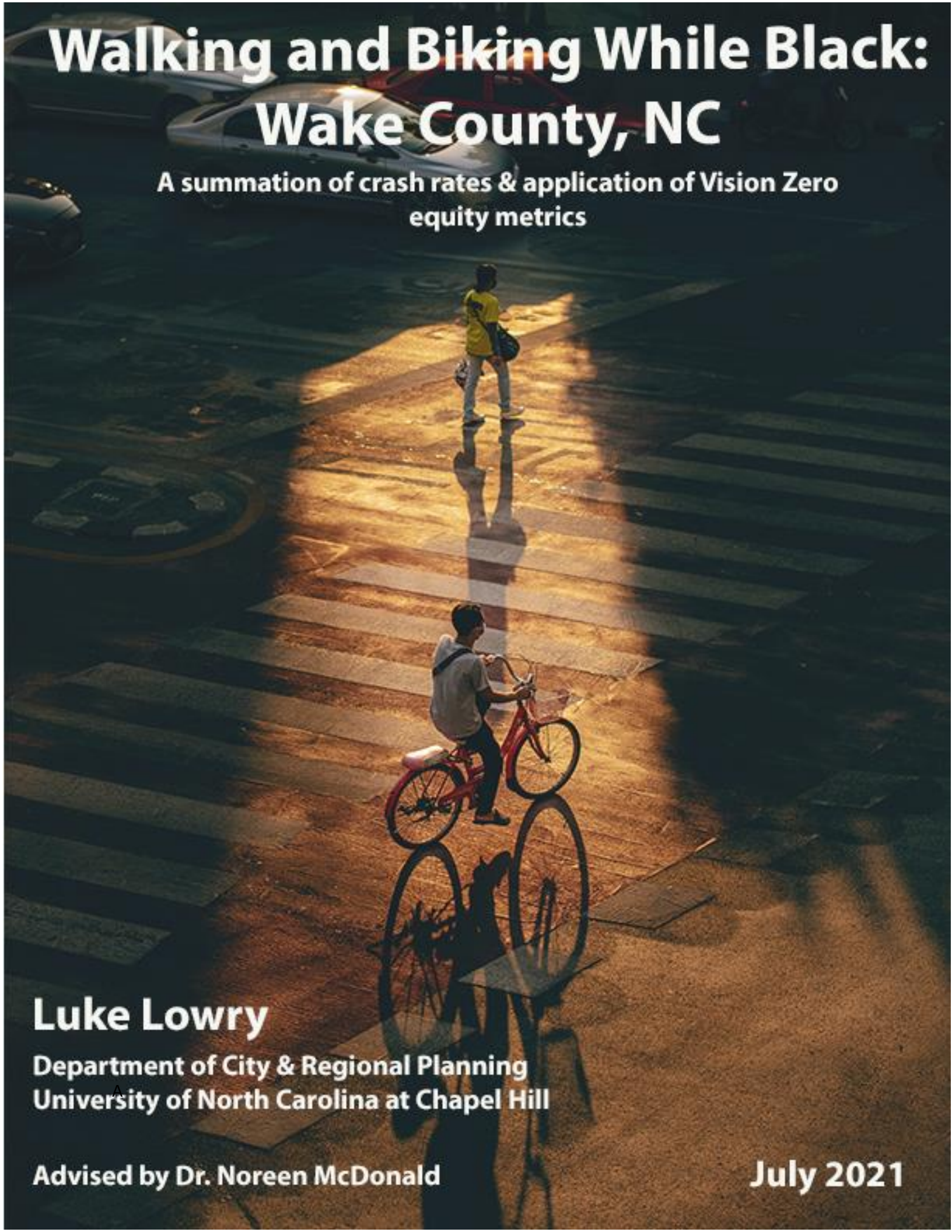
Walking and Biking While Black: Wake County, NC

A summation of crash rates & application of Vision Zero equity metrics



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Abstract

For Black Americans, the risk of being a victim of traffic violence while walking or biking is higher than it is for the general public. However, for local and regional governments, racial crash disparities are not well documented, and existing methods for addressing racial crash disparities are not widespread. **Consequently, the purpose of this report is to provide an example of racial crash disparities at the regional level, and to test the effectiveness of an existing method used to address racial differences in crashes.** Wake County, NC was selected as the analysis region for two reasons: the robust pedestrian and bicycle crash data publicly available, and the lack of existing analysis on pedestrian and bicyclist crashes by race. The 'High Priority Network' method for addressing racial disparities is the most popular existing model, and it can be easily modified for different regions. The Portland Vision Zero 'High Priority Network' model is a prominent version of this model; thus, it was applied and tested in Wake County. Its three main components—Communities of Concern, High Crash Roads, and High Crash Intersections—were analyzed individually.

The analysis revealed that the overall rates of crashes were considerably higher for Black pedestrians and bicyclists, as were the median crash rates by Census Tract. Additionally, Black pedestrians and bicyclist crash victims had consistently less access to infrastructure at the location of the crash. When applied to Wake County, the Portland model for High Priority Networks was fairly competent at locating areas within Wake County with high numbers of Black crashes and a high rate of Black crashes. By modifying the network to focus on racial metrics, the model was more effective at addressing areas of high racial disparity. While some of the racial metrics were less effective at addressing all crashes within the system, a model which combines the standard metrics used by Portland and racial-specific metrics may results in better equity outcomes while not sacrificing the overall efficacy of the model.

Introduction

On May 25, 2020, in the midst of a year already marked by the spread of Covid-19 and the subsequent lockdowns, one moment sparked a worldwide movement. George Floyd, a 46-year old Black man, was killed after being detained by officers from the Minneapolis Police Department. Video footage showed that Derek Chauvin, one of the responding officers, pinned his knee on Floyd's neck despite Floyd's cries of distress. Unable to breathe, Floyd died at the scene.

Upon release of the video footage, public outrage grew to a breaking point. Cries of justice for Floyd, and the many other people of color who have been killed by law enforcement, erupted into nationwide protests calling for police reform. Across the nation, the public reckoned with the systemic racism that is deeply ingrained in American society. Even the international community reckoned with the legacy of colonialism and slavery. For many, it was these protests that finally opened eyes and ears to the disparities faced by people of color in this nation with regards to education, housing, healthcare, and many other sectors. The driving force of this movement, however, was the disproportionate violence brought on Black Americans, often framed as an 'epidemic of violence'.

The impacts of systemic racism in the field of transportation and transportation safety were examined during this period. Particularly, many people questioned the role of law enforcement in routine traffic stops and traffic violations, given the nature of these seemingly innocuous exchanges to result in violence. Many organizations such as Vision Zero removed 'enforcement' as a tenant of traffic safety and have committed to engaging with communities of color to promote safer transportation systems (Sarah Brown's report titled *Evaluating the Framing of Safety, Equity, and Policing in Active Transportation* provides a detailed synopsis and analysis of these changes[1]).

Despite these efforts, Black Americans face another epidemic of violence that is deeply intertwined with the transportation system, and one that the public is largely unaware of-- the disproportionate rate of bicycle and pedestrian crashes and fatalities. Across all demographic groups, the rate of bicycle and pedestrian crashes has steadily increased over the past decade. Yet, Black Americans are killed or injured while walking and biking at rates much higher than the national average.

While researchers and policy analysts are increasingly prioritizing this phenomenon, government entities themselves have been slower to react. Few municipal governments or regional governments have either documented or proactively addressed the racial gap in transportation safety. However, there are some examples, namely among Vision Zero communities. Vision Zero is a national movement which focuses on reaching zero traffic deaths[2], and some cities have prioritized eliminating crashes amongst vulnerable populations in their Vision Zero strategic plans. For example, Portland, Oregon explicitly addresses the racial gap in its Vision Zero Action Plan and establishes a 'High Priority Network' to focus its efforts in an equitable manner. The High Priority Network combines the top 30 high crash intersections, the top 20 high crash roads, and the upper quartile of 'disadvantaged' Census Blocks (as measured by 10 equity metrics) into one zone of analysis in which Vision Zero efforts are prioritized.

While the High Priority Network is the preeminent model for a local government to address racial gaps in traffic crashes, it has not been widely applied outside of these Vision Zero communities. Given this, plus the relatively small amount of communities which have documented the racial differences in crash rates, the purpose of this project is three-fold:

1. Provide a local example of the disparity in crash rates amongst Black pedestrians and bicyclists by analyzing the crash rates in a non-Vision Zero community: Wake County, NC.
2. Test the High Priority Network model in Wake County, NC to determine how effectively it addresses racial differences in pedestrian and bicycle crashes.
3. Compare the High Priority Network to an alternative network focused on Black crashes specifically.

Background

Research on the disparities in traffic crashes, injuries, and fatalities is prevalent in the literature. For decades, researchers have been analyzing the correlation between traffic collisions and socio-

[1] Brown, Sarah. "*Evaluating the Framing of Safety, Equity, and Policing in Active Transportation".*
[2] "What is Vision Zero?". Vision Zero Network.

demographic or environmental factors. A 2000 study[3] analyzed the spatial correlation between pedestrian collisions and several suspected factors and found that "Pedestrian injury rates were related to traffic flow, population density, age composition of the local population, unemployment, gender, and education". Particularly, the literature has focused on factors which predominately apply to people of lower socio-economic status or minority populations. Abdalla et al.[4] (1997) found that "casualty rates amongst residents from areas classified as relatively deprived were significantly higher than those from relatively affluent areas." Further, the literature focuses on specific populations who face intersectional factors which might increase the likelihood of a traffic collision even more. For example, several articles from Laflamme et al. (2000)[5], White et al (2000)[6], and Graham & Stephens (2008)[7] focused on the correlates between social deprivation, youth, and traffic collisions. Laflamme et al. found that "mortality and morbidity are often higher among children from lower social positions and in more deprived socioeconomic areas."

While some of this literature tangentially addresses the role of race in traffic fatalities, literature which focuses exclusively on race as a factor is more recent. Earlier literature set the stage for future research by identifying racial disparities in larger crash data sets such as FARS[8]. Future articles such as the pivotal *Death on the Crosswalk*[9] began to study the relationship of race and traffic collisions with more sophistication. In *Death of the Crosswalk*, the authors found that "only one of the demographic variables was included in the final regression model—the percentage of the population that was Hispanic/Latino. These findings support the assumption that pedestrian collisions are more likely to occur in low income, minority neighborhoods once other aspects of risk are controlled for."

Research on race and traffic collision has become more plentiful, and more varied, further into the 21st century. Research has focused on everything from racial bias affecting driver yielding at crosswalks[10] to racial disparities in pedestrian-related injury hospitalizations in the United States[11] to the relationship of the built environment to racial disparities in Austin, TX[12]. The conversation around race and traffic safety has even proliferated beyond the academic literature. Public policy and advocacy organizations have written numerous articles and white papers on the topic, such as the annual report Dangerous by Design from Smart Growth America[13]. In the 2020 book *Right of Way: Race, Class, and the Silent Epidemic of Pedestrian Deaths in America*, author Angie Schmitt spends multiple chapters outlining the ways in which Black pedestrians are disadvantaged and endangered while walking[14].

Despite the growing body of academic research, articles, and white papers outlining the racial disparities that Black pedestrians and bicyclists face, the public is largely unaware of the issue. However, the problem is only growing worse. Over the past decade, pedestrian fatalities have been steadily

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[3] LaScala et al. "Demographic and environmental correlates of pedestrian injury collision: a spatial analysis".
[4] Abdalla et al. "An investigation into the relationships between area social characteristics and road accident casualties".
[5] Laflamme et al. "Social differences in traffic injury risks in childhood and youth—a literature review and a research agenda
[6] White et al. "."ROAD ACCIDENTS AND CHILDREN LIVING IN DISADVANTAGED AREAS: A LITERATURE REVIEW"
[7] Graham & Stephens. "Decomposing the impact of deprivation on child pedestrian casualties in England"
[8] Campos-Outcalt. "Pedestrian fatalities by race/ethnicity in Arizona, 1990–1996".
[9] Loukaitou-Sideris et al. "Death on the Crosswalk".
[10] Coughenour et al. "Examining racial bias as a potential factor in pedestrian crashes"
[11] Hamann et al. "Racial disparities in pedestrian-related injury hospitalizations in the United States"
[12] Yu et al. "Income and Racial Disparity and the Role of the Built Environment in Pedestrian Injuries."
[13] "Dangerous by Design 2021". Smart Growth America.
[14] Schmitt, A. "Right of Way:"

increasing. According to national crash data, “Pedestrian and bicyclist fatalities increased by 50.7 percent in the ten-year period between 2009 and 2018. During that same time period, total traffic fatalities increased by 7.9 percent.”[15] As pedestrian and bicyclist fatality rates rise, and the disproportionate burden on Black pedestrians and bicyclists remains, the Black community suffers tremendously.

Overall, there are few examples of local communities who have documented the rates of bicycle and pedestrian crashes in their communities by race. There are even fewer examples of communities who have taken comprehensive action to address the issues. However, some local and regional governments have made intentional efforts to use a racial equity lens to focus transportation safety initiatives. Most commonly, this has been adopted by communities with Vision Zero programs. Portland, Oregon[16]; Denver[17], and San Francisco[18] have all adopted Vision Zero plans which included ‘Communities of Concern’ as a way to prioritize improvements in an equitable manner. While the ‘Communities of Concern’ are comprised of a broad array of equity metrics, they are meant to address areas with a higher rate of minority populations.

Methodology

Data & Software

The most crucial set of data underlying of all the analysis in this report is NCDOT Bicycle and Pedestrian Crash Map. This data set is maintained by the North Carolina Department of Transportation and contains all pedestrian and bicycle crashes state-wide from 2007 through 2019, as documented by police crash reports (the time-span has since been updated to 2007-2020). Each crash is mapped according to its latitudinal and longitudinal position. Additionally, the data set contains multiple attribute fields for each crash such as race, injury severity, road conditions, and reason for crash, which allows the researcher to examine multiple characteristics of each crash. However, since the data is from the perspective of the reporting officer, this can have subjectivity (i.e. the at-fault status may depend on the officer’s interpretation).

While North Carolina is fortunate to have such a rich data set, not every state is so fortunate. The Fatality Analysis Reporting System (FARS) is useful for larger geographies but has limitations at the regional or local level. Researchers should also look at their State Department of Transportation, Regional Planning Organization, or local government webpages. Some research or institutional organizations also maintain bicycle and pedestrian crash data.

Demographic data on population and race was gathered from the Census or American Community Survey using either Social Explorer or Census Reporter. NCDOT Connect was used for data

[15] “Safety”. Pedestrian and Bicycle Information Center.
[16] “Vision Zero Action Plan: Saving Lives with Safe Streets”. The City of Portland
[17] “Denver Vision Zero Action Plan”. The City and County of Denver
[18] “Vision Zero Action Strategy: Eliminating Traffic Deaths in San Francisco”. Vision Zero SF

on roads and intersections. The rest of the data, such as the CDC Social Vulnerability index, greenways, sidewalks, etc., was taken from either Wake County Open Data or Raleigh Open Data.

The two primary tools used for analysis were ArcGIS Pro and Microsoft Excel. Both of these programs were used purposefully due their common usage in the planning and policy workspaces. Consequently, the analysis done in this report should be easily adaptable by a planning agency or local government of any size and should not require knowledge or possession of complex statistical software.

Crash Rate Analysis

Crash rates were calculated using a population adjusted crash rate. Population data was taken from the Census 2010 data, and the rate was calculated by dividing the number of crashes in a given geometry and a given racial group by the population of the given racial group in the given geometry. **Percentage difference** was also used to calculate the difference between Black and White crash rates. Percentage difference is calculated using the formula $(x - y)/average(x, y)$, where *x* is the Black statistic and *y* is the White statistic. In this case, a positive percentage difference will indicate a higher Black rate than White rate, and a negative percentage difference will indicate a lower Black rate than White rate.

First, the population adjusted crash rates for all counties in North Carolina were calculated. Many North Carolina counties have both small populations and low rates of Black residents. In order to avoid rates based on small samples of crashes or population, only counties with populations of fifty-thousand or higher were selected. The median crash, fatality, major suspected injury, and minor suspected injury rates for White and Black pedestrians and cyclists were calculated. The percentage difference between the Black and White crash rates was calculated. The average rates for Wake County were measured and compared to the median rates for the selected counties.

