

**CY 2008 Motor Vehicle Stop Data Collection
Analysis**

Final Report



**Metropolitan Police Department
Nashville and Davidson County**

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**Prepared by
Crime Analysis Section**

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

Purpose

To address the methodology used and results from the analysis of the Metropolitan Police Department's (MPD) evaluation of the CY 2008 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. To date, a single best way to analyze the motor vehicle stop data has yet to be established.

All empirical data on motor vehicle stops yields inconclusive results, does not determine causation, and can be easily misinterpreted. Although a slightly 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, the empirical differences can be better explained.

A Geographical Information System (GIS) was used to evaluate the spatial relationship of the motor vehicle stop data. Use of a uniform grid with addresses of licensed drivers proved to be more valid than using U.S. Bureau of Census boundaries and population. The grid method results in equal square miles per grid. The grid method compared the locations of vehicle stops, crime, and police workload against the addresses of Black, White, and Hispanic licensed drivers. For this reason, residential population information was not assessed.

The Crime Analysis Section analyzed the correlation coefficients of the vehicle stops by grid. There is sufficient evidence to suggest that the locations where police resources were deployed and suspects were described are strongly correlated with the locations where Black, White, and Hispanic drivers were stopped. Locations where police resources are deployed were determined based on calls for service and reported incident locations. Moreover, a *MODERATELY STRONG to STRONG* correlation exists between residential addresses of Black licensed drivers and the geographic locations that police resources are deployed. On the other hand, a *WEAK to HIGH* correlation exists between the residential address of White and Hispanic licensed drivers and the geographic locations that police resources are deployed.

These relationships may help explain why a disproportionate amount of Black drivers were stopped. Unfortunately, locations with higher police officer presence may provide opportunities for police to engage Black drivers more often than White drivers.

Hispanic drivers represent 4.5% of the total vehicle stops in 2008, and make up an estimated 7.8% of the population. However, a significantly higher percentage of Hispanic drivers were searched and arrested as a result of a vehicle stop when compared to White and Black drivers. 7.7% of Hispanic drivers gave consent to search compared to 2.8% of Non-Hispanic drivers. 6.9% of Hispanic drivers were searched incident-to-arrest compared to 1.7% of Non-Hispanic drivers. 2.0% of Hispanic drivers were searched due to evidence in plain view compared to 0.6% of Non-Hispanic drivers. Unfortunately, the arrest charge is not available for analysis in this dataset.

Introduction

On January 1st 2001, the Metropolitan Police Department, Nashville, Tennessee began collecting vehicle stop data and volunteered to participate in the State of Tennessee Traffic Stop Data Collection Program. The State form was modified to add Metropolitan Police Department (MPD) specific information which included the address of the stop, complaint number, ticket number, residency of the driver, if the stop was part of a crime reduction initiative, officer employee Identification number, and supervisor employee identification number.

All Metropolitan Police Department officers were required to complete the MPD Form 252, Vehicle Stops Data Form or Traffic Citation Form, whenever a vehicle was stopped. This included moving traffic violations, vehicle equipment violations, and investigative reasons. The results of the stops are recorded to include if a citation was issued, an arrest was made, or if a search was conducted. The officer initiating the stop uses their personal judgment to determine the race/ethnicity of the driver as recorded on the appropriate form.

The major reason to collect the vehicle stop data is to analyze whether officers are engaging with a disproportionate amount of drivers according to the race/ethnicity breakdown of Davidson County. One quagmire in analyzing vehicle stop data is that officers exercise an enormous amount of discretion in deciding with whom to engage for certain violations (e.g., failing to signal, lane-changing violations). For this reason, information on the officer and situations that occurred during the engagement was collected. It is extremely problematic to attempt at measuring an officer's discretion of deciding if/when to pull someone over.

The Metropolitan Police Department has demonstrated an open commitment to unbiased policing. The Department recognized the need to collect vehicle stop information well before the State initiated their pilot test program. It was coincidental that the Department was able to take part in the 2001 pilot test. The Department has long committed to building trust and credibility for police in the community.

