

# **CY 2015 Motor Vehicle Stop Data Collection Analysis**



**Metropolitan Nashville Police Department  
Nashville and Davidson County**

**April 26, 2016**

**Prepared by  
Crime Analysis Section**

# Table of Contents

<b><u>Contents</u></b>	<b><u>Page</u></b>
Introduction	1
Purpose	2
Executive Summary	2
Data Analysis and Results	4
Limitations and Assumptions	4
Vehicle Stops to Population	5
Geographic Information Systems (GIS) Analysis	7
Correlations Coefficients	8
Conclusions	16
Works Cited	17
Appendix	18
MNPD Police Patrol Boundaries and Patrol Zones	19
Grid Density Maps	20
Annual Trends	24
2015 Motor Vehicle Stop Summary	25

# Metropolitan Nashville Police Department, Nashville, Tennessee Vehicle Stop Data Collection Analysis

## Introduction

In 2000, The Tennessee General Assembly created a pilot program in which 44 Tennessee law enforcement agencies volunteered to collect detailed information for vehicle stops, including race, ethnicity, and gender of driver. In 2001, the Metropolitan Nashville Police Department (MNPD) began collecting this information for vehicle stops initiated in Metro Nashville. Although the State of Tennessee has since discontinued the program and does not require law enforcement agencies to collect the additional information, MNPD has elected to continue the practice.

A primary purpose for collecting vehicle stop data is to analyze whether officers are engaging a disproportionate amount of drivers according to the demographic breakdown of Davidson County's population.

The data collection instrument is *MNPD Form 252 – Vehicle Stops Data Form*, a modified state form that includes MNPD-specific data entries, such as address of stop, complaint number, ticket number, residency of the driver, officer employee identification number, and driver's license number. All Metropolitan Nashville Police Department officers are required to complete *MNPD Form 252 – Vehicle Stops Data Form* whenever a vehicle is stopped. This includes moving traffic violations, vehicle equipment violations, and for investigative reasons. Each record denotes if a citation is issued, an arrest is made, or a search is conducted. The officer initiating the stop must use their personal observation to determine race and ethnicity of the driver.

The US Department of Justice has identified standards for federal law enforcement officers when conducting vehicle stops stating that, "Federal law enforcement officers may not use race, ethnicity, gender, national origin, religion, sexual orientation, or gender identity to any degree, except that officers may rely on the listed characteristics in a specific suspect description" (US Department of Justice, 2014). The Metropolitan Nashville Police Department has demonstrated an open commitment to unbiased policing. The Department recognized the need to collect vehicle stop information well before the State of Tennessee initiated a pilot test program. It was coincidental that MNPD was able to take part in the 2001 pilot test. MNPD has long committed to building trust and credibility for police in the community.

The Metropolitan Nashville Police Department, Strategic Development Division produces weekly reports that list the number of vehicle stops, citations, and arrests made for each Precinct and Detail. This report attempts to go beyond basic counts by examining relationships between vehicle stop data and other factors (police workload, crime, and licensed drivers).

## **Purpose**

To address the methodology used and results from the analysis of the Metropolitan Nashville Police Department's (MNP) evaluation of the 2015 Motor Vehicle Stop Data Collection Program. This assessment emphasized an analysis of Black, White, and Hispanic licensed drivers in Davidson County.

## **Executive Summary**

Law enforcement agencies across the country continue to be challenged to establish viable and reliable methods to explain why disproportionate amounts of vehicle stops of racial/ethnic minorities occur within a jurisdiction.

While a single best way to analyze motor vehicle stop data has yet to be established, special care has been taken to assure that individual motorists and officers can not be identified in this study—the dataset is only analyzed in the aggregate. The purpose of the study is to assess whether the department as a whole is acting professionally—not identify or isolate the conduct of individual officers.

Empirical data collected for motor vehicle stops yield inconclusive results, do not determine causation, and can be easily misinterpreted. Although a higher percent of Black than White drivers were stopped when compared to Davidson County's licensed driver statistics, causation cannot be fully explained. However if one examines correlation coefficients of vehicle stops to police workload, crime, description of criminal suspects, and licensed drivers, empirical differences can be better clarified.

A Geographic Information System (GIS) was used to evaluate spatial relationships of the motor vehicle stop data. Use of a uniform grid (equal area per grid cell) with addresses of licensed drivers proved to be more valid than using U.S. Bureau of Census boundaries and population. The grid method compared the locations of vehicle stops, crime, and police workload against home addresses of Tennessee licensed drivers.

Additionally, MNP's Crime Analysis Section analyzed the Pearson correlation coefficient of vehicle stop data for several different sets of variables. The Pearson coefficient (Pearson's  $r$ ) is a measure of the correlation between two variables, resulting in a value between +1 and -1. It is a widely used statistic for measuring the strength of linear dependence between two variables.

A *VERY STRONG* correlation exists between where Black suspects are described in incident reports and where Black drivers are stopped. A *VERY STRONG* correlation exists between where Hispanic suspects are described in incident reports and where Hispanic drivers are stopped. A *MODERATELY STRONG* exists between where White suspects are described in incident reports and where White drivers are stopped.

A *VERY STRONG* correlation exists between locations where violent and property incidents are reported and locations where police resources are deployed—a correlation that suggests MNPd police engage in increased activity in areas where victims report the most crime.

A *VERY STRONG* correlation exists between locations where licensed drivers are stopped and locations where police resources are deployed.

Correlations such as these may help explain why a disproportionate amount of Black drivers were stopped.

A higher percentage of Hispanic drivers were arrested as a result of a vehicle stop, when compared to White and Black drivers. However, an analysis of arrest charges shows that most drivers arrested during a vehicle stop—89.0% of Hispanic drivers and 72.7% of Non-Hispanic drivers—were charged with a driver's license-related violation (e.g. driving on a suspended license, driving without a license).

## Data Analysis and Results

Vehicle Stop Analyses summarize data collected from *MNPD Form 252 – Vehicle Stops Data Form* as either the hard copy form or by using the InPursuit eForm application in RMS. The MNPD Information Technology Division provides the Crime Analysis Section access to data tables of this information residing on a SQL server. In total, the MNPD Crime Analysis Section analyzed 358,612 vehicle stop records in 2015—130,199 Black motorists, 216,617 White motorists, and 20,209 Hispanic motorists. Although the following race categories were not evaluated in this study, there were 5,177 Asian/Pacific Islanders, 443 American Indian/Alaskans, and 6,176 “Other” motorists stopped while operating a motor vehicle. 15.0% of the drivers who were stopped were issued citations, and 7.0% of vehicle stops resulted in an arrest (physical and/or citation arrest). Arrests made as a result of a vehicle stop (25,036) represented 31.5% of all arrests (79,386) made in Davidson County in 2015. This is a slight percentage decrease from 2014, when arrests made as a result of a vehicle stop (28,129) represented 33.7% of all Davidson County arrests (83,441). This high count of chargeable offenses resulting from traffic stops supports the efficacy of the traffic stop as an enforcement tool—irrespective of citation issuance vs. warning.

State of Tennessee licensed driver data for Davidson County residents were compared to the vehicle stop information. The MNPD Crime Analysis Section used SPSS statistical software and ArcView Geographic Information System (GIS) mapping software to gain a clearer understanding of the comparative relationships. SPSS is a statistical analysis software package widely used in the social sciences. Similarly, ESRI ArcView GIS is a leading software package for examining spatial relationships among mapped datasets.

### Limitations and Assumptions

- Census data only represents the race and ethnicity of residents within the jurisdiction by census tract and census block and is not an accurate representation of the driver demographics in an area.
- Driver license race information was regarded as a more valid measure than census population information, but does not account for hot spot law enforcement initiatives.
- The movement of licensed drivers after license issuance may impact the validity of the data.
- Information on licensed drivers who reside outside of the area being studied, or do not have a valid driver license who are driving on local roads is unknown.
- It is impractical for a Police Department with such a large jurisdiction as Nashville (525 square miles) to conduct observational-type surveys on race and ethnicity of drivers on all of the major roads within the county. In addition, it is extremely difficult to determine the race/ethnicity of drivers based solely on an observer’s perception of a moving motor vehicle’s driver.
- More police are deployed in areas with high Calls for Service volume.