The median crash rates of Black and White bicyclists and pedestrians for Wake County Census Tracts were calculated. For each racial group, only the Census Tracts which contained a crash and the rate denominator were used. So, for example, if a Census Tract had a Black bike crash but did not have any Black residents who biked, the Census Tract was not included. Conversely, if a Census Tract had Black residents but did not have a recorded Black bike crash, the Census Tract was not included. The percentage difference between Black and White median crash rates was also calculated.

The crash rates for all of Wake County were calculated for Black and White bicyclists and pedestrians. The selected geometry for both bike crash rates and pedestrian crash rates was all Census Tracts that contained at least one bike or pedestrian crash. Only one Census Tract (Census Tract 532.05) was excluded from the analysis. The percentage difference for Black and White crash rates was also calculated.

Infrastructure Proximity Analysis

Infrastructure proximity analysis was used to roughly gauge access to infrastructure at the location of each crash. For pedestrians, the analyzed infrastructure types were sidewalks, trails, and greenways. For bicyclist, the analyzed infrastructure types were trails, greenways, and existing bicycle infrastructure. Wake County Open Data and Raleigh Open Data were used to collect shapefiles for the above infrastructure types, which were loaded into ArcGIS with the crash data. Comprehensive sidewalk data existed for Raleigh but not all of Wake County, so the pedestrian analysis was limited to Raleigh. Using the ArcGIS Select feature, crashes which were within a given distance from the given infrastructure type were selected. For pedestrians, the following distance increments were used: 600, 500, 400, 300, 200, 100, 50, 20, 10, and 0 feet. For bicyclists, the following distance increments were used: 5000, 2000, 1000, 500, 200, 100, 50, 20, and 0 feet. The amount of crashes which were within the given distance to infrastructure was divided by the total amount of crashes to calculate the rate of infrastructure proximity.

Vision Zero High Priority Network

The Vision Zero High Priority Network is based on the one used by the City of Portland, Oregon as part of its Vision Zero Program (Figure 1). The Portland model was selected for this analysis for multiple reasons. First, there are few models used by local or regional governments for addressing traffic crashes by race (and other equity measures). Secondly, of the existing models, Portland's is one of the most popular and prominent. Finally, the metrics used to create the High Priority Network are explicitly clear and easily replicable for other cities or regions. This model was replicated in Wake County to see how well the model addresses areas of high racial disparity in locations other than Portland.

It is comprised of three main components: Communities of Concern, High Crash Roads, and High Crash Intersections. In order to assess the effectiveness of the model in Wake County, a High Priority Network is created for Wake County and then applied.

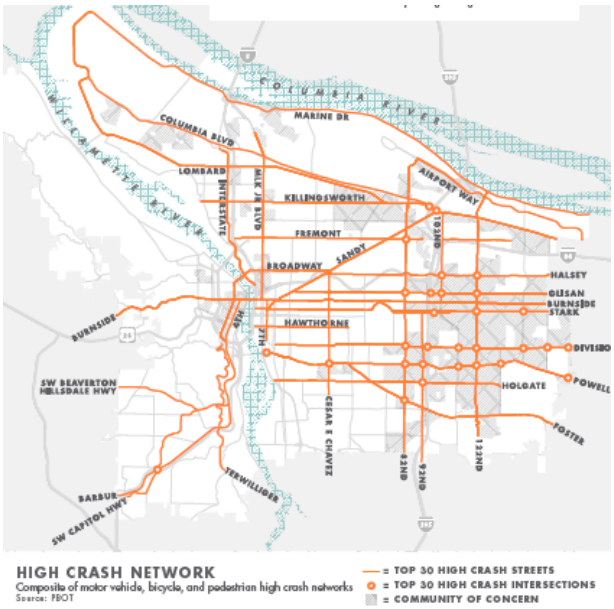

Figure 1: High Crash Network used by Portland's Vision Zero Program[19]

Communities of Concern

The Portland Vision Zero Communities of Concern is based on ten equity criteria identified by TriMet, Portland's regional transit provider. Census blocks which are in the upper quartile for these criteria are selected. These criteria are:

1. People of Color
2. Low-income households
3. People with disabilities
4. Low English Proficiency persons
5. Youth
6. Older adults
7. Affordable housing
8. Lower paying jobs
9. Poor vehicle access
10. Access to services

The Center for Disease Control has created a Social Vulnerability Index which closely imitates the equity indicators used by Portland. The Social Vulnerability Index (SVI) scores Census Tracts based on four themes: Socioeconomic Status (RPL Theme 1), Household Composition & Disability (RPL Theme 2), Minority Status & Language (RPL Theme 3), and Housing Type & Transportation (RPL Theme 4). The aggregate score of each theme is referred to as RPL Themes. Figure 2 shows the breakdown of the equity criteria in the SVI.

[19] The City of Portland.

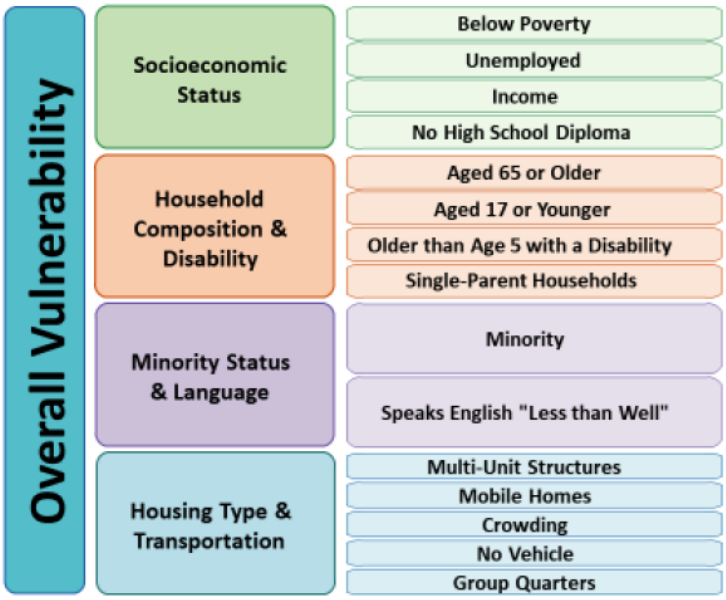

Figure 2: Social Vulnerability Index from the Centers for Disease Control[20]

SVI data was collected from Wake County Open Data as a shapefile and uploaded to ArcGIS. The upper quartile of each theme (RPL 1, RPL 2, RPL 3, RPL 4) and the upper quartile of the aggregate score (RPL Themes) were created as layers. A population adjusted crash rate (per ten thousand residents) was calculated for bicyclists and pedestrians by race for **each quartile** within **each RPL theme.** RPL Themes was used to represent Portland's version of Communities of Concern, and RPL Theme 1-4 were used as alternatives for comparison.

High Crash Roads

Portland identifies its high crash roads by compiling the top 20 roads for motor vehicle crashes (fatalities and serious injuries), bicycle crashes (all injury severities), and pedestrian crashes (all injury severities). The result is a combined network of 30 high crash roads. For this analysis, separate high crash road networks were created for bicyclists and pedestrians in order to better understand the patterns for each travel mode.

An NCDOT-maintained road shapefile was downloaded from NCDOT Connect and uploaded to ArcGIS. NCDOT classifies roads as follows: 1: Interstate; 2: Principal Arterial- Other Freeways and Expressways; 3: Principal Arterial- Other; 4: Minor Arterial; 5: Major Collector; 6: Minor Collector; and 7: Local. For the purpose of this analysis, NCDOT classified local roads were excluded. In ArcGIS, a 50 foot buffer was created around all roads in Wake County classified by NCDOT as type 1 through 6. Then, all bike crashes and pedestrian crashes which fell within that buffer were joined to the road layer.

[20] "SVI 2014 Documentation". CDC.

Four different filters were used to determine the top 20 high crash roads:

1. Roads with the most **Total Crashes**
2. Roads with the most **Total Crashes per Lane Mile** (for roads of at least five lane miles)
3. Roads with the most **Black Crashes**
4. Roads with the most **Black Crashes per Lane Mile** (for roads of at least five lane miles)

For the high crash road network, the rate of crashes could not be captured using population since that data is aggregated at the Census Tract level. Instead, the proportion of all crashes which fell within the high crash road network was used as a proxy for the effectiveness of capturing crashes by race. The proportion of white crashes captured, the proportion of black crashes captured, and the percentage difference of the proportion of white and black crashes captured was calculated for each of the four high crash roads scenarios.

Metric 3 and Metric 4 are focused on Black Crashes rather than Total Crashes as a means to focus more explicitly on racial equity. To measure the difference between a Total Crash and Black Crash focused approach, the **percentage of all crashes captured** and **all crashes per Lane Miles** are calculated for each. Then, the percent change for **percentage of all crashes captured** and **all crashes per Lane Miles** when going from Total Crashes to Black Crashes is calculated.

High Crash Intersections

Portland identifies its high crash intersections by using the aggregate of crashes by all modes, normalized for the number of cars passing through each intersection. Annual Average Daily Traffic (AADT) is typically the data that would be used to determine daily vehicle traffic volumes. For this analysis, AADT for Wake County roads was unavailable. However, NCDOT provides a shapefile via NCDOT Connect, 2013-2017 Total Crash Frequency by Intersection, which gives the total amount of motor vehicle crashes per intersection in Wake County from 2013-2017. Thus, the total amount of motor vehicle crashes was used as a proxy for AADT. Using the NCDOT intersection shapefile, all pedestrian and bicycle crashes within a 100 ft distance of each intersection were joined to the intersection layer.

Four different filters were used to determine the top 30 high crash intersections:

1. Intersections with the most **Total Crashes per Car Crash**
2. Intersections with the most **Total Crashes**
3. Intersections with the most **Black Crashes per Car Crash**
4. Intersections with the most **Black Crashes**

Similarly to high crash roads, the rate of crashes could not be captured using population methods since that data is aggregated at the Census Tract level. The proportion of White crashes captured, the proportion of Black crashes captured, and the percentage difference between White and Black crashes captured was calculated for each of the four high crash intersection scenarios. The proportion of all

crashes captured and the amount of all crashes per car crash were also calculated, as well as the percent change in these metrics between the corresponding Total Crash and Black Crash high crash scenarios.

Results

Crash Rate Analysis

Crash Rates by County for North Carolina

Table 1 shows the median crash, fatality, suspected serious injury, and suspected minor injury rate per population for all NC counties with populations over 50,000 and the average rates for Wake County. For the counties, for all four metrics, the rates for Black pedestrians are considerably higher than for White pedestrians, as evidenced by the percentage differences. In Wake County, as with the median crash rates for counties, the black rate is considerably higher for every metric. Compared to the median crash rates for counties, Wake County has a higher Black rate and a higher percentage difference for all four metrics.

Table 1: Median Rates for Black and White Pedestrians per Population: All NC Counties over 50,000. Average rates for Wake County. Population adjusted per ten thousand residents.

	Crash	Fatality	Suspected Serious Injury	Suspected Minor Injury
Black	41.89	3.12	3.40	14.23
White	15.74	1.79	1.82	6.04
% Difference	90.72	53.89	60.27	80.76

Table 2 shows the bicyclist median crash, fatality, suspected serious injury (SSI), and suspected minor injury (SMI) rates for all NC Counties with a population over 50,000 and the average rates for Wake County. For the counties, for three of the four metrics, Black median rates are much higher. However, the White median rate of fatalities is actually higher. In Wake County, for all four metrics, the Black rates are higher than the White rates. Further, the Black rates in Wake County are all equal to or higher than the corresponding median rates for the counties. However, unlike with pedestrian rates, the percentage difference in the crash rate is actually lower for Wake County than it is for the counties. This is likely due to the much higher White crash rate in Wake County (14.86) than the counties (6.73).

Table 2: Median Rates for Black and White bicyclists: All NC Counties over 50,000. Average Rates for Wake County. Population adjusted per ten thousand residents.

Crash x 1000	Fatality x 10000	SSI x 10000	SMI x 10000

White	6.73	0.25	0.50	3.09
Black	16.36	0.21	0.73	6.47
% Difference	83.49	-16.98	37.40	70.85

While this analysis is simply meant to be a high-level overview, it does suggest that there is disparity in bicycle and pedestrian crash rates across North Carolina. Further, it suggests that Wake County is contributing to the disparity in bicycle and pedestrian crashes, and that a more detailed analysis of Wake County is warranted.

Crash Rates in Wake County

For the analysis of Wake County, demographic data was selected from all Census Tracts that had a either a bicycle crash or a pedestrian crash (only one Census Tract, 532.05, failed to meet this criteria). Table 3 shows the totals for Population by race.

Table 3: Population data for Wake County, by race

	Black	White
Population	185944	593915

Table 4 shows the rates for pedestrian crashes and injury severities for Pedestrians and Bicyclists. Black pedestrians have a higher rate of crashes and of every injury type. Black cyclists also have a higher rate of crashes and of every injury type. Interestingly, the percent differences between Black and White pedestrian crash rates is much higher than the percent differences for bicycle crash rates; for crashes, the percent difference is **107.17 for pedestrians** and **39.53 for bicyclists**. So, while there is clearly racial disparity for Black pedestrians and bicyclists, the degree of disparity seems to be lower for bicyclists and higher for pedestrians.

Table 4: Rates for Pedestrian Crashes & Injury Severities. Population adjusted per ten thousand residents.

		Crashes	Suspected Serious Injury	Killed	Suspected Minor Injury	Possible Injury	No Injury	Unknown Injury
Pedestrians	Black	63.51	5.49	3.39	24.09	25.81	3.87	0.97
	White	19.19	1.50	1.03	8.57	6.28	1.60	0.24
	% Difference	**107.17**	**114.17**	**106.95**	**95.05**	**121.73**	**83.07**	**121.67**
Bicyclists	Black	22.32	1.24	7.64	9.36	3.55	0.22	0.32
	White	14.95	0.57	6.89	4.95	2.31	0.17	0.07
	% Difference	**39.53**	**73.45**	**10.33**	**61.61**	**42.44**	**24.38**	**130.93**

The bicycle and pedestrian median crash rates were also calculated at the Census Tract level as well as the overall county level. Only Census Tracts which contained a crash and a population of the given racial group were used in the analysis. Table 5 shows the median crash rates for pedestrians and bicyclists. The median crash rates confirm that Black crash rates are higher than White crash rates for pedestrians and bicyclists at multiple geographic scales. Similarly to the Wake County overall rates, the

percentage differences are smaller for bicyclists than pedestrians, which suggests that, while disparity exists, it may not be as high for bicyclists as it is for pedestrians.

Table 5: Median pedestrian and bicyclist crash rates by Census Tract. Population adjusted per ten thousand residents.

	Black	White	% Difference
Pedestrian	4.44	1.19	115.23
Bicyclist	2.31	0.90	87.30

While Table 4 shows the crash rates for different injury severities, that is but one of many crash characteristics that are included with the NCDOT crash dataset. Each crash also contains data about the crash event such as lighting condition, the road's speed limit, the position of the pedestrian or bicyclist, and more. While the scope of this report did not allow for a detailed exploration of these crash characteristics, they provide the potential for a nuanced analysis of Black crashes. For example, the data shows that 40.24 percent of Black bicyclists were facing traffic at the time of the crash, compared to 23.87 percent of White bicyclists. Research shows that bicyclists facing traffic are an average of 3.6 times more likely to be in an incident than those travelling with traffic[21]. These observations can inform a community's approach to equitable traffic safety interventions, and future efforts by practitioners should incorporate a detailed examination of crash characteristics. More detailed crash characteristics data is included in the Appendix; Section A contained pedestrian data, and Section B contains bicyclist data.

Infrastructure Proximity Analysis

As part of the exploration of crash rate disparities amongst Black and White pedestrians and bicyclists, an infrastructure proximity analysis was conducted. While the analysis does not show statistical correlation between crash rates and the presence of infrastructure, it does provide an easy, accessible method to use publicly available data to roughly determine whether Black and White crash victims had equal access to walkable or bikeable infrastructure.