The Metropolitan Police Department, Information Services Division produces monthly reports that list the number of vehicle stops, citations, and searches by race for each Precinct and Detail. This report attempts to go beyond 'bean counting' by examining relationships between vehicle stop data and other factors (police workload, crime, and licensed drivers).

Data Analysis and Results

Throughout the year, the MPD Data Entry Section transcribed data from MPD Form 252, Vehicle Stop Data Forms and Traffic Citation Forms into a database. The MPD Information Technology Division provides the Crime Analysis Section access to data tables of this information residing on a SQL server. In total, the MPD Crime Analysis Section analyzed 298,956 records from vehicle stops. There were 118,070 Black drivers, 169,394 White drivers, and 13,460 Hispanic drivers stopped during CY2008. Although the following race categories will not be evaluated in this study, there were 3,234 Asian/Pacific Islanders, 103 American Indian/Alaskans, and 8,155 Other [race] drivers stopped while operating a motor vehicle. 46.3% of drivers stopped were issued citations and 7.7% of vehicle stops (23,098) resulted in an arrest (physical and/or citation arrest).

State of Tennessee, driver license data for Davidson County were compared with the vehicle stop information. The MPD Crime Analysis Section used SPSS statistical software and ArcView Geographic Information System (GIS) mapping software to gain a clearer understanding of the comparative relationships. *Only correlation (the relationship) between data variables could be demonstrated because causation cannot be proved.*

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's 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 once a Driver License is issued may significantly impact the validity of the data.
- Information on licensed drivers who reside outside of the area being studied (e.g., census tract, grid, Davidson County) that are driving on the roads is unknown.
- It is impractical for a Police Department with such a large jurisdiction (533 square miles) to conduct observational-type surveys on the 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 higher reported crime.
- Annual 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

The Hispanic population in Nashville has increased significantly since the 2000 U.S. Census. Therefore, the 2007 Woods and Poole Economic Population Forecast was used for a more valid estimate of populations. Both the total population and the 16 years of age and older populations were assessed by race. The population estimates for Davidson County are depicted at **Table 1**.

Table 1. 2007 Woods and Poole Economic Population Estimates

	<i>Black</i>	<i>White</i>	<i>Hispanic</i>	<i>Estimated Total Population</i>
All Ages	164,821	352,659	45,544	583,711
16 Years & Up	122,154	291,706	30,637	466,953

A higher proportion of vehicles were stopped with Black drivers during CY 2008 when compared to the percentage of Black residents in Davidson County. Overall, there was a difference of +13.3 in the percent of vehicles stopped with Black drivers than the percent of Black residents (over 16) that comprise the total county population. On the other hand, there was a difference of -5.8 in the percent of vehicles stopped with White drivers than the percent of White residents (over 16) that comprise the total county population. When analyzing Hispanic drivers, there was a difference of -2.1 in the percent of vehicles stopped than the percent of Hispanic residents (over 16) that make up the total county population. Caution must be exercised so that one does not rely solely on these differences. Other factors that may contribute to these differences include police workload, hotspot policing, description of criminal suspects, and crime by geographic locations. A comparison of the percent of the totals is depicted at **Table 2** (Black Drivers Stopped), **Table 3** (White Drivers Stopped) and **Table 4** (Hispanic Drivers Stopped).