- Biannual workload assessments are performed to determine the optimum allocation of Patrol Zone Officers. The primary type of information used to perform the analysis is minutes of officer activity by location. The overall trend demonstrates that patrol zones (beats) are smaller towards the inner city and larger in the more rural areas near the county line. Thus, more officers are deployed towards the inner city, based on demand for police services.

Vehicle Stops to Population

Davidson County’s demographic characteristics change significantly during the 10-year gap between decennial censuses. Therefore, population projections from 2014 American Community Survey (ACS) 1-year sample dataset were used for a more valid estimate of populations.<sup>1</sup> For the purpose of this study, population counts of individuals age 16 and over were derived from the ACS. These population counts are depicted in **Table 1**.

**Table 1. 2014 American Community Survey Population Estimates (One-Year Estimate)**

	<i>Black</i>	<i>White</i>	<i>Hispanic</i>	<i>Estimated Total Population</i>
All Ages	184,190	419,527	66,369	668,347
16 Years & Up	142,243	352,602	43,643	538,443

Source: ACS 2014 (1-Year Sample) Tables DP05, B20005, B20005A, B20005B, and B20005I.

One might expect traffic stops to be distributed proportionately among the various race/ethnicity categories. However, vehicle stops for Black drivers accounted for 36.3% of all stops, even though the ACS reported that 26.4% of total population in Davidson County (age 16 and over) was Black—a difference of 9.9%. Vehicle stops for White drivers accounted for 60.4% of all stops, for a racial group representing 65.5% of total population—a difference of -5.1%. Vehicle stops for drivers with a Hispanic Ethnicity accounted for 5.6% of all stops, for an ethnic group representing 8.1% of total population—a difference of -2.5%. Caution must be exercised so that one does not rely solely on these numbers. Other factors that may contribute to the differences include police workload, hotspot policing, description of criminal suspects, and crime by geographic locations. Demographic comparisons are depicted in **Table 2** (Black Drivers Stopped), **Table 3** (White Drivers Stopped) and **Table 4** (Hispanic Drivers Stopped).

---

<sup>1</sup> In previous *Motor Vehicle Stop Data Collection* reports, the ACS 3-year sample dataset (three-year rolling average) was used for population projections. However, the US Census Bureau discontinued the 3-year ACS in November 2015. At this time, only the 1-year and 5-year ACS datasets are available for analysis.

**Table 2. Difference in Percent of Vehicle Stops to Population Type by Black Drivers**

	<i>Percent of Vehicle Stops (Black)</i>	<i>2014 Population Estimates 16 and Up (Black)</i>	<i>Difference between Stops and 16 and Up Population</i>
Black Drivers Stopped	36.3%	26.4%	9.9%

**Table 3. Difference in Percent of Vehicle Stops to Population Type by White Drivers**

	<i>Percent of Vehicle Stops (White)</i>	<i>2014 Population Estimates 16 and Up (White)</i>	<i>Difference between Stops and 16 and Up Population</i>
White Drivers Stopped	60.4%	65.5%	-5.1%

**Table 4. Difference in Percent of Vehicle Stops to Population Type by Hispanic Drivers**

	<i>Percent of Vehicle Stops (Hispanic)</i>	<i>2014 Population Estimates 16 and Up (Hispanic)</i>	<i>Difference between Stops and 16 and Up Population</i>
Hispanic Drivers Stopped	5.6%	8.1%	-2.5%

White drivers were issued citations at a higher rate (16.5%) than Black and Hispanic drivers (12.1% and 14.2%, respectively).

Black drivers were searched at a higher rate (4.6%) than White and Hispanic drivers (1.9% and 3.8%, respectively). 3.0% of Black drivers gave consent to search compared to 2.4% of Hispanic drivers and 1.4% of White drivers. 1.8% of Hispanic drivers were searched incident-to-arrest compared to 1.5% of Black drivers and 0.7% of White drivers. The rate for search due to evidence in plain view was 0.8% for Black drivers, 0.7% for White drivers, and 0.7% for Hispanic drivers.

Hispanic drivers were arrested at a higher rate than White and Black drivers. 24.4% of vehicle stops for Hispanic drivers resulted in arrest (physical arrest or misdemeanor citation arrest), compared to 10.1% for Black drivers and 5.3% for White drivers.

A detailed examination of arrest charges shows that the vast majority of arrests resulting from a vehicle stop included a driver's license-related violation. 89.0% of vehicle stops involving the arrest of a Hispanic driver included a violation of the provisions of TCA Title 55, Chapter 50 (offenses include: TCA 55-50-301 driving without

a license, and TCA 55-50-504 (a) driving on a suspended, canceled, or revoked license). 72.7% of vehicle stops involving the arrest of a non-Hispanic driver included a violation of TCA Title 55, Chapter 50.

**Table 5. Percentage of Drivers Who Were Issued Citations, Searched, or Arrested**

	<i>Vehicle Stops</i>	<i>Percent of Stops Issued Traffic Citations</i>	<i>Percent of Stops Searched</i>	<i>Percent of Stops Arrested</i>
White Drivers	216,617	16.5%	1.9%	5.3%
Black Drivers	130,199	12.1%	4.6%	10.1%
Hispanic Drivers	20,209	14.2%	3.8%	24.4%
County Total	358,612	15.0%	2.9%	7.0%

*Geographic Information Systems (GIS) Analysis*

The MNPD Crime Analysis Section used Geographic Information System (GIS) software to map densities of vehicle stop, crime, population, and police workload information. Through an automated geocoding process, the geographic locations of vehicle stops were plotted in the GIS. 92.5% of the vehicle stop locations were successfully matched to a location on the map. This match rate is considered to be very good and is made possible because the address data originates from MNPD’s Computer Aided Dispatch system, which verifies addresses as records are created by officers in the field.

Police patrol personnel are allocated to areas based on the demand for police services, with consideration taken for the severity of each offense type. The demand for police services is greater towards the inner city. Furthermore, additional police resources in the form of Crime Suppression Officers, DUI Task Force, Flex Officers, Walking & Bike Officers, and Special Events Officers are routinely assigned in and around the inner city area. There are generally more police field officers available in the inner city than towards the county line. A map of patrol zone/beat officer boundaries can be found in **Appendix A**.

Additionally, the geographic distribution of licensed driver residences remains diverse across Davidson County. The demographic characteristics of areas where higher concentrations of police officers are deployed are significantly different than areas containing lower concentrations of officers.

Vehicle stop, crime, driver license, and police workload information were assessed using uniform grids. This methodology was preferred over a method incorporating census tracts, because each grid cell encompassed an equal area (1.6 square miles in this analysis). A z-score was assigned to each grid cell in each dataset, allowing for

density analysis, which provides a straightforward approach to understanding the information quickly. The addresses of Black, White, and Hispanic Tennessee licensed drivers were geocoded and aggregated by grid cell. U.S. Census Bureau demographic information could not be accurately interpreted to grids, since these counts are summarized at the county level.

Grid maps are included in **Appendix B**. The maps show that higher concentrations of vehicle stops occur in the inner city area, as well as higher concentrations of minutes of officer activity, number of officers at incidents, and index crimes as defined by Uniform Crime Report guidelines. Summarized by race/ethnicity, each licensed driver population significantly differs from the others. The grid density patterns between Black licensed drivers and police workload and vehicle stop information demonstrate a closer relationship than those for White licensed drivers. Small-scale versions of the grid maps are included in **Appendix B**.

### Correlation Coefficients

The MNPD Crime Analysis Section used SPSS statistical software to calculate bivariate correlation coefficients of the variables being tested—an assessment of the linear relationship between vehicle stop information against police workload, crime, and race. The Crime Analysis Section analyzed Pearson correlation coefficient values of vehicle stop data for several different sets of variables.

The Pearson coefficient (Pearson's  $r$ ) is a measure of the linear dependence of two variables, resulting in a value between +1 and -1.