Figures 3, 5, and 7 show the percentage of crash victims who were within the range of either walkable or bikeable infrastructure at various distance increments. Figures 4, 6, and 8 shows the percentage difference between Black and White crash victims who were within proximity. As can be seen, a smaller proportion of Black crash victims were within range of walkable or bikeable infrastructure at every distance increment. Critically, the 0 foot increment shows the proportion of people who were actually using (or immediately adjacent to) a sidewalk, greenway, or trail (for pedestrians) or an existing bike facility, greenway, or trail (for bicyclists). Table 6 shows these proportions. This analysis is not a statistical measure of the correlation between crash likelihood and infrastructure proximity; however, given that Black pedestrians and bicyclists are less likely to be using

[21] "Why we bike with (not against) traffic". Susan Lacke.

walkable or bikeable infrastructure at the time of their crash, the evidence suggests that lack of infrastructure could be playing a role in the racial disparities in crash rates.

Table 6: Crash victims within 0 feet of walkable or bikeable infrastructure

	Black	White	% Difference
Pedestrians: Raleigh	0.061	0.103	50.64
Bicyclists: Raleigh	0.352	0.518	38.15
Bicyclists: Wake County	0.373	0.282	27.75

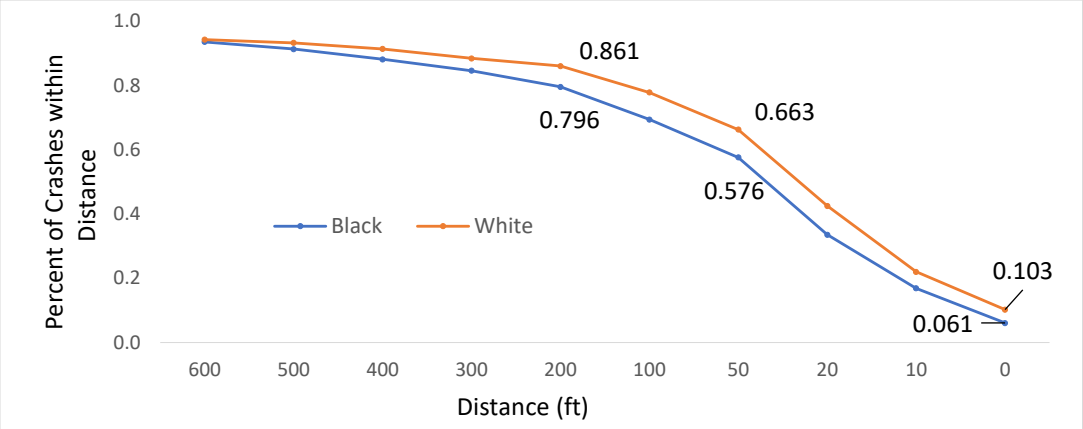

Figure 3: Percentage of Pedestrian Crashes within Distance of Sidewalks, Greenways, or Trails: Raleigh

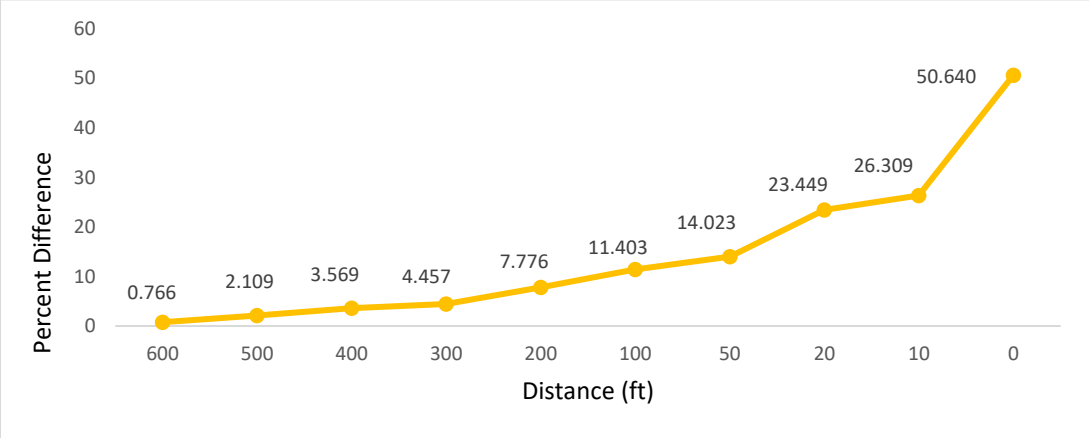

Figure 4: Percentage difference between White and Black pedestrian victims who were within distance of sidewalks, greenways, or trails.

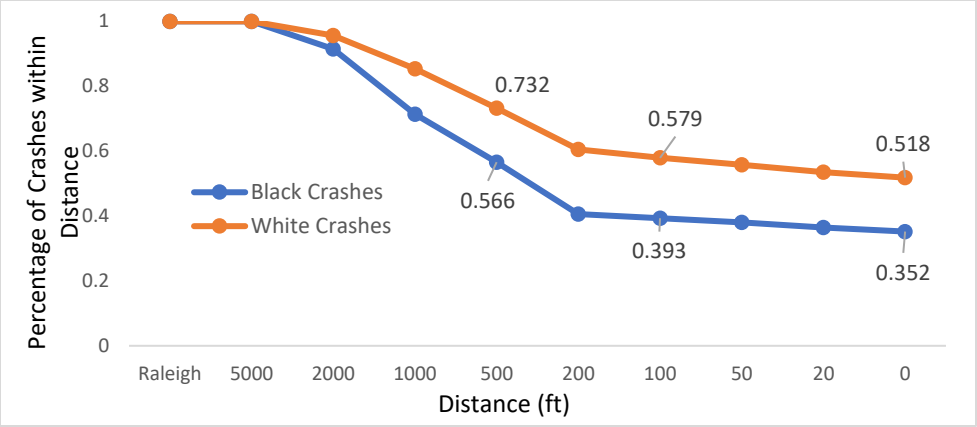

Figure 5: Percentage of Bicyclist Crashes within Distance of Existing Bike Facilities, Greenways, or Trails: Raleigh

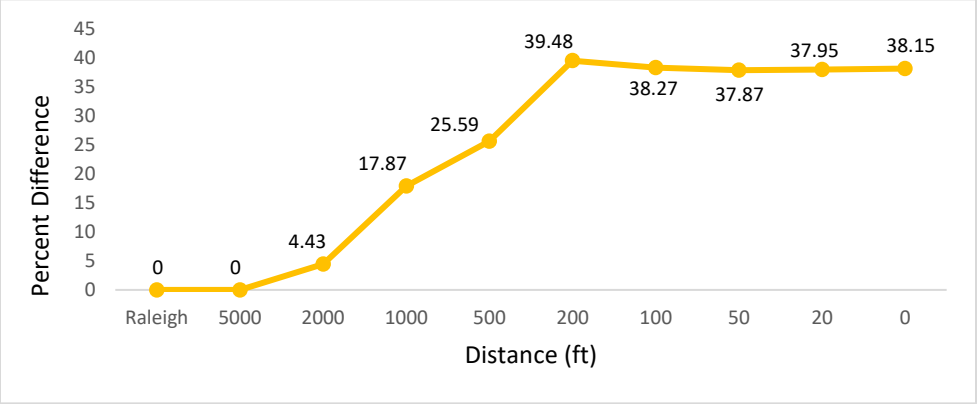

Figure 6: Percentage difference between White and Black bicyclist victims who were within distance of existing bike facilities, greenways, or trails: Raleigh

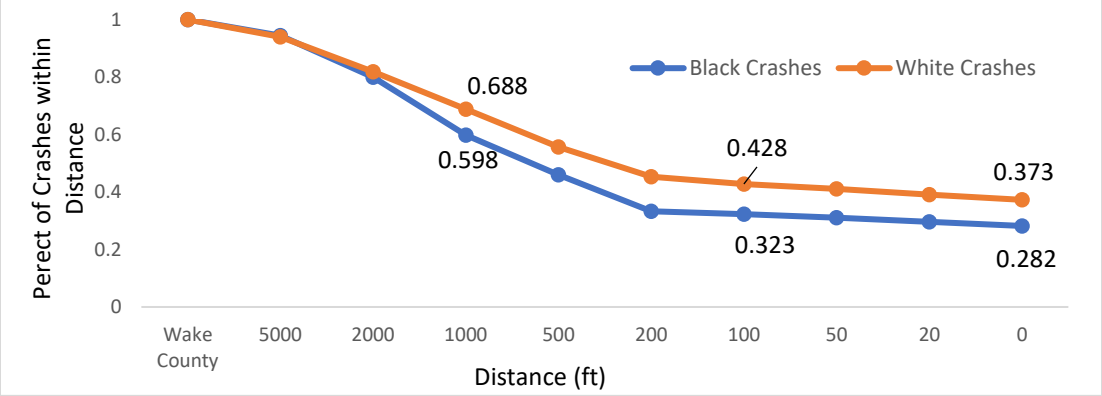

Figure 7: Percentage of Bicyclist Crashes within Distance of Existing Bike Facilities, Greenways, or Trails: Wake County

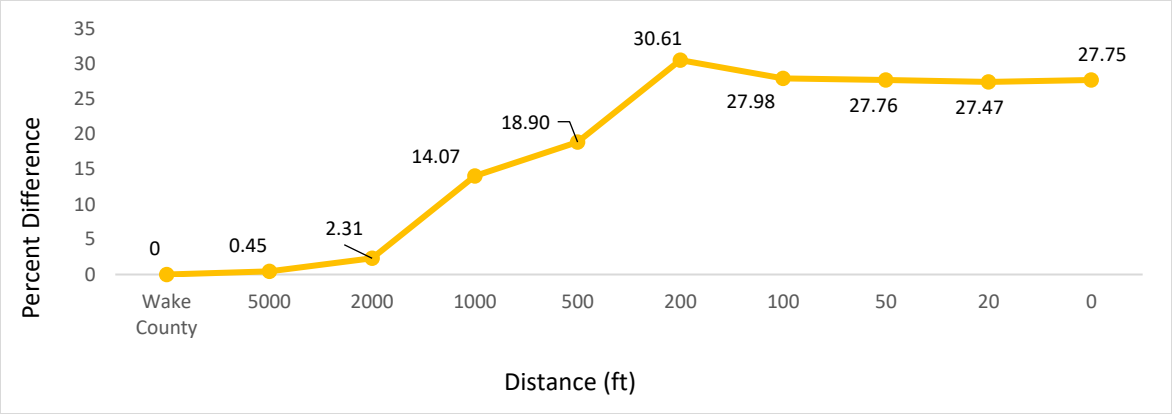

Figure 8: Percentage difference between White and Black bicyclist victims who were within distance of existing bike facilities, greenways, or trails: Wake County

The crash rate analysis and infrastructure proximity analysis of Wake County has provided evidence that Wake County has high level of racial disparity in both pedestrian and bicycle crash rates. Through the application of the Portland's Vision Zero High Priority Network—Communities of Concern, High Crash Roads, and High Crash Intersections—the efficacy of Portland's model for addressing racial inequities will be tested in the Wake County context.

Vision Zero: Communities of Concern

RPL Themes (comprised of Socio-Economic Status [RPL Theme 1]; Household Composition & Disability [RPL Theme 2]; Minority Status & Language [RPL Theme 3]; and Housing Type & Transportation [RPL Theme 4]) is an approximate measure for the 10 equity metrics used by Portland as 'Communities of Concern'. RPL Themes and RPL Theme 1-4 were split into quartile zones, where Zone 1 is the lower 25 percent and Zone 4 is the upper 25 percent. The crash rates for each quartile zone in each group were calculated and compared. Table 7 shows the results for pedestrians, and Table 8 shows the results for bicyclists.

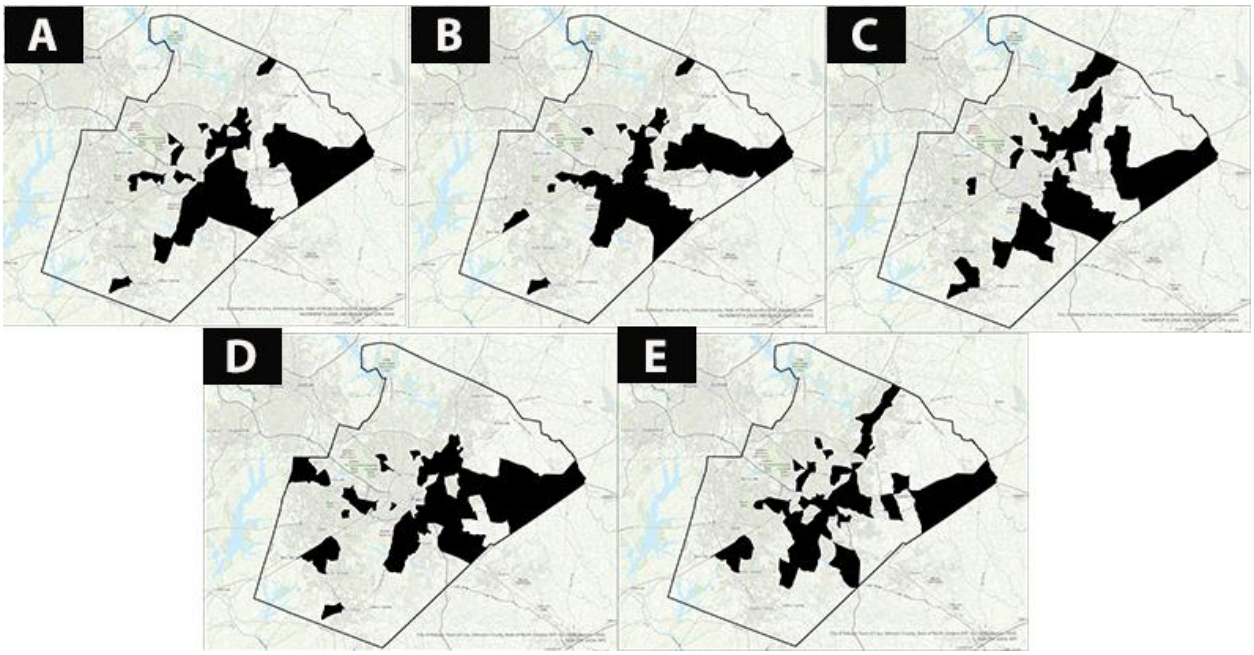

Figure 9: The upper quartile (Zone 4) of RPL Themes (A), RPL Theme 1 (B), RPL Theme 2 (C), RPL Theme 3 (D), and RPL Theme 4 (E).

While Zone 4 is the quartile zone with the greatest equity needs, Table 7 shows that for RPL Theme 2 and RPL Theme 3, Zone 4 does not have the highest black crash rate. RPL Themes is the zone which most closely represents the Portland model for Communities of Concern, and it does have its highest Black crash rate in Zone 4. However, the Black crash rate is higher in RPL Theme 4. The same pattern exists for bicycle crashes (Table 8). RPL Theme 2 and RPL Theme 3 have zones other than Zone 4 with a higher Black crash rate. While the RPL Themes has its highest Black crash rate in Zone 4, it is a smaller rate than those in RPL Theme 3 and RPL Theme 4.

Table 7: Pedestrian Black Crash Rate for each quantile zone of RPL Themes and RPL Theme 1-4. Population adjusted per ten thousand residents.

	RPL Themes	RPL Theme 1	RPL Theme 2	RPL Theme 3	RPL Theme 4
Zone 1	26.04	25.19	83.71	40.14	21.94
Zone 2	27.80	28.86	45.68	40.29	24.06
Zone 3	54.53	55.75	50.46	64.65	40.57
Zone 4	65.98	64.54	48.40	55.32	89.58

Table 8: Bicyclist Black Crash Rate (per W+B+T) for each quantile zone of RPL Themes and RPL Theme 1-4. Population adjusted per ten thousand residents.

	RPL Themes	RPL Theme 1	RPL Theme 2	RPL Theme 3	RPL Theme 4
Zone 1	12.63	15.82	26.18	17.43	8.98
Zone 2	10.55	10.95	21.59	17.52	12.99
Zone 3	20.47	17.83	17.88	22.26	15.48
Zone 4	22.05	22.52	16.51	18.20	27.94

Given these discrepancies, the upper quartile of the five RPL groups were compared across five key metrics: the percent of all crashes captured, the percent of Black crashes captured, the Black crash

rate, the overall crash rate, and the percent difference between the Black and White crash rate (which indicates high racial disparity). For each of these metrics, the RPL groups were given a score of 1 to 5. Table 9 shows the values and scores for pedestrian crashes, and Table 10 shows the values and scores for bicycle crashes. Each of the individual scores were aggregated and averaged to give a total score to the RPL groups. Table 11 shows the results.