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

	<i>Percent of Vehicle Stops (Black)</i>	<i>2007 Population Estimates Over 16 (Black)</i>	<i>Difference between Stops and 16 and Up Population</i>
Black Drivers Stopped	39.5 %	26.2 %	+ 13.3

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

	<i>Percent of Vehicle Stops (White)</i>	<i>2007 Population Estimates Over 16 (White)</i>	<i>Difference between Stops and 16 and Up Population</i>
White Drivers Stopped	56.7 %	62.5 %	- 5.8

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

	<i>Percent of Vehicle Stops (Hispanic)</i>	<i>2007 Population Estimates Over 16 (Hispanic)</i>	<i>Difference between Stops and 16 and Up Population</i>
Hispanic Drivers Stopped	4.5 %	6.6 %	-2.1

Table 5. Percentage of Drivers Cited, Searched, or Arrested

	<i>Vehicle Stops</i>	<i>Percent of Stops Cited</i>	<i>Percent of Stops Searched</i>	<i>Percent of Stops Arrested</i>
White Drivers	169,394	51.8%	4.3 %	6.4 %
Black Drivers	118,070	37.6 %	7.3 %	9.7 %
Hispanic Drivers	13,460	53.5 %	15.1 %	31.5 %
County Total	298,956	46.3 %	5.5 %	7.7 %

Geographic Information System (GIS) Analysis

The MPD Crime Analysis Section used ArcView GIS software to map the densities of vehicle stop, crime, population, and police workload information. The vehicle stop information was processed to determine the geocoded location of the vehicle stop on a map. During the geocoding process, 286,411 (95.8%) of the total 298,956 vehicle stop locations during CY 2008 were successfully matched to a location on the map. This is regarded as a high geocoding rate and is made possible because the address data originates from the Department's Computer Aided Dispatch system that verifies all addresses through the use of GIS software as records are created.

A map of Police Patrol zones was provided in this study. Police Patrol personnel are allocated to areas based on the demand for police services along with considerations for the type of offense. The demand for police services is greater towards the inner city. The Patrol zones towards the inner city are smaller than the zones towards the county line. Furthermore, additional police resources in the form of Crime Suppression Officers, DUI Task Force, Flex Officers, Walking & Bike Officers, and Special Events Officers to include downtown Motorcycle Officers are routinely assigned in and around the inner city area. In essence, there are more police field officers available in the inner city than towards the county line. A map of patrol zone/beat officer boundaries is at **Appendix A**.

Additionally, the demographic make-up where licensed drivers reside remains diverse across Davidson County. The demographics in areas where there are higher concentrations of police officers deployed are significantly different than areas with lower concentrations of officers.

Vehicle stop, crime, driver license, and police workload information were assessed using uniform grids. This methodology was preferred over the census tract method because each grid is made up of equal area (1.6 square miles). All data was assigned a z-score in each grid square to provide density analysis, which provides a more straightforward approach to understanding the information quickly. The addresses of Black, White, and Hispanic licensed drivers for the State of Tennessee were geocoded to the maps and joined to the grids. U.S. Bureau of Census demographic information cannot be accurately interpreted to grids.

It is quite apparent by viewing the grid density maps that higher concentrations of vehicle stops occurred in the inner city area. Likewise around the inner city areas, the maps depicted a higher concentration of minutes of officer activity, and number of officers at incidents, and index crimes as defined by Uniform Crime Report guidelines.

The following observations were noted. Each race and ethnicity licensed driver population significantly differs from the others. The grid density patterns between

Black licensed drivers and police workload and vehicle stop information demonstrates a closer relationship than those for White licensed drivers. The racial demographics in areas where there are higher concentrations of police officers deployed are different than areas with lower concentrations of officers.

Reduced size versions of the grid maps are at **Appendix B**. The larger 42" x 60" map sheets provide greater detail and are available for viewing at the Metropolitan Police Department, Crime Analysis Section.

Correlation Coefficients

The MPD Crime Analysis Section used SPSS statistical software to calculate the bivariate correlation coefficients of the variables being tested. The coefficient of the correlation allowed us to compare the linear relationship between vehicle stop information against police workload, crime, and race. Correlation in no way can be used to determine *causation*. The 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.