Pearson correlation coefficients were calculated to determine  $r$  values and were found to be significant at the 0.01 (2 tailed) level. When the  $r$  value equals 0, there is no relationship between the two variables. The closer the  $r$  value gets to 1 or -1, the greater the relationship between the two variables. **Table 6** shows seven levels of magnitude for interpreting the Pearson Correlation Coefficient, ranging from *WEAK* to *VERY STRONG*. *Only correlation (the relationship) between data variables could be demonstrated; causation cannot be proved.*

**Table 6. Pearson Correlation Coefficient Magnitude**

<b>Correlation Coefficient (r value) Range</b>	<b>Interpretation</b>
0.000 - 0.299	Weak Positive Correlation
0.300 - 0.499	Moderate Positive Correlation
0.500 - 0.549	High Positive Correlation
0.550 - 0.649	Very High Positive Correlation
0.650 - 0.749	Moderately Strong Positive Correlation
0.750 - 0.849	Strong Positive Correlation
0.850 - 1.000	Very Strong Positive Correlation

The correlation coefficients allow us to make more precise interpretations of the relationships of the density grids displayed on the maps. In essence, there was sufficient evidence to conclude the following regarding the grid density maps:

- A *VERY STRONG* positive correlation exists between where Black and Hispanic suspects are described by victims on incident reports and where Black and Hispanic drivers are stopped. A *MODERATELY STRONG* positive correlation exists between where White suspects are described by victims on incident reports and where White drivers are stopped (**See Table 9**).
- A *VERY STRONG* positive correlation exists between police workload and locations where violent and property incidents are reported by the victim. This correlation suggests that MNPd police engage in an increased amount of activity in areas where crime incidents are more frequently reported (**See Table 11**).
- A *VERY STRONG* positive correlation exists between where suspects (all races) are described by victims on incident reports and where drivers (all races) are stopped. (*VERY STRONG* correlation for Black drivers; *STRONG* correlation for White drivers, *VERY HIGH* for Hispanic drivers.) These correlations suggest that MNPd police engage in an increased amount of activity in areas where suspects are reported (**See Table 15**).
- A *VERY STRONG* positive correlation exists between locations of violent incidents and locations of vehicle stops, arrests, and searches. A *MODERATELY STRONG* positive correlation exists between locations of violent incidents and locations where vehicle stop citations are issued. (**See Table 12**).
- A *VERY STRONG* positive correlation exists between locations of property incidents and locations of vehicle stops and vehicle stop arrests. A *STRONG* positive correlation exists between property incidents and locations of vehicle stop citations and searches. (**See Table 12**).

- A *VERY STRONG* positive correlation exists between drug incident locations and where Black drivers are stopped, issued citations, arrested, and searched. A *MODERATELY STRONG* to *STRONG* positive correlation exists between drug incident locations and where White drivers are stopped, issued citations, arrested, and searched. A *MODERATE* to *VERY HIGH* positive correlation exists between drug incident locations and where Hispanic drivers are stopped, issued citations, arrested, and searched (**See Table 8**).
- A *MODERATELY STRONG* to *STRONG* positive correlation exists between where Black licensed drivers live compared to where violent, property, and drug crimes occur. These correlations are consistently higher than measurements for where White and Hispanic drivers live compared to where violent, property, and drug crimes occur (**See Table 10**).
- A *MODERATELY STRONG* to *STRONG* positive correlation exists between where Black licensed drivers live and where Black drivers are stopped, issued citations, arrested, and searched due to the vehicle stop (**See Table 13**).
- A *HIGH* to *VERY HIGH* positive correlation exists between where White licensed drivers live and where White drivers are stopped, issued citations, arrested, and searched due to the vehicle stop (**See Table 13**).
- A *MODERATELY STRONG* to *VERY STRONG* positive correlation exists between where Hispanic licensed drivers live and where Hispanic drivers are stopped, issued citations, arrested, and searched due to the vehicle stop (**See Table 13**).
- A *VERY HIGH* positive correlation exists between where Black licensed drivers live and where Hispanic and White drivers are stopped. A *STRONG* positive correlation exists between where Black licensed drivers live and where Black drivers are stopped (**See Table 14**).
- A *MODERATE* positive correlation exists between where White licensed drivers live and where Black and Hispanic drivers are stopped. A *VERY HIGH* positive correlation exists between where White licensed drivers live and where White drivers are stopped (**See Table 14**).
- A *MODERATE* positive correlation exists between where Hispanic licensed drivers live and where Black and White drivers are stopped. A *STRONG* positive correlation exists between where Hispanic licensed drivers live and where Hispanic drivers are stopped (**See Table 14**).

**Table 7. The Bivariate Correlation Coefficients of  
Vehicle Stops to Police Workload by Grid**

<i>Variable 1</i>	<i>Variable 2</i>	<i>Correlation Coefficient (r)</i>	<i>Relationship</i>
Number of Officers at Incidents	Vehicle Stops (Black)	0.967	Very Strong Positive Correlation
	Citations Issued from Stops (Black)	0.905	Very Strong Positive Correlation
	Arrests Made from Stops (Black)	0.937	Very Strong Positive Correlation
	Searches from Vehicle Stops (Black)	0.904	Very Strong Positive Correlation
	Vehicle Stops (White)	0.914	Very Strong Positive Correlation
	Citations Issued from Stops (White)	0.810	Strong Positive Correlation
	Arrests Made from Stops (White)	0.767	Strong Positive Correlation
	Searches from Vehicle Stops (White)	0.834	Strong Positive Correlation
	Vehicle Stops (Hispanic)	0.604	Very High Positive Correlation
	Citations Issued from Stops (Hispanic)	0.623	Very High Positive Correlation
	Arrests Made from Stops (Hispanic)	0.520	High Positive Correlation
	Searches from Vehicle Stops (Hispanic)	0.542	High Positive Correlation
Minutes of Officer Activity at Incident Locations	Vehicle Stops (Black)	0.968	Very Strong Positive Correlation
	Citations Issued from Stops (Black)	0.910	Very Strong Positive Correlation
	Arrests Made from Stops (Black)	0.937	Very Strong Positive Correlation
	Searches from Vehicle Stops (Black)	0.902	Very Strong Positive Correlation
	Vehicle Stops (White)	0.884	Very Strong Positive Correlation
	Citations Issued from Stops (White)	0.791	Strong Positive Correlation
	Arrests Made from Stops (White)	0.752	Strong Positive Correlation
	Searches from Vehicle Stops (White)	0.818	Strong Positive Correlation
	Vehicle Stops (Hispanic)	0.597	Very High Positive Correlation
	Citations Issued from Stops (Hispanic)	0.614	Very High Positive Correlation
	Arrests Made from Stops (Hispanic)	0.515	High Positive Correlation
	Searches from Vehicle Stops (Hispanic)	0.544	High Positive Correlation