Table 9: Pedestrian crash statistics with rankings for RPL Themes and RPL Theme 1-4

	All Crashes: Percent Captured		Black Crashes: Percent Captured		Black Crashes: Population adjusted rate		All Crashes: Population adjusted rate		Percent Difference between Black and White population adjusted crash rate	
RPL Themes	45.47	4	63.19	5	65.98	4	49.72	3	86.88	3
RPL Theme 1	43.66	3	59.80	3	64.54	3	50.74	4	80.70	1
RPL Theme 2	31.60	1	44.02	1	48.40	1	34.63	1	102.11	5
RPL Theme 3	37.94	2	51.06	2	55.32	2	40.53	2	89.36	4
RPL Theme 4	52.33	5	62.00	4	89.58	5	60.73	5	84.11	2

Table 10: Bicyclist crash statistics and rankings for RPL Themes and RPL Theme 1-4

	All Crashes: Percent Captured		Black Crashes: Percent Captured		Black Crashes: Rate per Population		All Crashes: Rate per Population		Percent Difference between Black and White Crash Rate (per Population)	
RPL Themes	37.40	3	59.86	5	25.72	4	22.29	3	86.88	3
RPL Theme 1	38.11	4	59.13	4	25.13	3	24.13	4	80.70	1
RPL Theme 2	23.66	1	42.55	1	19.84	1	14.13	1	102.11	5
RPL Theme 3	28.58	2	47.60	2	22.53	2	16.64	2	89.36	4
RPL Theme 4	46.10	5	54.81	3	35.29	5	29.15	5	84.11	2

Table 11: Aggregate rankings for RPL Themes and RPL Theme 1-4

	Pedestrian	Bicyclist
RPL Theme 4	4.2	4
RPL Themes	3.8	3.6
RPL Theme 1	2.8	3.2
RPL Theme 3	2.4	2.4
RPL Theme 2	1.8	1.8

For pedestrian crashes, RPL Themes did have the highest proportion of Black crashes captured. However, it ranked 2nd in all crashes captured, 2nd in the Black crash rate, 3rd in the overall crash rate, and 3rd in the difference between the Black & White crash rate. For bicycle crashes, RPL Themes again had the highest proportion of black crashes captured. However, it ranked 3rd in all crashes captured, 2nd in the Black crash rate, 3rd in the overall crash rate, and 3rd in the difference between the Black & White crash rate.

In the end, RPL Theme 4 has the highest average score for both pedestrian crashes and bicycle crashes. In the context of Wake County, a focus on Housing Types & Transportation seems to have the best overall balance of addressing areas with a high number of Black and overall crashes, a high Black and overall crash rate, and high racial disparity. However, it does come with the tradeoff of addressing fewer overall Black crashes. This is a tradeoff that may or may not be prioritized by a community. Through this analysis of multiple equity metrics as they related to black crash rates, it is clear that communities should consider multiple options to see how different equity metrics may or may not align with overarching goals and values.

Vision Zero: High Crash Roads

Four options for the top 20 high crash roads were selected based on four criteria: Total Crashes, Black Crashes, Total Crashes per Lane Mile, and Black Crashes per Lane Mile. While the crash rate per means of transportation or per population could not be determined, the goal was to see how effectively Black crashes were being addressed by determining what proportion of Black crashes were being captured in the analysis. Figure 10 shows the top 20 high crash roads for pedestrians and cyclists based on the Total Crashes and Black Crashes methods.

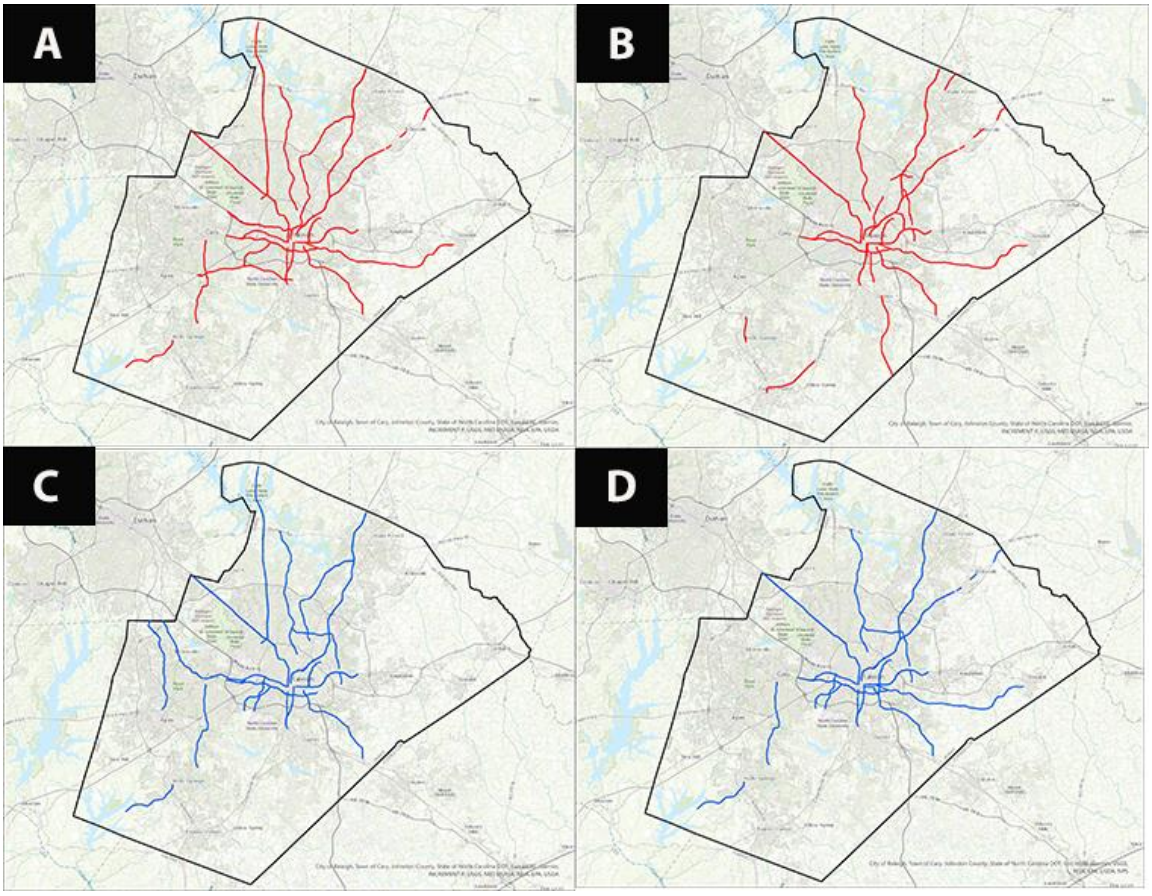

Figure 10: High Crash Roads based on total pedestrians crashes (A), total Black pedestrian crashes (B), total bicyclist crashes (C), and total Black bicyclist crashes (D).

Table 12 shows the rate at which pedestrian crashes were captured in the four options. Total Crashes, which is the method supported by the Portland Vision Zero High Priority Network, does captured a higher proportion of Black crashes than White crashes. The Total Crashes per Lane Mile option also captures Black crashes at a higher rate than White crashes. As would be expected, the Black Crashes method increases the proportion of Black crashes captured, while decreasing the proportion of White crashes that are captured. The same is true of the Black Crashes per Lane Mile method.

Table 13 shows the proportion of all crashes captured, and the amount of crashes per lane mile, for each method. The Total Crashes method has the highest proportion of all crashes captured, and a change to the Black Crashes method results in a percent decrease of around 7 percent. Conversely, the Black Crashes method has a higher amount of crashes per lane mile within its network, and a switch from Total Crashes to Black Crashes results in a percent increase of around 14 percent. When comparing Total Crashes per Lane Mile to Black Crashes per Lane Mile, a switch from Total to Black results in a 6 percent increase in all crashes captured but a 13 percent decrease in crashes per lane mile.

Table 12: Proportion of Pedestrian Crashes Captured on High Crash Roads

	Black	White	% Difference
Total Crashes	0.4024	0.3260	0.2099
Black Crashes	0.4433	0.2540	0.5427
Total Crash / LM	0.2738	0.1791	0.4180
Black Crash / LM	0.3328	0.1630	0.6851

Table 13: Pedestrian Crashes captured and the percent change between options

	% All Crashes Captured	All Crash / LM	% Change: All Crashes Captured	% Change: All Crashes / LM
Total Crashes	0.3565	0.9268	-0.0717	0.1454
Black Crashes	0.3310	1.0615		
Total Crash / LM	0.2276	1.6637	0.0574	-0.1291
Black Crash / LM	0.2406	1.4489		

Table 14 shows the rate at which bicyclist crashes were captured by the four methods. As with pedestrian crashes, the Total Crashes method captures a higher proportion of Black crashes than White crashes, as does the Total Crashes per Lane Mile method. The Black Crashes and Black Crashes per Lane Mile methods increase the proportion of Black crashes captured but decrease the proportion of white crashes captured. Table 15 shows the proportion of all crashes captured and all crashes per lane mile for each method. Unlike with pedestrian crashes, the switch from Total Crashes to Black Crashes, or Total Crashes per Lane Mile to Black Crashes per Lane Miles, results in a decrease in both the proportion of all crashes captured and the amount of crashes per lane mile.

Table 14: Proportion of Bicycle Crashes Captured on High Crash Roads

	Black	White	% Difference
Total Crashes	0.4224	0.3144	0.2933
Black Crashes	0.4653	0.2609	0.5631
Total Crash / LM	0.3135	0.2341	0.2900
Black Crash / LM	0.3861	0.1706	0.7744

Table 15: Bicyclist Crashes Captured and the percent change between options

	% All Crashes Captured	All Crash / LM	% Change: All Crashes Captured	% Change: All Crashes / LM
Total Crashes	0.3731	0.7592	-0.0823	-0.0550
Black Crashes	0.3424	0.7174		
Total Crash / LM	0.2791	1.2383	-0.0777	-0.1774
Black Crash / LM	0.2575	1.0186		

Overall, each of the high crash road methods addresses Black crashes effectively. The proportion of Black crashes captured is substantially larger than the proportion of White crashes (or total crashes); thus, safety interventions for any of these road networks should have an outsized impact on Black pedestrians and bicyclists. Focusing on Black crashes does increase the level of impact towards Black pedestrians and bicyclists, but it comes with certain tradeoffs.

For pedestrians, these tradeoffs seem more balanced. However, for bicyclists, a focus on Black crashes inevitably leads to a decrease in all crashes captured. This may be due to the smaller number of Black bicycle crashes compared to White bicycle crashes. The raw numbers for Wake County are 888 White bicycle crashes and 415 Black bicycle crashes. Comparatively, there were 1140 White pedestrian crashes and 1181 Black pedestrian crashes. While the rate of Black bicycle crashes is still disproportionately high, a focus on Black crashes will not yield as many crashes captured since the raw number of crashes is lower. This is a tradeoff that communities will need to take into account when establishing equity goals and metrics.

High Crash Intersections

As with High Crash Roads, four options were selected for the Top 30 High Crash Intersections based on four criteria: Total Crashes, Black Crashes, Total Crashes per Car Crash, and Black Crashes per Car Crash. Figure 11 shows the top high crash intersections for pedestrians and bicyclists based on the total and Black crashes per car crash method. Most of the high crash intersections fell within the Raleigh municipal boundaries, and Figures 12 and 13 show pedestrian and bicyclist high crash intersections within central Raleigh. Table 16 shows the proportion of pedestrian crashes captured in each of the High Crash Intersection networks.

Total Crashes per Car Crash, which is the method employed in the Portland Vision Zero method, captures a smaller proportion of Black crashes than White crashes—20.51 percent and 22.15 percent

respectively. While the Total Crashes method does captured a higher proportion of Black crashes than White crashes, it is by a small margin. Given the disparities in crash rates, both Total Crashes based methods may not have a large enough impact on Black crashes. The Black Crashes and Black Crashes per Car Crash method markedly increase the proportion of Black crashes that are captured, but at the expense of a decrease in White crashes captured.

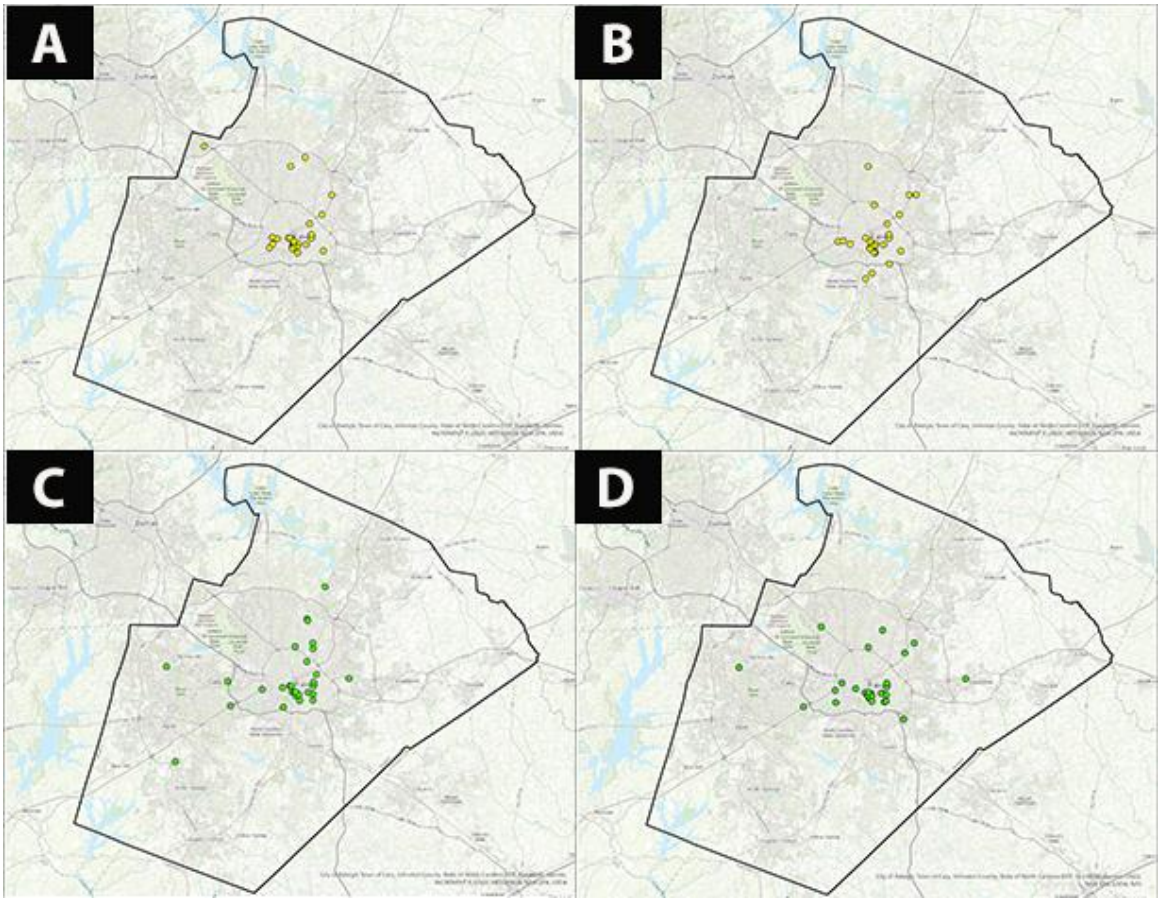

Figure 11: High Crash Intersections based on total pedestrian crashes per car crash (A), total black pedestrian crashes per car crash (B), total bicyclist crashes per car crash (C), and total black bicyclist crashes per car crash (D).