The correlation coefficients (**See Tables 6 – 9**) 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, issued citations, searched, and arrested. A *VERY HIGH* to *VERY STRONG* positive correlation exists between where White suspects are described by victims on incident reports and where White drivers are stopped, issued citations, searched, and arrested.
- A *VERY STRONG* positive correlation exists between police workload (the number of officers at incidents & minutes of officer activity) and the overall numbers of vehicle stops, citations, arrests, searches, and reported crimes (UCR and drug). This supports the logic that the police engage in an increased amount of activity in areas where there is a higher concentration of police officers.
- A *VERY STRONG* positive correlation exists between crime (violent and property Part I offenses) and the overall numbers of vehicle stops, citations, arrests, and searches. There was a significantly higher correlation between where Black drivers were stopped or issued citations and areas where violent offenses occurred than White and Hispanic drivers. There was a significantly higher correlation between where White and Black drivers were stopped or issued citations and areas where more property offenses occurred than Hispanic drivers.
- A *VERY STRONG* positive correlation exists between drug incident locations and where Black drivers are stopped, issued citations, arrested, and searched. A *MODERATELY STRONG* positive correlation exists between drug incident locations and where White drivers are stopped, issued citations, arrested, and searched. A *MODERATE* positive correlation exists between drug incident locations

and where Hispanic drivers are stopped, issued citations, arrested, and searched.

- A *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. Additionally, there is a *MODERATE* to *HIGH* positive correlation between where Black licensed drivers live and where White and Hispanic drivers are stopped.
- A *STRONG* positive correlation exists between where Black licensed drivers live and where violent, property, and drug crimes occur, and where police resources are deployed.
- A *MODERATE* to *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. Additionally, there is a *WEAK* (0.303) positive correlation between where White licensed drivers live and where Black drivers are stopped. There is a much stronger [*VERY STRONG*] positive correlation between where Black licensed drivers live and where white drivers are stopped (0.840).
- A *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.
- A *MODERATE* to *HIGH* positive correlation exists between where White licensed drivers live and violent and property crimes occur, and where police resources are deployed. A *WEAK* positive correlation exists to where White licensed drivers live and drug incident locations.

**Table 6. The Bivariate Correlation Coefficients of
CY 2008 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)	0.945	VERY STRONG positive correlation
	Citations Issued from Stops (Black)	0.916	VERY STRONG positive correlation
	Arrests Made from Stops (Black)	0.913	VERY STRONG positive correlation
	Searches from Vehicle Stops (Black)	0.925	VERY STRONG positive correlation
	Vehicle Stops (White)	0.892	VERY STRONG positive correlation
	Citations Issued from Stops (White)	0.833	VERY STRONG positive correlation
	Arrests Made from Stops (White)	0.823	STRONG positive correlation
	Searches from Vehicle Stops (White)	0.869	VERY STRONG positive correlation
	Vehicle Stops (Hispanic)	0.544	HIGH positive correlation
	Citations Issued from Stops (Hispanic)	0.508	HIGH positive correlation
	Arrests Made from Stops (Hispanic)	0.466	MODERATE positive correlation
	Searches from Vehicle Stops (Hispanic)	0.452	MODERATE positive correlation
Minutes of Officer Activity At Incident Locations	Vehicle Stops (Black)	0.939	VERY STRONG positive correlation
	Citations Issued from Stops (Black)	0.914	VERY STRONG positive correlation
	Arrests Made from Stops (Black)	0.916	VERY STRONG positive correlation
	Searches from Vehicle Stops (Black)	0.933	VERY STRONG positive correlation
	Vehicle Stops (White)	0.876	VERY STRONG positive correlation
	Citations Issued from Stops (White)	0.823	STRONG positive correlation
	Arrests Made from Stops (White)	0.806	STRONG positive correlation
	Searches from Vehicle Stops (White)	0.859	VERY STRONG positive correlation
	Vehicle Stops (Hispanic)	0.527	HIGH positive correlation
	Citations Issued from Stops (Hispanic)	0.493	HIGH positive correlation
	Arrests Made from Stops (Hispanic)	0.449	MODERATE positive correlation
	Searches from Vehicle Stops (Hispanic)	0.438	MODERATE positive correlation