**Table 8. The Bivariate Correlation Coefficients of Vehicle Stops to Crime by Grid**

<i>Variable 1</i>	<i>Variable 2</i>	<i>Correlation Coefficient (r)</i>	<i>Relationship</i>
Violent Part One Incidents	Vehicle Stops (Black)	0.954	Very Strong Positive Correlation
	Citations Issued from Stops (Black)	0.845	Strong Positive Correlation
	Arrests Made from Stops (Black)	0.928	Very Strong Positive Correlation
	Searches from Vehicle Stops (Black)	0.894	Very Strong Positive Correlation
	Vehicle Stops (White)	0.788	Strong Positive Correlation
	Citations Issued from Stops (White)	0.676	Moderately Strong Positive Correlation
	Arrests Made from Stops (White)	0.740	Moderately Strong Positive Correlation
	Searches from Vehicle Stops (White)	0.792	Strong Positive Correlation
	Vehicle Stops (Hispanic)	0.604	Very High Positive Correlation
	Citations Issued from Stops (Hispanic)	0.570	Very High Positive Correlation
	Arrests Made from Stops (Hispanic)	0.540	High Positive Correlation
	Searches from Vehicle Stops (Hispanic)	0.580	Very High Positive Correlation
Property Part One Incidents	Vehicle Stops (Black)	0.861	Very Strong Positive Correlation
	Citations Issued from Stops (Black)	0.823	Strong Positive Correlation
	Arrests Made from Stops (Black)	0.806	Strong Positive Correlation
	Searches from Vehicle Stops (Black)	0.767	Strong Positive Correlation
	Vehicle Stops (White)	0.857	Very Strong Positive Correlation
	Citations Issued from Stops (White)	0.740	Moderately Strong Positive Correlation
	Arrests Made from Stops (White)	0.808	Strong Positive Correlation
	Searches from Vehicle Stops (White)	0.828	Strong Positive Correlation
	Vehicle Stops (Hispanic)	0.689	Moderately Strong Positive Correlation
	Citations Issued from Stops (Hispanic)	0.699	Moderately Strong Positive Correlation
	Arrests Made from Stops (Hispanic)	0.628	Very High Positive Correlation
	Searches from Vehicle Stops (Hispanic)	0.629	Very High Positive Correlation
Drug Incidents	Vehicle Stops (Black)	0.958	Very Strong Positive Correlation
	Citations Issued from Stops (Black)	0.861	Very Strong Positive Correlation
	Arrests Made from Stops (Black)	0.955	Very Strong Positive Correlation
	Searches from Vehicle Stops (Black)	0.943	Very Strong Positive Correlation
	Vehicle Stops (White)	0.845	Strong Positive Correlation
	Citations Issued from Stops (White)	0.741	Moderately Strong Positive Correlation
	Arrests Made from Stops (White)	0.739	Moderately Strong Positive Correlation
	Searches from Vehicle Stops (White)	0.829	Strong Positive Correlation
	Vehicle Stops (Hispanic)	0.554	Very High Positive Correlation
	Citations Issued from Stops (Hispanic)	0.549	High Positive Correlation
	Arrests Made from Stops (Hispanic)	0.478	Moderate Positive Correlation
	Searches from Vehicle Stops (Hispanic)	0.502	High Positive Correlation

**Table 9. The Bivariate Correlation Coefficients of Vehicle Stops to Suspects by Grid**

<i>Variable 1</i>	<i>Variable 2</i>	<i>Correlation Coefficient (r)</i>	<i>Relationship</i>
Black Suspects Described By Victim in Incident Reports	Vehicle Stops (Black)	0.916	Very Strong Positive Correlation
	Citations Issued from Stops (Black)	0.808	Strong Positive Correlation
	Arrests Made from Stops (Black)	0.902	Very Strong Positive Correlation
	Searches from Vehicle Stops (Black)	0.865	Very Strong Positive Correlation
	Licensed Drivers (Black)	0.768	Strong Positive Correlation
	Vehicle Stops (White)	0.758	Strong Positive Correlation
	Vehicle Stops (Hispanic)	0.509	High Positive Correlation
White Suspects Described By Victim in Incident Reports	Vehicle Stops (White)	0.738	Moderately Strong Positive Correlation
	Citations Issued from Stops (White)	0.623	Very High Positive Correlation
	Arrests Made from Stops (White)	0.811	Strong Positive Correlation
	Searches from Vehicle Stops (White)	0.791	Strong Positive Correlation
	Licensed Drivers (White)	0.523	High Positive Correlation
	Vehicle Stops (Black)	0.623	Very High Positive Correlation
	Vehicle Stops (Hispanic)	0.737	Moderately Strong Positive Correlation
Hispanic Suspects Described By Victim in Incident Reports	Vehicle Stops (Hispanic)	0.852	Very Strong Positive Correlation
	Citations Issued from Stops (Hispanic)	0.735	Moderately Strong Positive Correlation
	Arrests Made from Stops (Hispanic)	0.847	Strong Positive Correlation
	Searches from Vehicle Stops (Hispanic)	0.878	Very Strong Positive Correlation
	Licensed Drivers (Hispanic)	0.855	Very Strong Positive Correlation
	Vehicle Stops (White)	0.539	High Positive Correlation
	Vehicle Stops (Black)	0.433	Moderate Positive Correlation

**Table 10. The Bivariate Correlation Coefficients of Police Workload to Licensed Drivers by Grid**

<i>Variable 1</i>	<i>Variable 2</i>	<i>Correlation Coefficient (r)</i>	<i>Relationship</i>
Licensed Drivers (Black)	Violent Part One Incidents	0.848	Strong Positive Correlation
	Property Part One Incidents	0.776	Strong Positive Correlation
	Drug Incidents	0.699	Moderately Strong Positive Correlation
	Number of Officers at Incidents	0.740	Moderately Strong Positive Correlation
	Minutes of Officer Activity	0.766	Strong Positive Correlation
Licensed Drivers (White)	Violent Part One Incidents	0.421	Moderate Positive Correlation
	Property Part One Incidents	0.593	Very High Positive Correlation
	Drug Incidents	0.402	Moderate Positive Correlation
	Number of Officers at Incidents	0.510	High Positive Correlation
	Minutes of Officer Activity	0.486	Moderate Positive Correlation
Licensed Drivers (Hispanic)	Violent Part One Incidents	0.477	Moderate Positive Correlation
	Property Part One Incidents	0.519	High Positive Correlation
	Drug Incidents	0.341	Moderate Positive Correlation
	Number of Officers at Incidents	0.391	Moderate Positive Correlation
	Minutes of Officer Activity	0.402	Moderate Positive Correlation

**Table 11. The Bivariate Correlation Coefficients of Vehicle Stops to Police Workload by Grid**

<i>Variable 1</i>	<i>Variable 2</i>	<i>Correlation Coefficient (r)</i>	<i>Relationship</i>
Number of Officers at Incidents	Vehicle Stops (All Stops)	0.972	Very Strong Positive Correlation
	Citations Issued from Stops (All Stops)	0.853	Very Strong Positive Correlation
	Arrests Made from Stops (All Stops)	0.950	Very Strong Positive Correlation
	Searches from Vehicle Stops (All Stops)	0.934	Very Strong Positive Correlation
	Violent Part One Incidents	0.948	Very Strong Positive Correlation
	Property Part One Incidents	0.901	Very Strong Positive Correlation
Minutes of Officer Activity at Incident Locations	Vehicle Stops (All Stops)	0.954	Very Strong Positive Correlation
	Citations Issued from Stops (All Stops)	0.841	Strong Positive Correlation
	Arrests Made from Stops (All Stops)	0.943	Very Strong Positive Correlation
	Searches from Vehicle Stops (All Stops)	0.928	Very Strong Positive Correlation
	Violent Part One Incidents	0.960	Very Strong Positive Correlation
	Property Part One Incidents	0.901	Very Strong Positive Correlation

**Table 12. The Bivariate Correlation Coefficients of Vehicle Stops to Crime by Grid**

<i>Variable 1</i>	<i>Variable 2</i>	<i>Correlation Coefficient (r)</i>	<i>Relationship</i>
Violent Part One Incidents	Vehicle Stops (All Stops)	0.890	Very Strong Positive Correlation
	Citations Issued from Stops (All Stops)	0.740	Moderately Strong Positive Correlation
	Arrests Made from Stops (All Stops)	0.932	Very Strong Positive Correlation
	Searches from Vehicle Stops (All Stops)	0.914	Very Strong Positive Correlation
Property Part One Incidents	Vehicle Stops (All Stops)	0.894	Very Strong Positive Correlation
	Citations Issued from Stops (All Stops)	0.781	Strong Positive Correlation
	Arrests Made from Stops (All Stops)	0.880	Very Strong Positive Correlation
	Searches from Vehicle Stops (All Stops)	0.836	Strong Positive Correlation

**Table 13. The Bivariate Correlation Coefficients of Licensed Driver Addresses to Vehicle Stops, Citations, Arrests, and Searches by Grid**