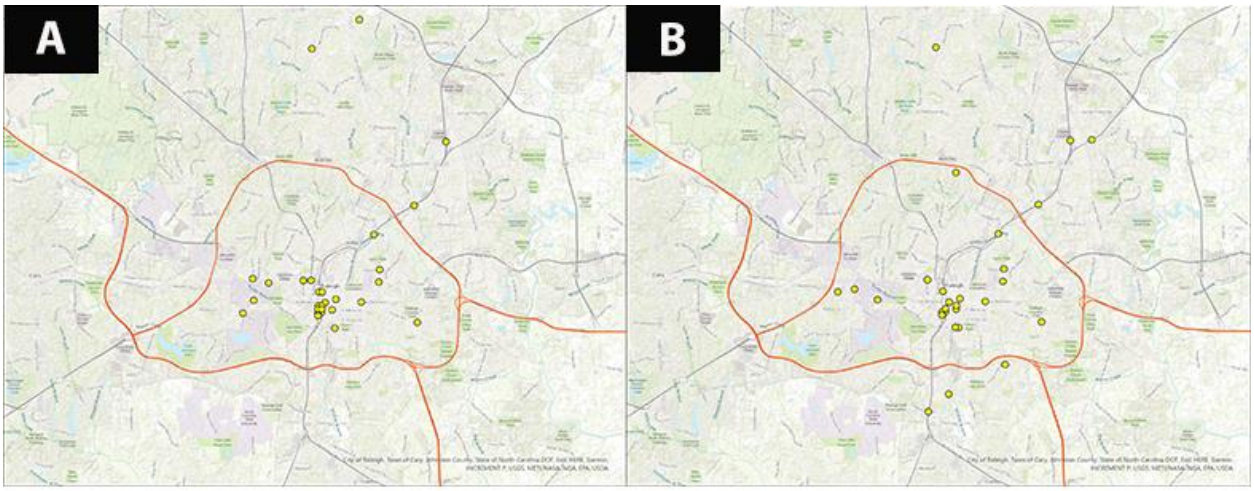

Figure 12: Pedestrian High Crash Intersections within central Raleigh: Total crashes per car crash (A) and total black crashes per car crash (B).

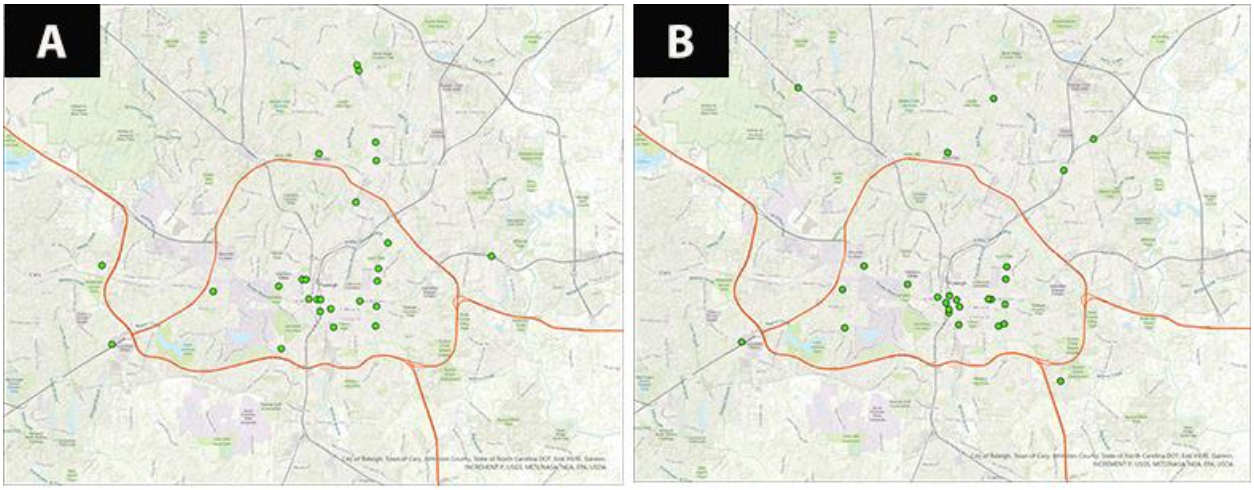

Figure 13: Bicyclist High Crash Intersections within central Raleigh: Total crashes per car crash (A) and total black crashes per car crash (B).

As seen in Table 17, a transition from Total Crashes to Black Crashes results in a decrease in the proportion of all crashes captured, and a decrease in all crashes per car crash within the intersections. However, the percent decreases are relatively small—7.26 percent and 3.08 percent, respectively. A transition from Total Crashes per Car Crash to Black Crashes per Car Crashes also results in decreases for both categories, and at a larger deficit.

Table 16: Proportion of pedestrian crashes captured in High Crash Intersections

	Black	White	% Difference
Total Crashes	25.64	24.05	6.40
Black Crashes	30.45	17.41	54.51
Total Crash / Car Crash	20.51	22.15	-7.68
Black Crash / Car Crash	26.28	13.61	63.55

Table 17: Pedestrian crashes captured and the percent change between options

	% All Crashes Captured	All Crashes / Car Crashes	% Change: All Crashes Captured	% Change: All Crashes / Car Crashes
Total Crashes	24.55	5.89	-7.26	-3.08
Black Crashes	22.77	5.71		
Total Crash / Car Crash	19.75	5.90	-11.11	-17.47
Black Crash / Car Crash	17.56	4.87		

For bicyclists, the disparities in Black and White crashes captured are more pronounced. As seen in Table 18, the Total Crash per Car Crash method and the Total Crash method both result in a smaller proportion of Black crashes captured than White crashes captured. The Black Crashes and Black Crashes per Car Crashes methods increase the proportion of Black crashes captured, but the decrease in White crashes captured is extremely drastic. Table 19 shows that the percent decreases for all crashes captured and all crashes per car crash that result from switching to a Black Crash metric are also drastic. For Total Crashes per Car Crash to Black Crashes per Car Crash, the decreases are both above 30 percent. As with the High Crash Roads analysis, switching the analytical focus to Black crashes over Total crashes comes with tradeoffs, especially for bicyclist focused work.

Table 18: Proportion of bicyclist crashes captured in High Crash Intersections

	Black	White	% Difference
Total Crashes	17.54	27.20	-43.16
Black Crashes	34.21	10.40	106.75
Total Crash / Car Crash	15.79	17.20	-8.55
Black Crash / Car Crash	30.70	4.80	145.92

Table 19: Bicyclist Crashes Captured and the percent change between options

	% All Crashes Captured	All Crash / Car Crash	% Change: All Crashes Captured	% Change: All Crash / Car Crash
Total Crashes	23.67	7.03	-21.57	-5.48
Black Crashes	18.56	6.64		
Total Crash / Car Crash	17.63	3.47	-31.58	-35.19
Black Crash / Car Crash	12.06	2.25		

The High Priority Networks for Wake County based on both Racial Equity metrics and the standard metrics used by Portland Vision Zero are displayed below in Figures 14 through 17.

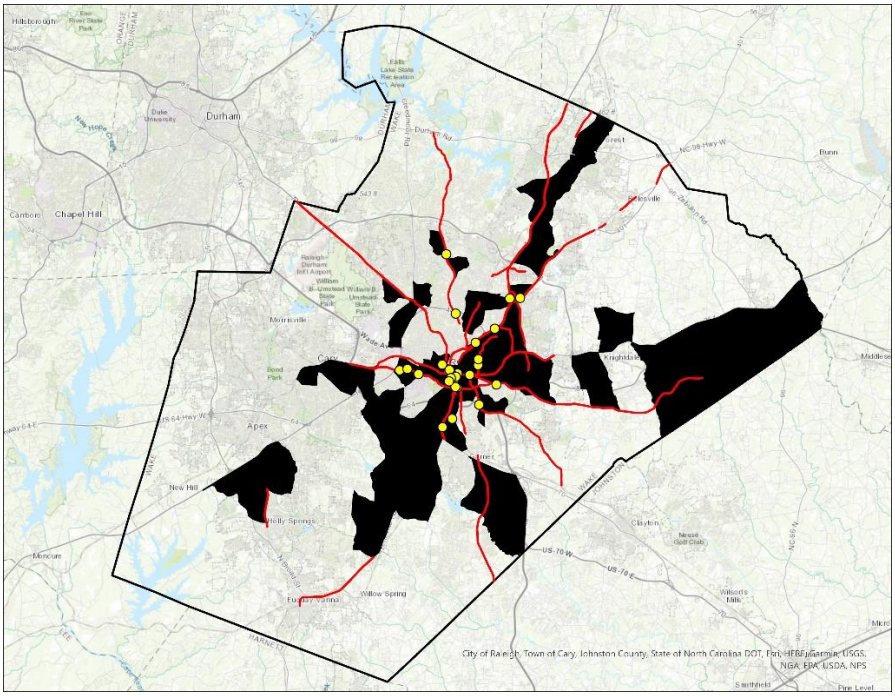

Figure 14: Pedestrian High Priority Network, Racial Equity: RPL Theme 4, High Crash Roads (Black crashes), High Crash Intersections (Black crashes per car crash).

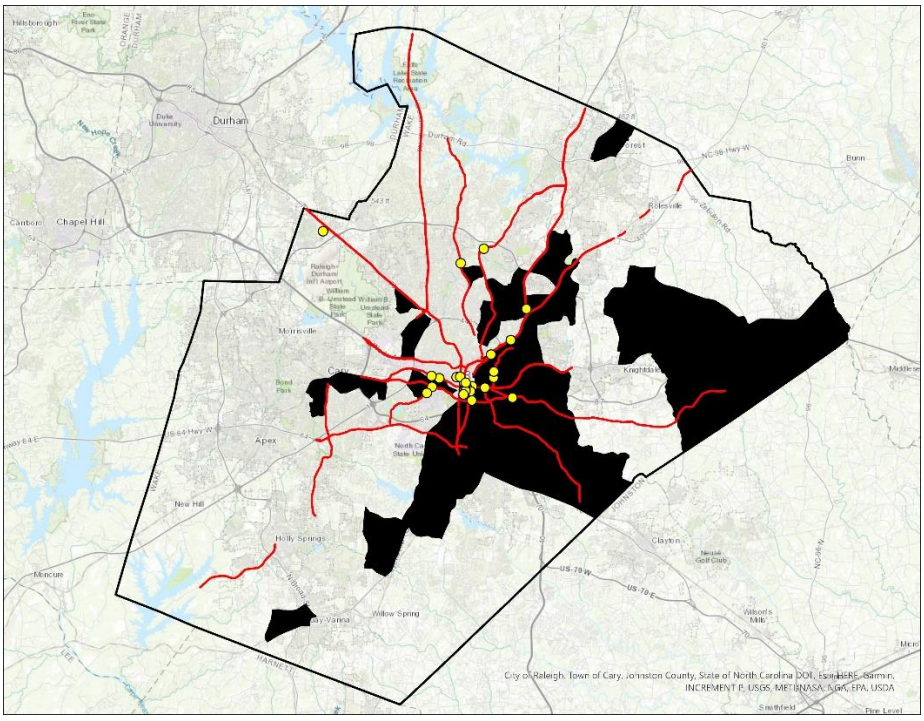

Figure 15: Pedestrian High Priority Network, Standard: RPL Themes, High Crash Roads (Total crashes), High Crash Intersections (Total crashes per car crash).

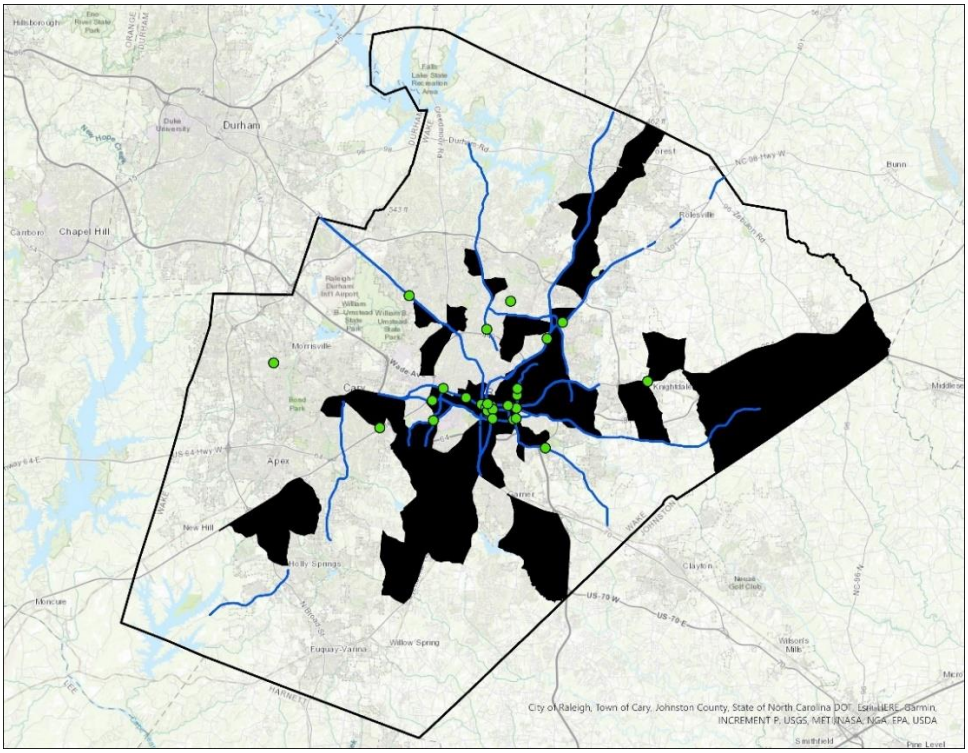

Figure 16: Bicyclist High Priority Network, Racial Equity: RPL Theme 4, High Crash Roads (Black crashes), High Crash Intersections (Black crashes per car crash).

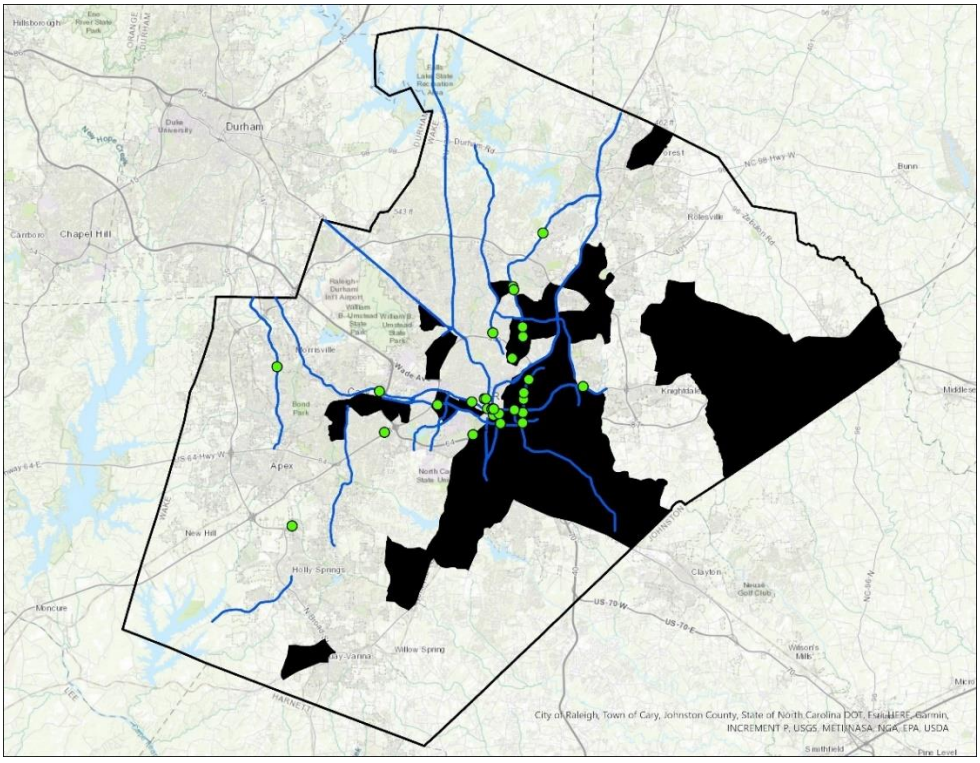

Figure 17: Bicyclist High Priority Network, Standard: RPL Themes, High Crash Roads (Total crashes), High Crash Intersections (Total crashes per car crash).

Combining Normal and Adjusted High-Priority Network

Through the analysis of Communities of Concern, High Crash Roads, and High Crash Intersections, it is evident that the High Priority Network could be improved to address the disparities in Black pedestrian and bicyclist safety more effectively. However, it is also evident that focusing directly on locations where Black crashes are more prominent may have tradeoffs. As a community, having clear values and goals will help determine where tradeoffs should be made.

Yet, the application of a racial-equity lens to the High Priority Network does not need to be an "Either-Or" option. In fact, there is substantial overlap in the Communities of Concern, High Crash Roads, and High Crash Intersections analyzed in this report. Table 24 shows the percentage of "shared" attributes: for RPL zones, Census Tracts; for High Crash Roads, Lane Miles; for Intersections, the intersections themselves. RPL Zones represents the combination of RPL Themes and RPL Theme 4. High Crash Roads represents the combination of the top 20 Total Crash roads and the top 20 Black Crash roads. For Intersections, the top 30 intersections for Total Crashes and Black Crashes, and the top 30 intersections for Total Crashes per Car Crash and Black Crashes per Car Crash, were combined. As can be seen, each of these different networks shares anywhere from 43.33 percent to 81.39 percent of the same network. So, choosing between one or the other for an analytical lens does not need to be a zero sum game.