**Table 7. The Bivariate Correlation Coefficients of
CY 2008 Vehicle Stops to Crime by Grid**

<i>Data Variable 1</i>	<i>Data Variable 2</i>	<i>Correlation Coefficient (r value)</i>	<i>Relationship</i>
Violent Part One Incidents	Vehicle Stops (Black)	0.955	VERY STRONG positive correlation
	Citations Issued from Stops (Black)	0.935	VERY STRONG positive correlation
	Arrests Made from Stops (Black)	0.951	VERY STRONG positive correlation
	Searches from Vehicle Stops (Black)	0.951	VERY STRONG positive correlation
	Vehicle Stops (White)	0.812	STRONG positive correlation
	Citations Issued from Stops (White)	0.758	STRONG positive correlation
	Arrests Made from Stops (White)	0.785	STRONG positive correlation
	Searches from Vehicle Stops (White)	0.821	STRONG positive correlation
	Vehicle Stops (Hispanic)	0.535	HIGH positive correlation
	Citations Issued from Stops (Hispanic)	0.504	HIGH positive correlation
	Arrests Made from Stops (Hispanic)	0.470	MODERATE positive correlation
	Searches from Vehicle Stops (Hispanic)	0.448	MODERATE positive correlation

<i>Data Variable 1</i>	<i>Data Variable 2</i>	<i>Correlation Coefficient (r value)</i>	<i>Relationship</i>
Property Part I Incidents	Vehicle Stops (Black)	0.855	VERY STRONG positive correlation
	Citations Issued from Stops (Black)	0.832	STRONG positive correlation
	Arrests Made from Stops (Black)	0.789	STRONG positive correlation
	Searches from Vehicle Stops (Black)	0.789	STRONG positive correlation
	Vehicle Stops (White)	0.871	VERY STRONG positive correlation
	Citations Issued from Stops (White)	0.811	STRONG positive correlation
	Arrests Made from Stops (White)	0.829	STRONG positive correlation
	Searches from Vehicle Stops (White)	0.833	STRONG positive correlation
	Vehicle Stops (Hispanic)	0.620	VERY HIGH positive correlation
	Citations Issued from Stops (Hispanic)	0.580	VERY HIGH positive correlation
	Arrests Made from Stops (Hispanic)	0.536	HIGH positive correlation
	Searches from Vehicle Stops (Hispanic)	0.500	HIGH positive correlation
Drug Incidents	Vehicle Stops (Black)	0.909	VERY STRONG positive correlation
	Citations Issued from Stops (Black)	0.901	VERY STRONG positive correlation
	Arrests Made from Stops (Black)	0.943	VERY STRONG positive correlation
	Searches from Vehicle Stops (Black)	0.966	VERY STRONG positive correlation
	Vehicle Stops (White)	0.729	MODERATELY STRONG positive correlation
	Citations Issued from Stops (White)	0.696	MODERATELY STRONG positive correlation
	Arrests Made from Stops (White)	0.666	MODERATELY STRONG positive correlation
	Searches from Vehicle Stops (White)	0.747	MODERATELY STRONG positive correlation
	Vehicle Stops (Hispanic)	0.397	MODERATE positive correlation
	Citations Issued from Stops (Hispanic)	0.376	MODERATE positive correlation
	Arrests Made from Stops (Hispanic)	0.333	MODERATE positive correlation
	Searches from Vehicle Stops (Hispanic)	0.333	MODERATE positive correlation

Table 8. The Bivariate Correlation Coefficients of CY 2008 Vehicle Stops to Suspects by Grid