<i>Variable 1</i>	<i>Variable 2</i>	<i>Correlation Coefficient (r)</i>	<i>Relationship</i>
Licensed Drivers (Black)	Vehicle Stops (Black)	0.758	Strong Positive Correlation
	Citations Issued from Stops (Black)	0.655	Moderately Strong Positive Correlation
	Arrests Made from Stops (Black)	0.701	Moderately Strong Positive Correlation
	Searches from Vehicle Stops (Black)	0.678	Moderately Strong Positive Correlation
Licensed Drivers (White)	Vehicle Stops (White)	0.610	Very High Positive Correlation
	Citations Issued from Stops (White)	0.505	High Positive Correlation
	Arrests Made from Stops (White)	0.538	High Positive Correlation
	Searches from Vehicle Stops (White)	0.542	High Positive Correlation
Licensed Drivers (Hispanic)	Vehicle Stops (Hispanic)	0.826	Strong Positive Correlation
	Citations Issued from Stops (Hispanic)	0.679	Moderately Strong Positive Correlation
	Arrests Made from Stops (Hispanic)	0.837	Strong Positive Correlation
	Searches from Vehicle Stops (Hispanic)	0.884	Very Strong Positive Correlation

**Table 14. The Bivariate Correlation Coefficients of Licensed Driver Addresses to Vehicle Stops by Race by Grid**

<i>Variable 1</i>	<i>Variable 2</i>	<i>Correlation Coefficient (r)</i>	<i>Relationship</i>
Licensed Drivers (Black)	Vehicle Stops (Black)	0.758	Strong Positive Correlation
	Vehicle Stops (White)	0.586	Very High Positive Correlation
	Vehicle Stops (Hispanic)	0.554	Very High Positive Correlation
Licensed Drivers (White)	Vehicle Stops (Black)	0.406	Moderate Positive Correlation
	Vehicle Stops (White)	0.610	Very High Positive Correlation
	Vehicle Stops (Hispanic)	0.470	Moderate Positive Correlation
Licensed Drivers (Hispanic)	Vehicle Stops (Black)	0.358	Moderate Positive Correlation
	Vehicle Stops (White)	0.451	Moderate Positive Correlation
	Vehicle Stops (Hispanic)	0.826	Strong Positive Correlation

**Table 15. The Bivariate Correlation Coefficients of Suspects (All Races) to Vehicle Stops by Grid**

<i>Variable 1</i>	<i>Variable 2</i>	<i>Correlation Coefficient (r)</i>	<i>Relationship</i>
Suspects (All Races) Described By Victim in Incident Reports	Vehicle Stops (Black)	0.879	Very Strong Positive Correlation
	Citations Issued from Stops (Black)	0.811	Strong Positive Correlation
	Arrests Made from Stops (Black)	0.840	Strong Positive Correlation
	Searches from Vehicle Stops (Black)	0.802	Strong Positive Correlation
	Vehicle Stops (White)	0.811	Strong Positive Correlation
	Citations Issued from Stops (White)	0.694	Moderately Strong Positive Correlation
	Arrests Made from Stops (White)	0.774	Strong Positive Correlation
	Searches from Vehicle Stops (White)	0.800	Strong Positive Correlation
	Vehicle Stops (Hispanic)	0.648	Very High Positive Correlation
	Citations Issued from Stops (Hispanic)	0.639	Very High Positive Correlation
	Arrests Made from Stops (Hispanic)	0.589	Very High Positive Correlation
	Searches from Vehicle Stops (Hispanic)	0.591	Very High Positive Correlation
	Vehicle Stops (All)	0.873	Very Strong Positive Correlation
	Citations Issued from Stops (All)	0.744	Moderately Strong Positive Correlation
	Arrests Made from Stops (All)	0.888	Very Strong Positive Correlation
	Searches from Vehicle Stops (All)	0.851	Very Strong Positive Correlation

## Conclusions

The US Department of Justice approves of law enforcement efforts targeted at high crime areas properly supported by reliable, empirical data. “So long as they are not motivated by racial animus, officers can properly decide to enforce all laws aggressively (in high crime areas), including less serious quality of life ordinances” (US Department of Justice, 2014). The approaches described in this document attempt to establish a reliable method for determining if a disproportionate amount of vehicle stops of racial/ethnic minorities occur in Davidson County.

Vehicle stops for Black drivers accounted for 36.3% of all stops, while the American Community Survey reported that 26.4% of Davidson County’s population (age 16 and over) was Black—a difference of 9.9%. Vehicle stops for White drivers accounted for 60.4% of all stops, for a racial group representing 65.5% of total population—a difference of -5.1%. Vehicle stops for Hispanic drivers accounted for 5.6% of all stops, for a racial group representing 8.1% of total population—a difference of -2.5%.

A higher percentage of Hispanic drivers were arrested as a result of a vehicle stop when compared to Non-Hispanic drivers. 89.0% of Hispanic drivers were charged with a driver’s license-related violation, such as driving without a license, or driving on a suspended, canceled, or revoked license, compared to 72.7% for non-Hispanic drivers.

The MNPD Crime Analysis Section used GIS and statistical software to calculate Pearson correlation coefficients for several variables recorded in the traffic stop data. Findings of the correlation analysis demonstrate that Black motorists were stopped at a higher rate in locations where Black licensed drivers live, White motorists were stopped at a higher rate in locations where White licensed drivers live, and Hispanic motorists were stopped at a higher rate where Hispanic licensed drivers live.

However, this issue is not as straightforward as one may anticipate. Caution must be exercised when comparing demographic breakdowns of vehicle stops against population counts. By examining correlation coefficients of vehicle stops to police workload, crime incident, suspect, and licensed driver data, empirical differences can be better clarified. For instance:

- A *VERY STRONG* positive correlation exists between police workload and locations where vehicle stops, arrests, and searches take place (**See Table 11**).
- A *VERY STRONG* positive correlation exists between locations where suspects are described on incident reports and locations where vehicle stops, arrests, and searches take place (**See Table 15**).
- A *VERY STRONG* positive correlation exists between vehicle stops and locations where Violent Part I and Property Part I crimes are reported to the police (**See Table 12**).

- A *MODERATELY STRONG* to *STRONG* positive correlation exists between locations where Black drivers live and where police resources are deployed (**See Table 10**).
- A *MODERATE* to *HIGH* positive correlation exists between locations where White or Hispanic drivers live and where police resources are deployed (**See Table 10**).