Additionally, Table 24 shows the percentage difference in overall space when the two categories are merged; for example, the merger of RPL Themes and RPL Themes 4 results in a 24.76 percent increase in the amount of Census Tracts being analyzed. Selecting a few roads or intersections where Black crashes are particularly high, even if it wouldn't be captured by the primary lens of analysis, will likely not overburden the network or weaken its clarity.

Table 24: The overlap and merger of Racial and Non-Racial forms of analysis

	% Shared	% Difference when merged
RPL Zones	71.74	24.76
High Crash Roads - Bike	81.39	21.70
High Crash Roads- Ped	67.90	12.51
Intersection- Bike- Total	46.67	40.00
Intersection-Bike- Total per Car Crash	43.33	37.84
Intersection- Ped- Total	73.33	18.18
Intersection- Ped- Total per Car Crash	63.33	23.53

Discussion

Based upon the results of both the crash rate analysis and the application of the High Priority Network to Wake County, a few closing thoughts and recommendations will be offered:

1. **THERE IS A NEED FOR BETTER EXPOSURE DATA.** While population data was a suitable way to account for exposure for a geography as large as Wake County, it is extremely limited. Both high crash roads and high crash intersections could not be analyzed by crash rate, as the exposure data could only be applied at the Census Tract level. Even at the Census Tract level, many tracts either 1) did not have population data, or 2) had so few data points that it made comparisons between Census Tracts tenuous. For example, Table 25 shows the data for Means of Transportation to Work, collected from the American Community Survey, for Wake County. Work-related trips are a small segment of commuting, and it consequently drastically underreports the amount of pedestrians, bicyclists, and transit-users. Thus, some Census Tracts have no exposure data whatsoever, even though there were crashes within the Census Tract. When aggregated at the county level or across multiple Census Tracts, the data was reliable. However, more finite analysis was rendered impossible. Ideally, pedestrian and bicycle traffic counts could be used for exposure. While this data is often collected by municipal governments or purchased from third-party organizations, efforts should be made to **provide publicly available** data that is a more robust measure of exposure than population.

Table 25: Means of Transportation data for Wake County. American Community Survey 5 yr 2015-2019.

	Black	White
Walk	1246	4166
Bike	1535	4627
Walk + Bike + Transit (W+B+T)	5280	10895

2. **FOCUSING ON EQUITY METRICS MAY REQUIRE TRADEOFFS.** In both the High Crash Road and High Crash Intersection analyses, efforts to account for Black crashes instead of Total Crashes mostly resulted in a decrease in the overall amount of crashes captured by the analysis zone. If a community is adamant about pursuing racial equity as a primary goal, than this 'efficiency' loss may be fine. This points to the importance of communities establishing strong goals which guide the manner in which they account for racial equity.

3. **FOCUSING ON EQUITY METRICS IS NOT AN EITHER – OR GAME.** Although this analysis focused on contrasting zones of analysis (i.e. Total Crashes vs. Black Crashes), there was actually considerable overlap between the racial equity-based zones and the "standard" zones. A community does not have to completely abandon streets, intersections, or districts from their plans because they do not have high Black crash rates. Rather, by incorporating racial equity as a consideration in existing initiatives, communities may identify and add streets, intersections, or districts which may not have been otherwise identified by standard metrics.

4. **LOCAL CONTEXT MATTERS. MODELS MUST BE ADAPTED.** Overall, Wake County is a much different region that the City of Portland. Everything from the socio-demographic composition, the layout of streets, the rates of people who walk and bike, and the political climate are distinct. While the High Priority Network is a useful tool given its simplicity, it may not be as

effective in helping minority populations as it is for Portland. Additionally, not all communities will have the same goals surrounding racial equity as Portland. Ultimately, tools such as the High Priority Network are a starting point for communities to build from. Wake County, or any other community, must ultimately tinker with different metrics until they find the one that is both effective and aligned with their goals.

Conclusion

Overall, this analysis provides evidences that Wake County, NC has higher rates of pedestrian crashes, fatalities, and severe injuries for Black pedestrians and bicyclists than the population at large. While the analysis is limited by the quality of the exposure data, the results are still strong enough to confidently substantiate this hypothesis. Further, the High Priority Network used by Portland, Oregon and other Vision Zero communities does not perfectly address racial disparities in the Wake County context. Efforts to focus on Black crashes improve outcomes for areas with high Black crashes or crash rates, but it often decreases the overall amount of crashes or high-crash areas that are included in the High Priority Zone. However, given that there is often substantial overlap between areas derived from Black-focused metrics and All Crash-focused metrics, communities may be able to combine traditional High Crash Networks with components that are more focused on racial equity. Further, communities of different sizes, demographic compositions, or layout may have better or worse outcomes using the High Priority Network. Each community is unique, and it should build upon the efforts of other communities to create custom-tailored solutions that fit their context. Ultimately, communities should engage with the public to establish goals and priorities around racial equity that will inform the way they approach traffic safety.

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Cover Page image

Joshua Rawson-Harris on Unsplash: https://unsplash.com/photos/HCQQnoR5z0M

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Appendix

Section A: Wake County Pedestrian Data

	Crashes	A: Suspected Serious Injury	K: Killed	B: Suspected Minor Injury	C: Possible Injury	O: No Injury	Unknown Injury
Number: Black	1181	102	63	448	480	72	18
Number: White	1140	89	61	509	373	95	14
Rate: Black (W+B+T)	223.67	19.32	11.93	84.85	90.91	13.64	3.41
Rate: White (W+B+T)	104.64	8.17	5.60	46.72	34.24	8.72	1.28
% Difference: (W+B+T)	72.52	81.12	72.25	57.96	90.57	43.99	90.50
Rate: Black (Population)	635.14	54.86	33.88	240.93	258.14	38.72	9.68
Rate: White (Population)	191.95	14.99	10.27	85.70	62.80	16.00	2.36
% Difference: (Population)	107.17	114.17	106.95	95.05	121.73	83.07	121.67
Proportion of crash characteristic: Black	100.00	8.64	5.33	37.93	40.64	6.10	1.52
Proportion of crash characteristic: White	100.00	7.81	5.35	44.65	32.72	8.33	1.23

Figure A-1: Injury Severity

	0-5	6_10	11_15	16-20	16-19	20-24	21-25	25-29	26-30	30-39
Number: Black	23	45	100	33	99	127	18	114	21	139
Number: White	8	28	62	34	91	110	24	99	20	165
Rate: Black (W+B+T)	4.36	8.52	18.94	6.25	18.75	24.05	3.41	21.59	3.98	26.33
Rate: White (W+B+T)	0.73	2.57	5.69	3.12	8.35	10.10	2.20	9.09	1.84	15.14
% Difference: (W+B+T)	142.30	107.33	107.58	66.79	76.73	81.74	42.99	81.52	73.68	53.92
Rate: Black (Population)	12.37	24.20	53.78	17.75	53.24	68.30	9.68	61.31	11.29	74.75
Rate: White (Population)	1.35	4.71	10.44	5.72	15.32	18.52	4.04	16.67	3.37	27.78
% Difference: (Population)	160.72	134.78	134.98	102.44	110.61	114.67	82.20	114.49	108.13	91.62
Proportion of crash characteristic: Black	1.95	3.81	8.47	2.79	8.38	10.75	1.52	9.65	1.78	11.77
Proportion of crash characteristic: White	0.70	2.46	5.44	2.98	7.98	9.65	2.11	8.68	1.75	14.47

Figure A-2: Age

	31-40	40-49	41-50	50-59	51-60	60-69	61-79	70+	71+	Unknown
Number: Black	19	130	40	144	16	74	12	18	6	3
Number: White	30	127	41	143	18	68	10	49	12	1
Rate: Black (W+B+T)	3.60	24.62	7.58	27.27	3.03	14.02	2.27	3.41	1.14	0.57
Rate: White (W+B+T)	2.75	11.66	3.76	13.13	1.65	6.24	0.92	4.50	1.10	0.09
% Difference: (W+B+T)	26.60	71.47	67.25	70.04	58.87	76.75	84.93	-27.53	3.12	144.37
Rate: Black (Population)	10.22	69.91	21.51	77.44	8.60	39.80	6.45	9.68	3.23	1.61
Rate: White (Population)	5.05	21.38	6.90	24.08	3.03	11.45	1.68	8.25	2.02	0.17
% Difference: (Population)	67.68	106.31	102.82	105.13	95.81	110.63	117.23	15.95	45.98	162.20
Proportion of crash characteristic: Black	1.61	11.01	3.39	12.19	1.35	6.27	1.02	1.52	0.51	0.25
Proportion of crash characteristic: White	2.63	11.14	3.60	12.54	1.58	5.96	0.88	4.30	1.05	0.09

Figure A-3: Age, Continued

	5 - 15 MPH	20 - 25 MPH	30 - 35 MPH	40 - 45 MPH	50 - 55 MPH	60 - 75 MPH	Unknown
Number: Black	55	171	551	333	25	29	17
Number: White	50	208	482	306	33	42	19
Rate: Black (W+B+T)	10.42	32.39	104.36	63.07	4.73	5.49	3.22
Rate: White (W+B+T)	4.59	19.09	44.24	28.09	3.03	3.85	1.74
% Difference: (W+B+T)	77.67	51.65	80.91	76.75	43.95	35.04	59.46
Rate: Black (Population)	29.58	91.96	296.33	179.09	13.44	15.60	9.14
Rate: White (Population)	8.42	35.02	81.16	51.52	5.56	7.07	3.20
% Difference: (Population)	111.38	89.68	114.00	110.63	83.03	75.21	96.31
Proportion of crash characteristic: Black	4.66	14.48	46.66	28.20	2.12	2.46	1.44
Proportion of crash characteristic: White	4.39	18.25	42.28	26.84	2.89	3.68	1.67

Figure A-4: Speed Limit

	No Control Present	Yield Sign	Stop Sign	Warning Sign	Stop and Go Signal	Other
Number: Black	693	2	129	2	286	5
Number: White	542	5	143	3	363	9
Rate: Black (W+B+T)	131.25	0.38	24.43	0.38	54.17	0.95
Rate: White (W+B+T)	49.75	0.46	13.13	0.28	33.32	0.83
% Difference: (W+B+T)	90.06	-19.13	60.21	31.62	47.66	13.64
Rate: Black (Population)	372.69	1.08	69.38	1.08	153.81	2.69
Rate: White (Population)	91.26	0.84	24.08	0.51	61.12	1.52
% Difference: (Population)	121.32	24.38	96.94	72.18	86.25	55.83
Proportion of crash characteristic: Black	58.68	0.17	10.92	0.17	24.22	0.42
Proportion of crash characteristic: White	47.54	0.44	12.54	0.26	31.84	0.79

Figure A-5: Traffic Control

	Human Control	Flashing Stop and Go Signal	Flashing Signal without Stop Sign	Flashing Signal With Stop Sign	Double Yellow Line, No Passing Zone
Number: Black	10	2	2	2	48
Number: White	18	0	3	3	50
Rate: Black (W+B+T)	1.89	0.38	0.38	0.38	9.09
Rate: White (W+B+T)	1.65	0.00	0.28	0.28	4.59
% Difference: (W+B+T)	13.64	200.00	31.62	31.62	65.81
Rate: Black (Population)	5.38	1.08	1.08	1.08	25.81
Rate: White (Population)	3.03	0.00	0.51	0.51	8.42
% Difference: (Population)	55.83	200.00	72.18	72.18	101.63
Proportion of crash characteristic: Black	0.85	0.17	0.17	0.17	4.06
Proportion of crash characteristic: White	1.58	0.00	0.26	0.26	4.39

Figure A-6: Traffic Control, Continued

	Local Street	Interstate	NC Route	State Secondary Route	US Route	Private Road, Driveway	Public Vehicular Area
Number: Black	985	35	18	66	23	3	51
Number: White	905	39	19	105	35	5	32
Rate: Black (W+B+T)	186.55	6.63	3.41	12.50	4.36	0.57	9.66
Rate: White (W+B+T)	83.07	3.58	1.74	9.64	3.21	0.46	2.94
% Difference: (W+B+T)	76.77	59.74	64.63	25.86	30.22	21.27	106.73
Rate: Black (Population)	529.73	18.82	9.68	35.49	12.37	1.61	27.43
Rate: White (Population)	152.38	6.57	3.20	17.68	5.89	0.84	5.39
% Difference: (Population)	110.64	96.55	100.64	67.01	70.92	62.85	134.32
Proportion of crash characteristic: Black	83.40	2.96	1.52	5.59	1.95	0.25	4.32
Proportion of crash characteristic: White	79.39	3.42	1.67	9.21	3.07	0.44	2.81

Figure A-7: Road Class

	1 Lane	2 Lanes	3 Lanes	4 Lanes	5 Lanes
Number: Black	20	500	132	197	102
Number: White	15	480	147	204	89
Rate: Black (W+B+T)	3.79	94.70	25.00	37.31	19.32
Rate: White (W+B+T)	1.38	44.06	13.49	18.72	8.17
% Difference: (W+B+T)	93.37	72.99	59.79	66.34	81.12
Rate: Black (Population)	10.76	268.90	70.99	105.95	54.86
Rate: White (Population)	2.53	80.82	24.75	34.35	14.99
% Difference: (Population)	123.94	107.56	96.59	102.07	114.17
Proportion of crash characteristic: Black	1.69	42.34	11.18	16.68	8.64
Proportion of crash characteristic: White	1.32	42.11	12.89	17.89	7.81

Figure A-8: Number of Lanes

	6 Lanes	7 Lanes	8 Lanes	9 or more lanes	Unknown
Number: Black	74	34	39	26	57
Number: White	76	34	27	26	42
Rate: Black (W+B+T)	14.02	6.44	7.39	4.92	10.80
Rate: White (W+B+T)	6.98	3.12	2.48	2.39	3.85
% Difference: (W+B+T)	67.07	69.43	99.51	69.43	94.75
Rate: Black (Population)	39.80	18.29	20.97	13.98	30.65
Rate: White (Population)	12.80	5.72	4.55	4.38	7.07
% Difference: (Population)	102.68	104.63	128.74	104.63	125.02
Proportion of crash characteristic: Black	6.27	2.88	3.30	2.20	4.83
Proportion of crash characteristic: White	6.67	2.98	2.37	2.28	3.68

Figure A-9: Number of Lanes, Continued

	Crosswalk Area	Intersection Proper	Other / Unknown	Paved Shoulder / Bike Lane / Parking Lane	Sidewalk / Shared Use Path / Driveway	Travel Lane	Unpaved Right-Of-Way
Number: Black	273	27	31	57	81	686	26
Number: White	390	28	28	43	62	573	16
Rate: Black (W+B+T)	51.70	5.11	5.87	10.80	15.34	129.92	4.92
Rate: White (W+B+T)	35.80	2.57	2.57	3.95	5.69	52.59	1.47
% Difference: (W+B+T)	36.36	66.21	78.22	92.91	91.77	84.74	108.11
Rate: Black (Population)	146.82	14.52	16.67	30.65	43.56	368.93	13.98
Rate: White (Population)	65.67	4.71	4.71	7.24	10.44	96.48	2.69
% Difference: (Population)	76.38	101.96	111.82	123.58	122.67	117.08	135.38
Proportion of crash characteristic: Black	23.12	2.29	2.62	4.83	6.86	58.09	2.20
Proportion of crash characteristic: White	34.21	2.46	2.46	3.77	5.44	50.26	1.40

Figure A-10: Pedestrian Position

	Dark - Lighted Roadway	Dark - Roadway Not Lighted	Dark - Unknown Lighting	Dawn	Daylight	Dusk	Unknown
Number: Black	305	159	10	24	638	42	3
Number: White	252	145	5	26	678	31	3
Rate: Black (W+B+T)	57.77	30.11	1.89	4.55	120.83	7.95	0.57
Rate: White (W+B+T)	23.13	13.31	0.46	2.39	62.23	2.85	0.28
% Difference: (W+B+T)	85.63	77.40	121.98	62.29	64.02	94.62	69.43
Rate: Black (Population)	164.03	85.51	5.38	12.91	343.11	22.59	1.61
Rate: White (Population)	42.43	24.41	0.84	4.38	114.16	5.22	0.51
% Difference: (Population)	117.79	111.16	145.86	98.69	100.14	124.92	104.63
Proportion of crash characteristic: Black	25.83	13.46	0.85	2.03	54.02	3.56	0.25
Proportion of crash characteristic: White	22.11	12.72	0.44	2.28	59.47	2.72	0.26

Figure A-11: Light Condition

	Yes	No
Number: Black	280	901
Number: White	211	929
Rate: Black (W+B+T)	53.03	170.64
Rate: White (W+B+T)	19.37	85.27
% Difference: (W+B+T)	93.00	66.72
Rate: Black (Population)	150.58	484.55
Rate: White (Population)	35.53	156.42
% Difference: (Population)	123.64	102.39
Proportion of crash characteristic: Black	23.71	76.29
Proportion of crash characteristic: White	18.51	81.49

Figure A-12: Hit & Run

	Backing Vehicle	Bus-Related	Crossing Driveway or Alley	Crossing Expressway	Crossing Roadway - Vehicle Not	Crossing Roadway - Vehicle Turning	Dash / Dart-out	Multiple Threat / Trapped
Number: Black	39	15	53	7	274	252	146	20
Number: White	20	10	43	10	269	305	94	27
Rate: Black (W+B+T)	7.39	2.84	10.04	1.33	51.89	47.73	27.65	3.79
Rate: White (W+B+T)	1.84	0.92	3.95	0.92	24.69	27.99	8.63	2.48
% Difference: (W+B+T)	120.38	102.32	87.11	36.36	71.04	52.12	104.87	41.80
Rate: Black (Population)	20.97	8.07	28.50	3.76	147.36	135.52	78.52	10.76
Rate: White (Population)	3.37	1.68	7.24	1.68	45.29	51.35	15.83	4.55
% Difference: (Population)	144.66	130.93	118.98	76.38	105.96	90.08	132.90	81.16
Proportion of crash characteristic: Black	3.30	1.27	4.49	0.59	23.20	21.34	12.36	1.69
Proportion of crash characteristic: White	1.75	0.88	3.77	0.88	23.60	26.75	8.25	2.37

Figure A-13: Crash Group

	Other / Unknown - Insufficient	Pedestrian in Roadway - Circumstances	Unique Midblock	Unusual Circumstances	Waiting to Cross	Walking along Roadway	Working or Playing in Roadway
Number: Black	25	67	12	140	2	108	21
Number: White	28	47	7	168	3	80	29
Rate: Black (W+B+T)	4.73	12.69	2.27	26.52	0.38	20.45	3.98
Rate: White (W+B+T)	2.57	4.31	0.64	15.42	0.28	7.34	2.66
% Difference: (W+B+T)	59.27	98.52	111.84	52.92	31.62	94.34	39.63
Rate: Black (Population)	13.44	36.03	6.45	75.29	1.08	58.08	11.29
Rate: White (Population)	4.71	7.91	1.18	28.29	0.51	13.47	4.88
% Difference: (Population)	96.15	127.97	138.23	90.76	72.18	124.70	79.26
Proportion of crash characteristic: Black	2.12	5.67	1.02	11.85	0.17	9.14	1.78
Proportion of crash characteristic: White	2.46	4.12	0.61	14.74	0.26	7.02	2.54

Figure A-14: Crash Group, Continued

	Intersection	Intersection-Related	Non-Intersection	Unknown
Number: Black	397	208	573	3
Number: White	488	133	519	0
Rate: Black (W+B+T)	75.19	39.39	108.52	0.57
Rate: White (W+B+T)	44.79	12.21	47.64	0.00
% Difference: (W+B+T)	50.67	105.37	77.98	200.00
Rate: Black (Population)	213.51	111.86	308.16	1.61
Rate: White (Population)	82.17	22.39	87.39	0.00
% Difference: (Population)	88.84	133.28	111.63	200.00
Proportion of crash characteristic: Black	33.62	17.61	48.52	0.25
Proportion of crash characteristic: White	42.81	11.67	45.53	0.00

Figure A-15: Crash Location

	Commercial	Farms, Woods, Pastures	Industrial	Institutional	Residential
Number: Black	596	52	1	21	511
Number: White	636	70	6	59	369
Rate: Black (W+B+T)	112.88	9.85	0.19	3.98	96.78
Rate: White (W+B+T)	58.38	6.42	0.55	5.42	33.87
% Difference: (W+B+T)	63.65	42.07	-97.64	-30.62	96.31
Rate: Black (Population)	320.53	27.97	0.54	11.29	274.81
Rate: White (Population)	107.09	11.79	1.01	9.93	62.13
% Difference: (Population)	99.83	81.40	-61.04	12.81	126.24
Proportion of crash characteristic: Black	50.47	4.40	0.08	1.78	43.27
Proportion of crash characteristic: White	55.79	6.14	0.53	5.18	32.37

Figure A-16: Development

	One-Way, Not Divided	Two-Way, Not Divided	Two-Way, Divided, Positive Median Barrier	Two-Way, Divided, Unprotected	Unknown
Number: Black	104	707	90	267	13
Number: White	128	634	94	272	12
Rate: Black (W+B+T)	19.70	133.90	17.05	50.57	2.46
Rate: White (W+B+T)	11.75	58.19	8.63	24.97	1.10
% Difference: (W+B+T)	50.55	78.83	65.58	67.79	76.37
Rate: Black (Population)	55.93	380.22	48.40	143.59	6.99
Rate: White (Population)	21.55	106.75	15.83	45.80	2.02
% Difference: (Population)	88.74	112.32	101.43	103.27	110.32
Proportion of crash characteristic: Black	8.81	59.86	7.62	22.61	1.10
Proportion of crash characteristic: White	11.23	55.61	8.25	23.86	1.05

Figure A-17: Road Configuration

	Alley Intersection	Bridge	Bridge approach	Driveway, Private	Driveway, Public	Five-point, Or More
Number: Black	1	6	2	23	39	1
Number: White	0	5	4	22	27	1
Rate: Black (W+B+T)	0.19	1.14	0.38	4.36	7.39	0.19
Rate: White (W+B+T)	0.00	0.46	0.37	2.02	2.48	0.09
% Difference: (W+B+T)	200.00	84.93	3.12	73.31	99.51	69.43
Rate: Black (Population)	0.54	3.23	1.08	12.37	20.97	0.54
Rate: White (Population)	0.00	0.84	0.67	3.70	4.55	0.17
% Difference: (Population)	200.00	117.23	45.98	107.82	128.74	104.63
Proportion of crash characteristic: Black	0.08	0.51	0.17	1.95	3.30	0.08
Proportion of crash characteristic: White	0.00	0.44	0.35	1.93	2.37	0.09

Figure A-18: Road Features

	Four-Way Intersection	Merge Lane Between on and off	Missing	No Special Feature	Non-intersection Median Crossing	On or Off Ramp
Number: Black	182	0	24	760	1	12
Number: White	223	0	37	660	3	16
Rate: Black (W+B+T)	34.47	0.00	4.55	143.94	0.19	2.27
Rate: White (W+B+T)	20.47	0.00	3.40	60.58	0.28	1.47
% Difference: (W+B+T)	50.97	#DIV/0!	28.95	81.52	-36.99	42.99
Rate: Black (Population)	97.88	0.00	12.91	408.73	0.54	6.45
Rate: White (Population)	37.55	0.00	6.23	111.13	0.51	2.69
% Difference: (Population)	89.10	#DIV/0!	69.78	114.49	6.27	82.20
Proportion of crash characteristic: Black	15.41	0.00	2.03	64.35	0.08	1.02
Proportion of crash characteristic: White	19.56	0.00	3.25	57.89	0.26	1.40

Figure A-19: Road Features, Continued

	Other	Related to Intersection	Shared-Use Paths or Trails	T-Intersection	Traffic Circle/Roundabout	Underpass	Y-Intersection
Number: Black	8	13	0	102	4	2	0
Number: White	10	28	0	100	0	3	1
Rate: Black (W+B+T)	1.52	2.46	0.00	19.32	0.76	0.38	0.00
Rate: White (W+B+T)	0.92	2.57	0.00	9.18	0.00	0.28	0.09
% Difference: (W+B+T)	49.10	-4.29	#DIV/0!	71.16	200.00	31.62	-200.00
Rate: Black (Population)	4.30	6.99	0.00	54.86	2.15	1.08	0.00
Rate: White (Population)	1.68	4.71	0.00	16.84	0.00	0.51	0.17
% Difference: (Population)	87.49	38.90	#DIV/0!	106.06	200.00	72.18	-200.00
Proportion of crash characteristic: Black	0.68	1.10	0.00	8.64	0.34	0.17	0.00
Proportion of crash characteristic: White	0.88	2.46	0.00	8.77	0.00	0.26	0.09

Figure A-20: Road Features, Further Continued

	Yes	No
Number: Black	123	1019
Number: White	128	974
Rate: Black (W+B+T)	23.30	192.99
Rate: White (W+B+T)	11.75	89.40
% Difference: (W+B+T)	65.90	73.37
Rate: Black (Population)	66.15	548.01
Rate: White (Population)	21.55	164.00
% Difference: (Population)	101.70	107.87
Proportion of crash characteristic: Black	10.41	86.28
Proportion of crash characteristic: White	11.23	85.44

Figure A-21: Pedestrian Alcohol Flag

	.	Missing	No	Unknown	Yes-Alcohol and Drugs, impairment	Yes-Alcohol, impairment suspected	Yes-Alcohol, impairment detected	Yes-Alcohol and Drugs, impairment	Yes-Drugs, impairment suspected
Number: Black	210	0	821	39	1	94	3	6	7
Number: White	209	1	782	37	0	93	5	4	9
Rate: Black (W+B+T)	39.77	0.00	155.49	7.39	0.19	17.80	0.57	1.14	1.33
Rate: White (W+B+T)	19.18	0.09	71.78	3.40	0.00	8.54	0.46	0.37	0.83
% Difference: (W+B+T)	69.85	-200.00	73.67	74.02	200.00	70.37	21.27	102.32	46.44
Rate: Black (Population)	112.94	0.00	441.53	20.97	0.54	50.55	1.61	3.23	3.76
Rate: White (Population)	35.19	0.17	131.67	6.23	0.00	15.66	0.84	0.67	1.52
% Difference: (Population)	104.97	-200.00	108.12	108.40	200.00	105.40	62.85	130.93	85.20
Proportion of crash characteristic: Black	17.78	0.00	69.52	3.30	0.08	7.96	0.25	0.51	0.59
Proportion of crash characteristic: White	18.33	0.09	68.60	3.25	0.00	8.16	0.44	0.35	0.79

Figure A-22: Pedestrian: Alcohol, Drug

Section 2: Wake County Bicyclist Data

	Crashes	A: Suspected Serious Injury	B: Suspected Minor Injury	C: Possible Injury	O: No Injury	K: Killed	Unknown Injury
Number: Black	415	23	142	174	66	4	6
Number: White	888	34	409	294	137	10	4
Rate: Black (per B)	270.36	14.98	92.51	113.36	43.00	2.61	3.91
Rate: White (per B)	191.92	7.35	88.39	63.54	29.61	2.16	0.86
% Difference (per B)	33.94	68.38	4.55	56.32	36.88	18.65	127.56
Rate: Black (per Population)	223.19	12.37	76.37	93.58	35.49	2.15	3.23
Rate: White (per Population)	149.52	5.72	68.87	49.50	23.07	1.68	0.67
% Difference (per Population)	39.53	73.45	10.33	61.61	42.44	24.38	130.93
Proportion of Crash Characteristic: Black	100.00	5.54	34.22	41.93	15.90	0.96	1.45
Proportion of Crash Characteristic: White	100.00	3.83	46.06	33.11	15.43	1.13	0.45

Figure B-1: Bike Injury

	0-5	6_10	11_15	16-19	20-24	25-29
Number: Black	4	29	89	54	48	25
Number: White	1	29	71	80	160	131
Rate: Black (per B)	2.61	18.89	57.98	35.18	31.27	16.29
Rate: White (per B)	0.22	6.27	15.34	17.29	34.58	28.31
% Difference (per B)	169.37	100.36	116.29	68.19	-10.05	-53.93
Rate: Black (per Population)	2.15	15.60	47.86	29.04	25.81	13.44
Rate: White (per Population)	0.17	4.88	11.95	13.47	26.94	22.06
% Difference (per Population)	170.96	104.63	120.06	73.26	-4.27	-48.52
Proportion of Crash Characteristic: Black	0.96	6.99	21.45	13.01	11.57	6.02
Proportion of Crash Characteristic: White	0.11	3.27	8.00	9.01	18.02	14.75

Figure B-2: Bike Age

	30-39	40-49	50-59	60-69	70+	Unknown
Number: Black	32	61	51	21	0	1
Number: White	141	112	102	48	10	3
Rate: Black (per B)	20.85	39.74	33.22	13.68	0.00	0.65
Rate: White (per B)	30.47	24.21	22.04	10.37	2.16	0.65
% Difference (per B)	-37.52	48.58	40.46	27.49	-200.00	0.48
Rate: Black (per Population)	17.21	32.81	27.43	11.29	0.00	0.54
Rate: White (per Population)	23.74	18.86	17.17	8.08	1.68	0.51
% Difference (per Population)	-31.90	53.99	45.98	33.15	-200.00	6.27
Proportion of Crash Characteristic: Black	7.71	14.70	12.29	5.06	0.00	0.24
Proportion of Crash Characteristic: White	15.88	12.61	11.49	5.41	1.13	0.34

Figure B-3: Bike Age, Continued

	Facing Traffic	With Traffic	Unknown	Not Applicable
Number: Black	167	195	12	41
Number: White	212	618	17	41
Rate: Black (per B)	108.79	127.04	7.82	26.71
Rate: White (per B)	45.82	133.56	3.67	8.86
% Difference (per B)	81.46	-5.01	72.11	100.36
Rate: Black (per Population)	89.81	104.87	6.45	22.05
Rate: White (per Population)	35.70	104.06	2.86	6.90
% Difference (per Population)	86.24	0.78	77.10	104.63
Proportion of Crash Characteristic: Black	40.24	46.99	2.89	9.88
Proportion of Crash Characteristic: White	23.87	69.59	1.91	4.62

Figure B-4: Bike Direction

	Bike Lane / Paved Shoulder	Driveway / Alley	Non-Roadway	Other	Sidewalk / Crosswalk / Driveway Crossing	Travel Lane	Unknown
Number: Black	14	19	8	5	131	210	28
Number: White	44	8	7	3	220	559	37
Rate: Black (per B)	9.12	12.38	5.21	3.26	85.34	136.81	18.24
Rate: White (per B)	9.51	1.73	1.51	0.65	47.55	120.81	8.00
% Difference (per B)	-4.17	150.97	110.01	133.60	56.88	12.42	78.09
Rate: Black (per Population)	7.53	10.22	4.30	2.69	70.45	112.94	15.06
Rate: White (per Population)	7.41	1.35	1.18	0.51	37.04	94.12	6.23
% Difference (per Population)	1.62	153.41	113.98	136.74	62.16	18.17	82.94
Proportion of Crash Characteristic: Black	3.37	4.58	1.93	1.20	31.57	50.60	6.75
Proportion of Crash Characteristic: White	4.95	0.90	0.79	0.34	24.77	62.95	4.17

Figure B-5: Bike Position

	Backing Vehicle	Bicyclist Failed to Yield - Midblock	Bicyclist Failed to Yield - Signalized Intersection	Bicyclist Failed to Yield - Sign-controlled Intersection	Bicyclist left turn / merge	Bicyclist Overtaking Motorist
Number: Black	2	39	41	37	8	7
Number: White	9	33	36	28	31	42
Rate: Black (per B)	1.30	25.41	26.71	24.10	5.21	4.56
Rate: White (per B)	1.95	7.13	7.78	6.05	6.70	9.08
% Difference (per B)	-39.54	112.33	109.77	119.73	-24.99	-66.24
Rate: Black (per Population)	1.08	20.97	22.05	19.90	4.30	3.76
Rate: White (per Population)	1.52	5.56	6.06	4.71	5.22	7.07
% Difference (per Population)	-33.95	116.23	113.75	123.38	-19.27	-61.04
Proportion of Crash Characteristic: Black	0.48	9.40	9.88	8.92	1.93	1.69
Proportion of Crash Characteristic: White	1.01	3.72	4.05	3.15	3.49	4.73