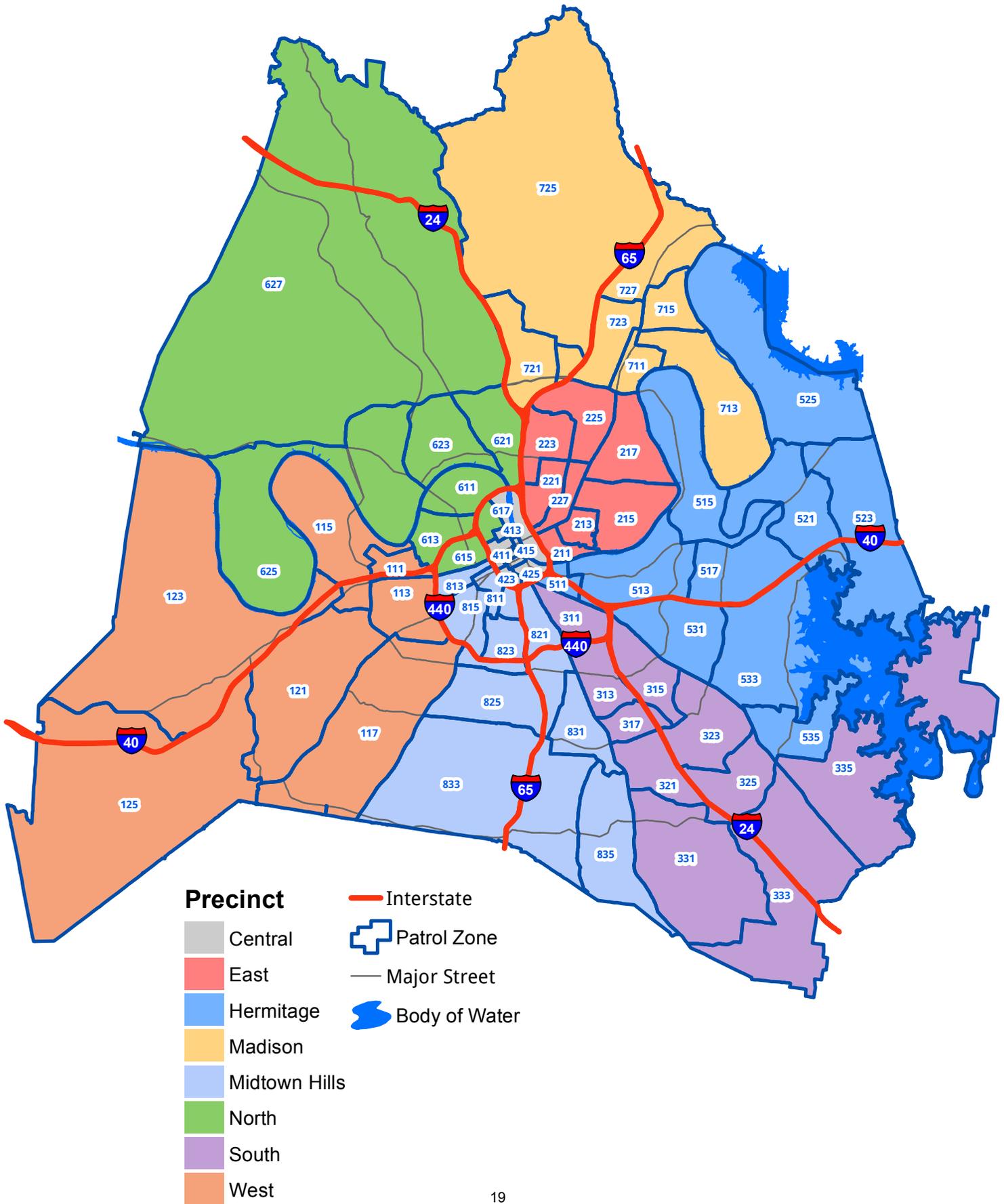
Hotspot police initiatives provide more opportunity for officers to engage with members of communities within areas that have a higher volume of crime incidents and officer activity. MNPD police resources are deployed at a higher rate in locations where crimes are more frequently reported. These relationships may explain why a disproportionate amount of Black drivers were stopped.

### **Works Cited**

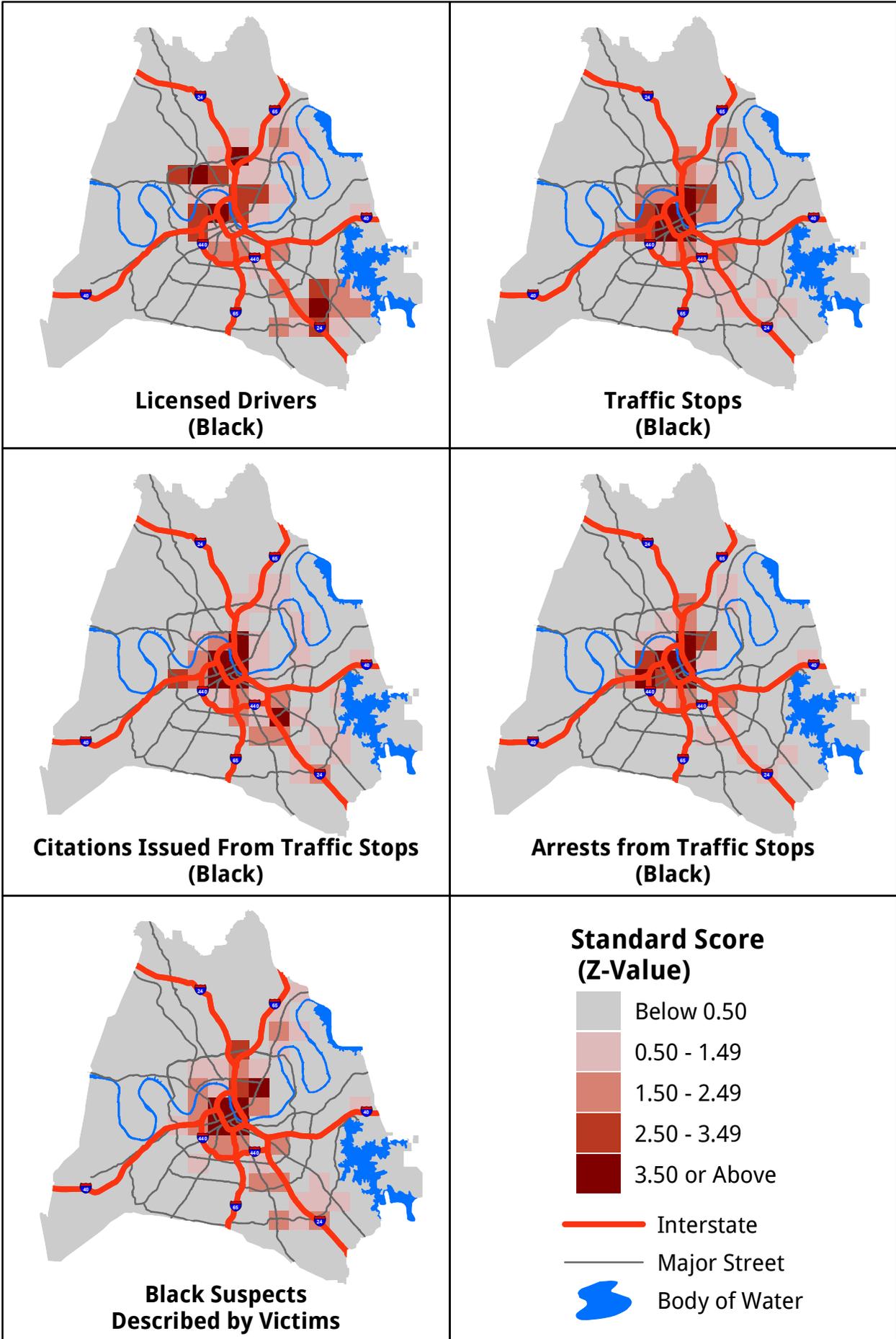
United States. Department of Justice. *Guidance for Federal Law Enforcement Agencies Regarding the Use of Race, Ethnicity, Gender, National Origin, Religion, Sexual Orientation, or Gender Identity*. United States Department of Justice, 2014.

## Appendix

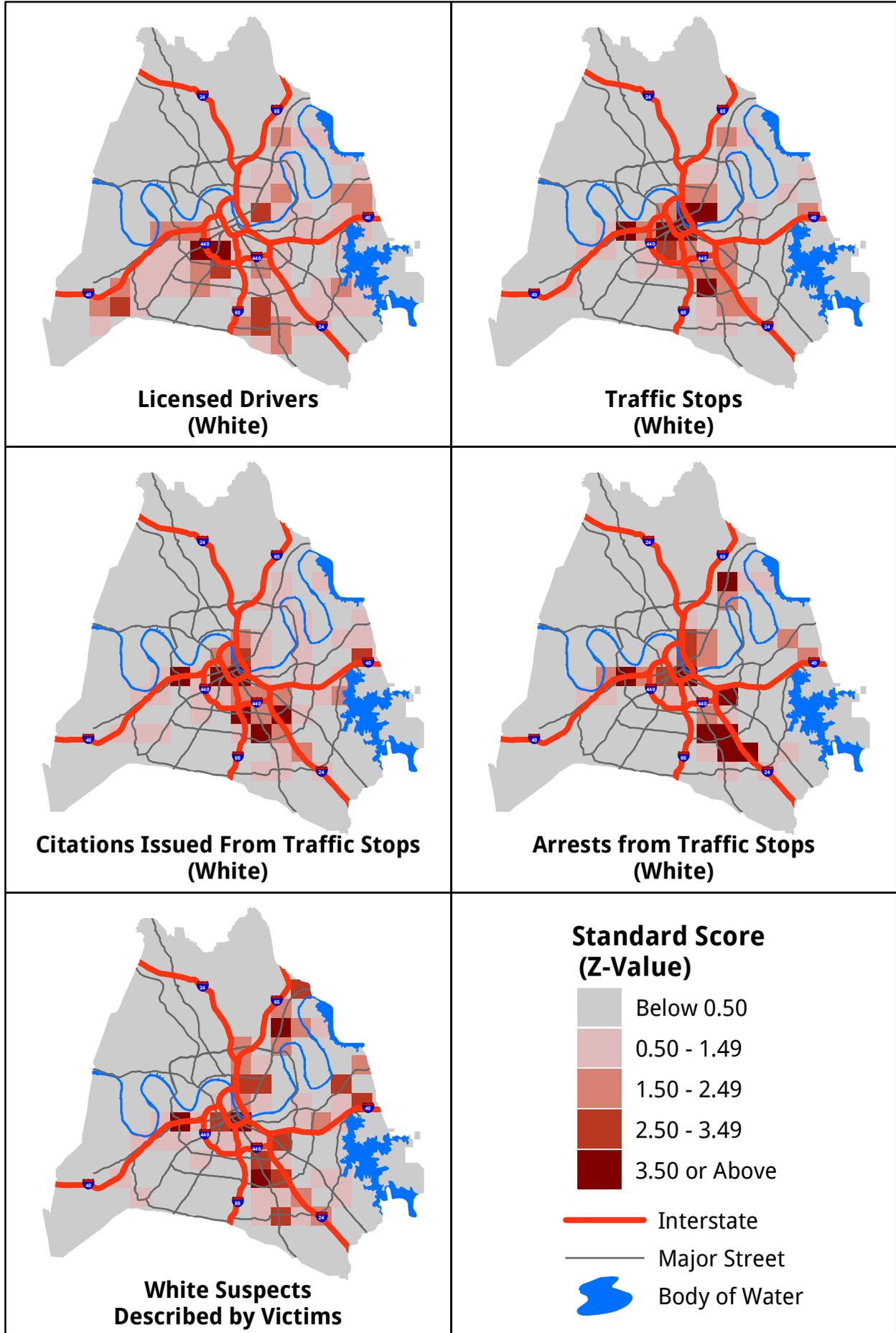
# MNPD Police Patrol Boundaries and Patrol Zones



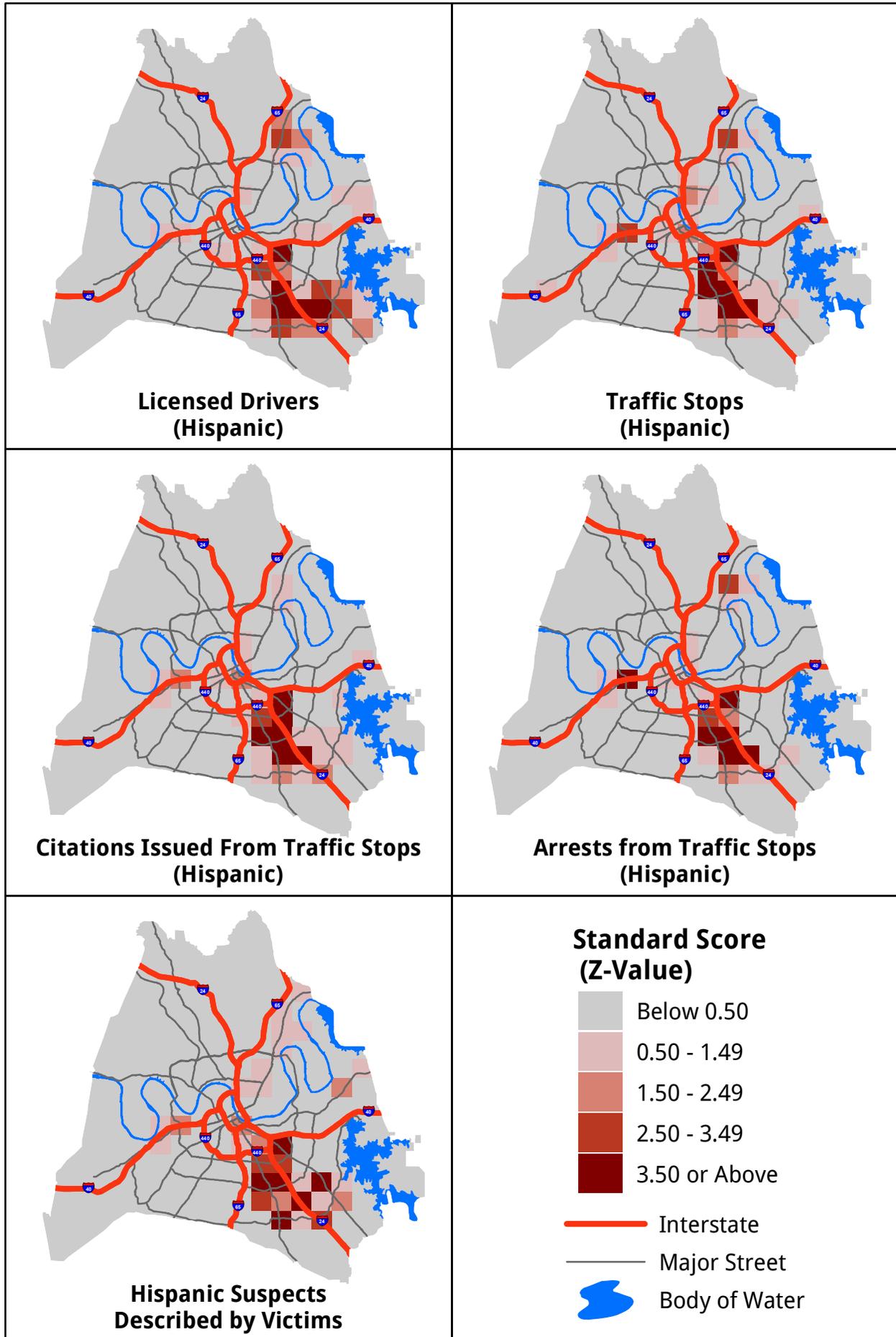
# Grid Density Maps of Vehicle Stops with Black Drivers



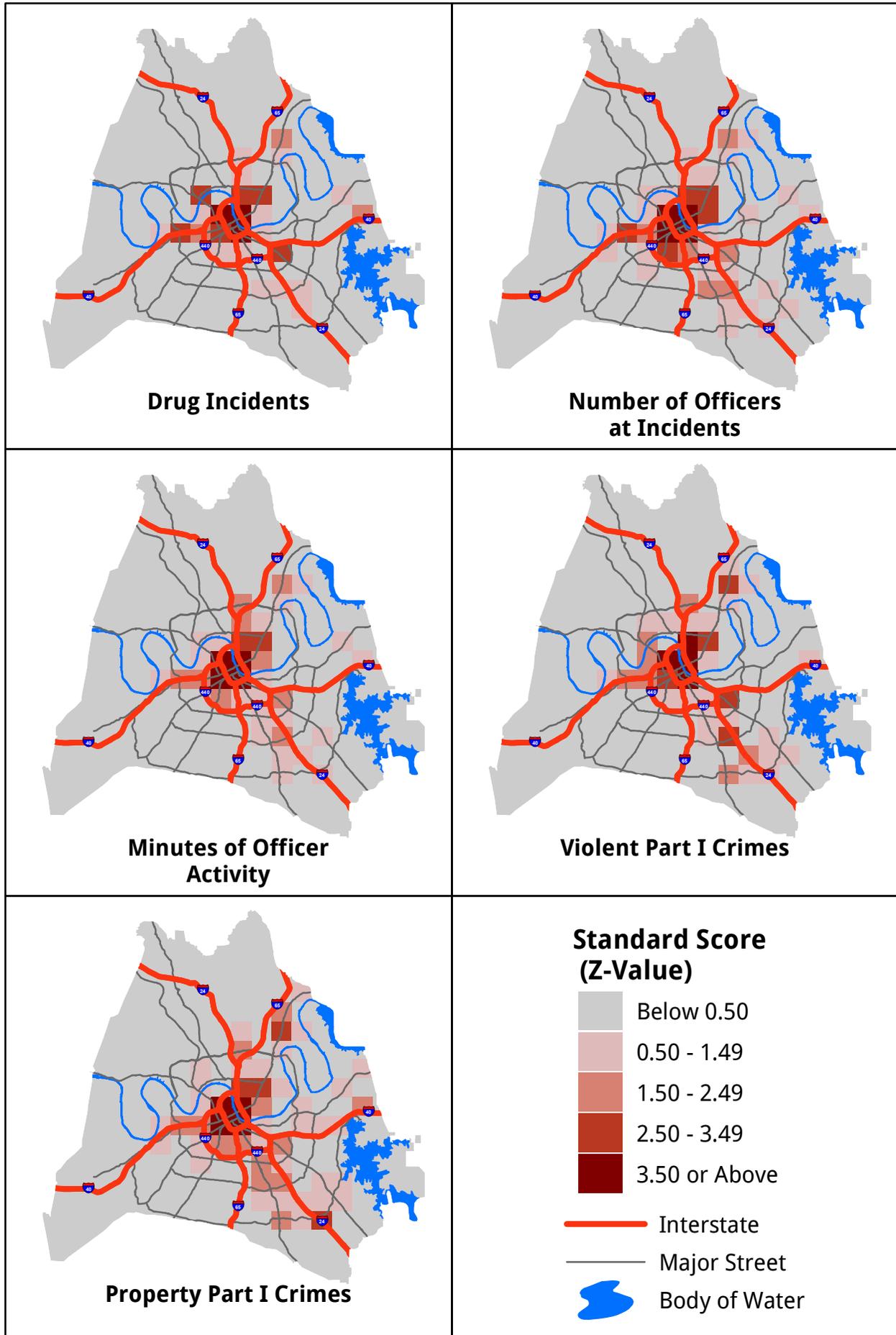
# Grid Density Maps of Vehicle Stops with White Drivers