Figure B-6: Crash Group

	Bicyclist Right Turn / Merge	Crossing Paths - Other Circumstances	Head-on	Loss of Control / Turning Error	Motorist Failed to Yield - Midblock	Motorist Failed to Yield - Signalized Intersection	Motorist Failed to Yield - Sign-controlled Intersection
Number: Black	3	36	11	19	42	19	49
Number: White	3	52	7	34	61	49	114
Rate: Black (per B)	1.95	23.45	7.17	12.38	27.36	12.38	31.92
Rate: White (per B)	0.65	11.24	1.51	7.35	13.18	10.59	24.64
% Difference (per B)	100.36	70.42	130.27	51.00	69.94	15.57	25.76
Rate: Black (per Population)	1.61	19.36	5.92	10.22	22.59	10.22	26.35
Rate: White (per Population)	0.51	8.76	1.18	5.72	10.27	8.25	19.19
% Difference (per Population)	104.63	75.44	133.55	56.37	74.97	21.31	31.43
Proportion of Crash Characteristic: Black	0.72	8.67	2.65	4.58	10.12	4.58	11.81
Proportion of Crash Characteristic: White	0.34	5.86	0.79	3.83	6.87	5.52	12.84

Figure B-7: Crash Group, Continued

	Motorist left turn / merge	Motorist Overtaking Bicyclist	Motorist Right Turn / Merge	Other / Unknown - Insufficient Detail	Other / Unusual Circumstances	Parallel Paths - Other Circumstances	Parking / Bus-related
Number: Black	22	45	20	0	3	8	1
Number: White	154	133	77	0	6	13	4
Rate: Black (per B)	14.33	29.32	13.03	0.00	1.95	5.21	0.65
Rate: White (per B)	33.28	28.74	16.64	0.00	1.30	2.81	0.86
% Difference (per B)	-79.60	1.97	-24.35	#DIV/0!	40.46	59.89	-28.10
Rate: Black (per Population)	11.83	24.20	10.76	0.00	1.61	4.30	0.54
Rate: White (per Population)	25.93	22.39	12.96	0.00	1.01	2.19	0.67
% Difference (per Population)	-74.67	7.76	-18.62	#DIV/0!	45.98	65.12	-22.41
Proportion of Crash Characteristic: Black	5.30	10.84	4.82	0.00	0.72	1.93	0.24
Proportion of Crash Characteristic: White	17.34	14.98	8.67	0.00	0.68	1.46	0.45

Figure B-8: Crash Group, Further Continued

	Intersection	Intersection-related	Non-intersection	Unknown Location
Number: Black	217	38	159	1
Number: White	485	72	331	0
Rate: Black (per B)	141.37	24.76	103.58	0.65
Rate: White (per B)	104.82	15.56	71.54	0.00
% Difference (per B)	29.69	45.61	36.60	200.00
Rate: Black (per Population)	116.70	20.44	85.51	0.54
Rate: White (per Population)	81.66	12.12	55.73	0.00
% Difference (per Population)	35.33	51.07	42.17	200.00
Proportion of Crash Characteristic: Black	52.29	9.16	38.31	0.24
Proportion of Crash Characteristic: White	54.62	8.11	37.27	0.00

Figure B-9: Crash Location

	Commercial	Farms, Woods, Pastures	Industrial	Institutional	Residential
Number: Black	189	6	1	5	214
Number: White	453	74	4	57	300
Rate: Black (per B)	123.13	3.91	0.65	3.26	139.41
Rate: White (per B)	97.90	15.99	0.86	12.32	64.84
% Difference (per B)	22.82	-121.44	-28.10	-116.35	73.02
Rate: Black (per Population)	101.64	3.23	0.54	2.69	115.09
Rate: White (per Population)	76.27	12.46	0.67	9.60	50.51
% Difference (per Population)	28.52	-117.72	-22.41	-112.46	77.99
Proportion of Crash Characteristic: Black	45.54	1.45	0.24	1.20	51.57
Proportion of Crash Characteristic: White	51.01	8.33	0.45	6.42	33.78

Figure B-10: Development

	Yes	No
Number: Black	61	354
Number: White	143	745
Rate: Black (per B)	39.74	230.62
Rate: White (per B)	30.91	161.01
% Difference (per B)	25.01	35.55
Rate: Black (per Population)	32.81	190.38
Rate: White (per Population)	24.08	125.44
% Difference (per Population)	30.69	41.13
Proportion of Crash Characteristic: Black	14.70	85.30
Proportion of Crash Characteristic: White	16.10	83.90

Figure B-11: Hit & Run

	Dark - Lighted Roadway	Dark - Roadway Not Lighted	Dark - Unknown Lighting	Dawn	Daylight	Dusk	Unknown	Other
Number: Black	64	22	0	4	310	0	0	0
Number: White	120	46	3	10	672	0	1	1
Rate: Black (per B)	41.69	14.33	0.00	2.61	201.95	0.00	0.00	0.00
Rate: White (per B)	25.93	9.94	0.65	2.16	145.23	0.00	0.22	0.22
% Difference (per B)	46.60	36.18	-200.00	18.65	32.67	#DIV/0!	-200.00	-200.00
Rate: Black (per Population)	34.42	11.83	0.00	2.15	166.72	0.00	0.00	0.00
Rate: White (per Population)	20.20	7.75	0.51	1.68	113.15	0.00	0.17	0.17
% Difference (per Population)	52.04	41.75	-200.00	24.38	38.28	#DIV/0!	-200.00	-200.00
Proportion of Crash Characteristic: Black	15.42	5.30	0.00	0.96	74.70	0.00	0.00	0.00
Proportion of Crash Characteristic: White	13.51	5.18	0.34	1.13	75.68	0.00	0.11	0.11

Figure B-12: Light Condition

	1 Lane	2 lanes	3 lanes	4 lanes	5 lanes
Number: Black	14	212	40	59	22
Number: White	17	445	85	152	93
Rate: Black (per B)	9.12	138.11	26.06	38.44	14.33
Rate: White (per B)	3.67	96.17	18.37	32.85	20.10
% Difference (per B)	85.14	35.80	34.61	15.67	-33.50
Rate: Black (per Population)	7.53	114.01	21.51	31.73	11.83
Rate: White (per Population)	2.86	74.93	14.31	25.59	15.66
% Difference (per Population)	89.82	41.37	40.20	21.41	-27.84
Proportion of Crash Characteristic: Black	3.37	51.08	9.64	14.22	5.30
Proportion of Crash Characteristic: White	1.91	50.11	9.57	17.12	10.47

Figure B-13: Number of Lanes

	6 lanes	7 lanes	8 lanes	9 or more lanes	Unknown
Number: Black	26	9	9	7	17
Number: White	27	11	9	7	42
Rate: Black (per B)	16.94	5.86	5.86	4.56	11.07
Rate: White (per B)	5.84	2.38	1.95	1.51	9.08
% Difference (per B)	97.51	84.60	100.36	100.36	19.83
Rate: Black (per Population)	13.98	4.84	4.84	3.76	9.14
Rate: White (per Population)	4.55	1.85	1.52	1.18	7.07
% Difference (per Population)	101.86	89.30	104.63	104.63	25.54
Proportion of Crash Characteristic: Black	6.27	2.17	2.17	1.69	4.10
Proportion of Crash Characteristic: White	3.04	1.24	1.01	0.79	4.73

Figure B-14: Number of Lanes, Continued

	Local Street	Interstate	NC Route	State Secondary Route	US Route	Private Road, Driveway	Public Vehicular Area	Unknown	Missing
Number: Black	339	2	5	36	8	2	22	1	0
Number: White	637	4	31	150	13	1	39	8	5
Rate: Black (per B)	220.85	1.30	3.26	23.45	5.21	1.30	14.33	0.65	0.00
Rate: White (per B)	137.67	0.86	6.70	32.42	2.81	0.22	8.43	1.73	1.08
% Difference (per B)	46.40	40.46	-69.15	-32.09	59.89	143.09	51.87	-90.53	-200.00
Rate: Black (per Population)	182.31	1.08	2.69	19.36	4.30	1.08	11.83	0.54	0.00
Rate: White (per Population)	107.25	0.67	5.22	25.26	2.19	0.17	6.57	1.35	0.84
% Difference (per Population)	51.84	45.98	-64.00	-26.43	65.12	145.86	57.23	-85.87	-200.00
Proportion of Crash Characteristic: Black	81.69	0.48	1.20	8.67	1.93	0.48	5.30	0.24	0.00
Proportion of Crash Characteristic: White	71.73	0.45	3.49	16.89	1.46	0.11	4.39	0.90	0.56

Figure B-15: Road Class

	One-Way, Not Divided	Two-Way, Not Divided	Two-Way, Divided, Positive Median Barrier	Two-Way, Divided, Unprotected Median	Unknown
Number: Black	37	264	21	91	2
Number: White	43	601	39	199	6
Rate: Black (per B)	24.10	171.99	13.68	59.28	1.30
Rate: White (per B)	9.29	129.89	8.43	43.01	1.30
% Difference (per B)	88.69	27.89	47.51	31.82	0.48
Rate: Black (per Population)	19.90	141.98	11.29	48.94	1.08
Rate: White (per Population)	7.24	101.19	6.57	33.51	1.01
% Difference (per Population)	93.29	33.54	52.93	37.44	6.27
Proportion of Crash Characteristic: Black	8.92	63.61	5.06	21.93	0.48
Proportion of Crash Characteristic: White	4.84	67.68	4.39	22.41	0.68

Figure B-16: Road Configuration

	Bridge	Driveway, Private	Driveway, Public	Four-Way Intersection	Missing	No Special Feature	Non-intersection Median Crossing
Number: Black	0	9	21	84	4	205	0
Number: White	1	10	34	185	22	439	1
Rate: Black (per B)	0.00	5.86	13.68	54.72	2.61	133.55	0.00
Rate: White (per B)	0.22	2.16	7.35	39.98	4.75	94.88	0.22
% Difference (per B)	-200.00	92.27	60.23	31.13	-58.39	33.86	-200.00
Rate: Black (per Population)	0.00	4.84	11.29	45.17	2.15	110.25	0.00
Rate: White (per Population)	0.17	1.68	5.72	31.15	3.70	73.92	0.17
% Difference (per Population)	-200.00	96.76	65.45	36.75	-53.05	39.46	-200.00
Proportion of Crash Characteristic: Black	0.00	2.17	5.06	20.24	0.96	49.40	0.00
Proportion of Crash Characteristic: White	0.11	1.13	3.83	20.83	2.48	49.44	0.11

Figure B-17: Road Feature

	On or Off Ramp	Other	Related to Intersection	Shared-Use Paths or Trails	T-Intersection	Traffic Circle/Roundabout	Y-Intersection
Number: Black	5	1	6	1	72	2	4
Number: White	3	9	19	2	154	6	3
Rate: Black (per B)	3.26	0.65	3.91	0.65	46.91	1.30	2.61
Rate: White (per B)	0.65	1.95	4.11	0.43	33.28	1.30	0.65
% Difference (per B)	133.60	-99.64	-4.93	40.46	33.98	0.48	120.30
Rate: Black (per Population)	2.69	0.54	3.23	0.54	38.72	1.08	2.15
Rate: White (per Population)	0.51	1.52	3.20	0.34	25.93	1.01	0.51
% Difference (per Population)	136.74	-95.23	0.86	45.98	39.57	6.27	123.94
Proportion of Crash Characteristic: Black	1.20	0.24	1.45	0.24	17.35	0.48	0.96
Proportion of Crash Characteristic: White	0.34	1.01	2.14	0.23	17.34	0.68	0.34

Figure B-18: Road Feature, Continued

	5 - 15 MPH	20 - 25 MPH	30 - 35 MPH	40 - 45 MPH	50 - 55 MPH	60 - 75 MPH	Unknown
Number: Black	24	79	206	91	4	1	10
Number: White	52	158	365	256	29	1	27
Rate: Black (per B)	15.64	51.47	134.20	59.28	2.61	0.65	6.51
Rate: White (per B)	11.24	34.15	78.88	55.33	6.27	0.22	5.84
% Difference (per B)	32.72	40.46	51.92	6.90	-82.53	100.36	11.00
Rate: Black (per Population)	12.91	42.49	110.79	48.94	2.15	0.54	5.38
Rate: White (per Population)	8.76	26.60	61.46	43.10	4.88	0.17	4.55
% Difference (per Population)	38.33	45.98	57.28	12.68	-77.67	104.63	16.76
Proportion of Crash Characteristic: Black	5.78	19.04	49.64	21.93	0.96	0.24	2.41
Proportion of Crash Characteristic: White	5.86	17.79	41.10	28.83	3.27	0.11	3.04

Figure B-19: Speed Limit

	No Control Present	Yield Sign	Stop Sign	Warning Sign	Stop and Go Signal	Other
Number: Black	165	1	114	0	0	0
Number: White	352	9	196	0	0	7
Rate: Black (per B)	107.49	0.65	74.27	0.00	0.00	0.00
Rate: White (per B)	76.08	1.95	42.36	0.00	0.00	1.51
% Difference (per B)	34.23	-99.64	54.72	#DIV/0!	#DIV/0!	-200.00
Rate: Black (per Population)	88.74	0.54	61.31	0.00	0.00	0.00
Rate: White (per Population)	59.27	1.52	33.00	0.00	0.00	1.18
% Difference (per Population)	39.82	-95.23	60.03	#DIV/0!	#DIV/0!	-200.00
Proportion of Crash Characteristic: Black	39.76	0.24	27.47	0.00	0.00	0.00
Proportion of Crash Characteristic: White	39.64	1.01	22.07	0.00	0.00	0.79

Figure B-20: Traffic Control

	Human Control	Flashing Stop and Go Signal	Flashing Signal without Stop Sign	Flashing Signal With Stop Sign	Double Yellow Line, No Passing Zone	School Zone Signs
Number: Black	1	0	0	1	11	0
Number: White	1	1	0	1	74	1
Rate: Black (per B)	0.65	0.00	0.00	0.65	7.17	0.00
Rate: White (per B)	0.22	0.22	0.00	0.22	15.99	0.22
% Difference (per B)	100.36	-200.00	#DIV/0!	100.36	-76.23	-200.00
Rate: Black (per Population)	0.54	0.00	0.00	0.54	5.92	0.00
Rate: White (per Population)	0.17	0.17	0.00	0.17	12.46	0.17
% Difference (per Population)	104.63	-200.00	#DIV/0!	104.63	-71.22	-200.00
Proportion of Crash Characteristic: Black	0.24	0.00	0.00	0.24	2.65	0.00
Proportion of Crash Characteristic: White	0.11	0.11	0.00	0.11	8.33	0.11

Figure B-21: Traffic Control, Continued

	Yes	No
Number: Black	28	382
Number: White	22	855
Rate: Black (per B)	18.24	248.86
Rate: White (per B)	4.75	184.78
% Difference (per B)	117.29	29.55
Rate: Black (per Population)	15.06	205.44
Rate: White (per Population)	3.70	143.96
% Difference (per Population)	121.03	35.19
Proportion of Crash Characteristic: Black	6.75	92.05
Proportion of Crash Characteristic: White	2.48	96.28

Figure B-22: Bike Alcohol Flag

	.	No	Unknown	Yes-Alcohol, impairment suspected	Yes-Alcohol, impairment detected	Yes-Alcohol and Drugs, impairment suspected
Number: Black	105	290	5	8	4	3
Number: White	186	673	11	15	2	1
Rate: Black (per B)	68.40	188.93	3.26	5.21	2.61	1.95
Rate: White (per B)	40.20	145.45	2.38	3.24	0.43	0.22
% Difference (per B)	51.94	26.00	31.23	46.60	143.09	160.17
Rate: Black (per Population)	56.47	155.96	2.69	4.30	2.15	1.61
Rate: White (per Population)	31.32	113.32	1.85	2.53	0.34	0.17
% Difference (per Population)	57.30	31.67	36.86	52.04	145.86	162.20
Proportion of Crash Characteristic: Black	25.30	69.88	1.20	1.93	0.96	0.72
Proportion of Crash Characteristic: White	20.95	75.79	1.24	1.69	0.23	0.11

Figure B-23: Bike: Alcohol, Drug