# Grid Density Maps of Vehicle Stops with Hispanic Drivers



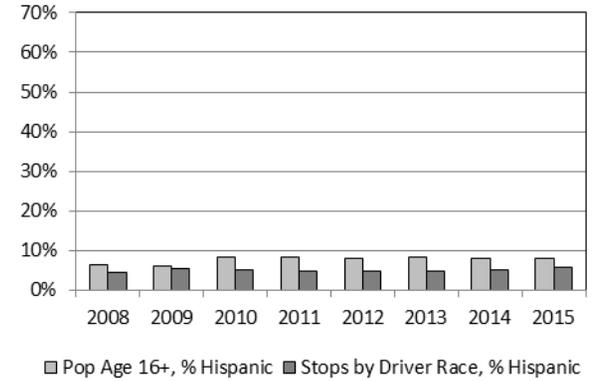
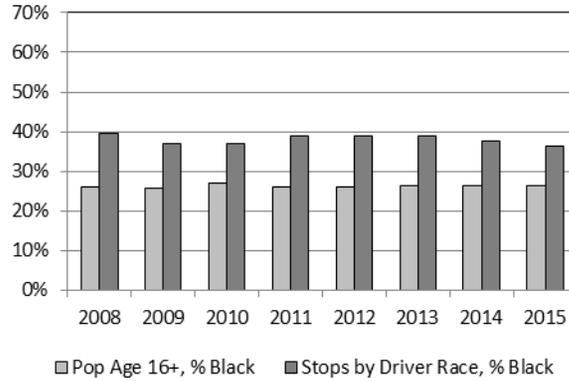
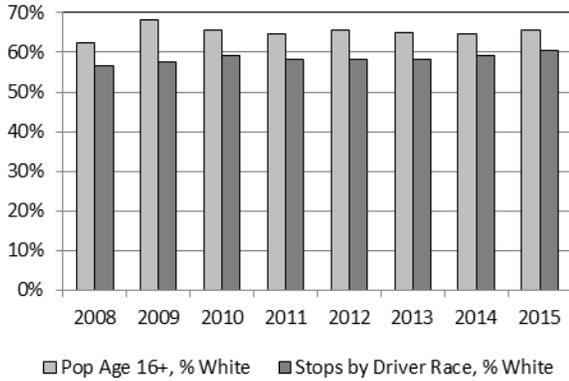
# Grid Density Maps of Officer Activity and Part I Crimes



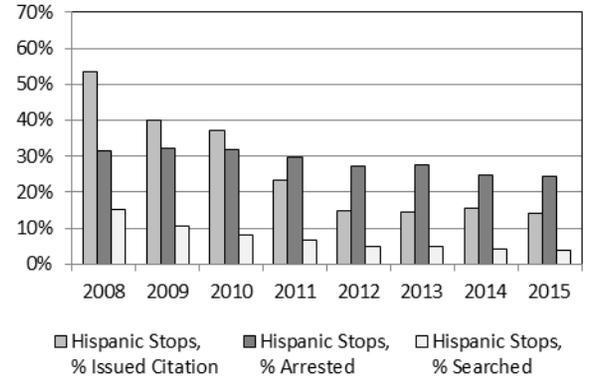
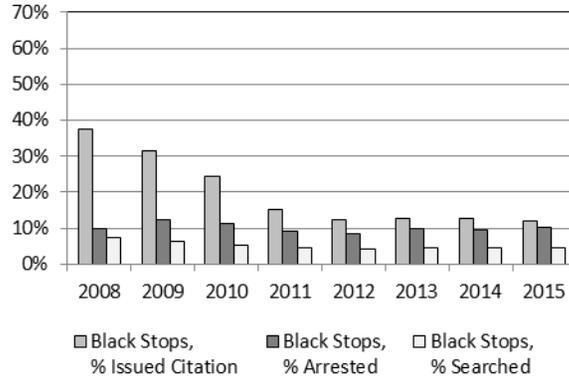
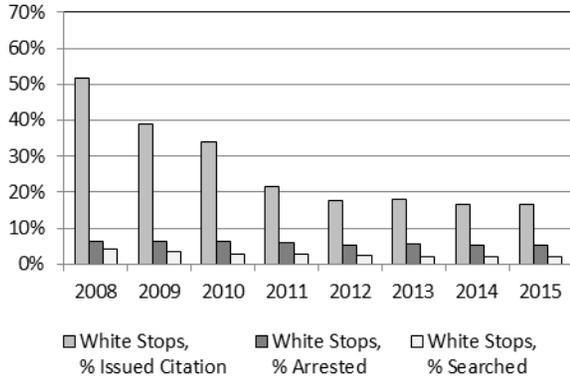
# Annual Trends

Summarized Information from Annual Motor Vehicle Stop Reports Since 2008

## Vehicle Stops to Population Comparisons



## Actions Taken: Percent of Stopped Drivers Issued Citations, Arrested, or Searched



## 2015 Motor Vehicle Stop Summary

All Stops	358,612	
All Stops, Driver Issued Citation	53,946	15.0%
All Stops, Driver Arrested*	25,036	7.0%
All Stops, Driver Searched	10,245	2.9%
All Stops, Driver Warned**	283,718	79.1%
White Stops	216,617	
White Stops, Driver Issued Citation	35,735	16.5%
White Stops, Driver Arrested*	11,389	5.3%
White Stops, Driver Searched	4,151	1.9%
White Stops, Driver Warned**	171,529	79.2%
Black Stops	130,199	
Black Stops, Driver Issued Citation	15,689	12.1%
Black Stops, Driver Arrested*	13,163	10.1%
Black Stops, Driver Searched	5,935	4.6%
Black Stops, Driver Warned**	103,232	79.3%
Hispanic Stops	20,209	
Hispanic Stops, Driver Issued Citation	2,872	14.2%
Hispanic Stops, Driver Arrested*	4,928	24.4%
Hispanic Stops, Driver Searched	775	3.8%
Hispanic Stops, Driver Warned**	13,454	66.6%

### Notes:

\* - A large majority of driver arrests (>70%) include a charge violating of the provisions of TCA Title 55, Chapter 50 (offenses include: TCA 55-50-301 driving without a license, and TCA 55-50-504 (a) driving on a suspended, canceled, or revoked license).

\*\* - "Driver Warned" refers to all vehicle stops in which the driver was not cited or arrested. For MNPB vehicle stops, this is typically a verbal warning.