<i>Data Variable 1</i>	<i>Data Variable 2</i>	<i>Correlation Coefficient (r value)</i>	<i>Relationship</i>
Black Suspects Described By Victim	Vehicle Stops (Black)	0.937	VERY STRONG positive correlation
	Citations Issued from Stops (Black)	0.918	VERY STRONG positive correlation
	Arrests Made from Stops (Black)	0.921	VERY STRONG positive correlation
	Searches from Vehicle Stops (Black)	0.919	VERY STRONG positive correlation
	Licensed Drivers (Black)	0.791	STRONG positive correlation
	Vehicle Stops (White)	0.797	STRONG positive correlation
	Vehicle Stops (Hispanic)	0.526	HIGH positive correlation
White Suspects Described By Victim	Vehicle Stops (White)	0.775	STRONG positive correlation
	Citations Issued from Stops (White)	0.726	MODERATELY STRONG positive correlation
	Arrests Made from Stops (White)	0.830	VERY STRONG positive correlation
	Licensed Drivers (White)	0.574	VERY HIGH positive correlation
	Searches from Vehicle Stops (White)	0.789	STRONG positive correlation
	Vehicle Stops (Black)	0.626	RELATIVELY STRONG positive correlation
	Vehicle Stops (Hispanic)	0.693	MODERATELY STRONG positive correlation

<i>Data Variable 1</i>	<i>Data Variable 2</i>	<i>Correlation Coefficient (r value)</i>	<i>Relationship</i>
Hispanic Suspects Described By Victim	Vehicle Stops (Hispanic)	0.921	VERY STRONG positive correlation
	Citations Issued from Stops (Hispanic)	0.913	VERY STRONG positive correlation
	Arrests Made from Stops (Hispanic)	0.904	VERY STRONG positive correlation
	Searches from Vehicle Stops (Hispanic)	0.867	VERY STRONG positive correlation
	Licensed Drivers (Hispanic)	0.867	VERY STRONG positive correlation
	Vehicle Stops (White)	0.614	VERY HIGH positive correlation
	Vehicle Stops (Black)	0.461	HIGH positive correlation

Table 9. The Bivariate Correlation Coefficients of CY 2008 Police Workload to Licensed Drivers by Grid

<i>Data Variable 1</i>	<i>Data Variable 2</i>	<i>Correlation Coefficient (r value)</i>	<i>Relationship</i>
Licensed Drivers (Black) Addresses	Violent Part One Incidents	0.781	STRONG positive correlation
	Property Part One Incidents	0.749	STRONG positive correlation
	Drug Incidents	0.673	MODERATELY STRONG positive correlation
	Number of Officers at Incidents	0.728	MODERATELY STRONG positive correlation
	Minutes of Officer Activity	0.723	MODERATELY STRONG positive correlation
Licensed Drivers (White) Addresses	Violent Part One Incidents	0.344	MODERATE positive correlation
	Property Part One Incidents	0.563	HIGH positive correlation
	Drug Incidents	0.239	WEAK positive correlation
	Number of Officers at Incidents	0.419	MODERATE positive correlation
	Minutes of Officer Activity	0.390	MODERATE positive correlation
Licensed Drivers (Hispanic) Addresses	Violent Part One Incidents	0.416	MODERATE positive correlation
	Property Part One Incidents	0.535	HIGH positive correlation
	Drug Incidents	0.272	WEAK positive correlation
	Number of Officers at Incidents	0.423	MODERATE positive correlation
	Minutes of Officer Activity	0.402	MODERATE positive correlation

Conclusions

This study attempted to establish a viable and reliable method of measuring if there was a disproportionate amount of vehicle stops of racial/ethnic minorities within Davidson County. Yet, this issue is not as straightforward as one may anticipate. It is not possible to identify and explain all of the independent factors that may affect this issue.

All empirical evidence yields inconclusive results and can be easily misinterpreted. A disproportionate percent of vehicles were stopped with Black drivers than White drivers when compared to the 2007 population estimates for Davidson County. Overall, there was a difference of +13.3 when comparing the percent of vehicles stopped with Black drivers and the percent of Black residents (over 16) that comprise the total county population. On the other hand, there was a difference of -5.8 when comparing the percent of vehicles stopped with White drivers and the percent of White residents [over 16] that comprise the total county population. Also, when analyzing Hispanic drivers, there was a difference of -2.1 when comparing the percent of vehicles stopped and the percent of Hispanic residents [over 16] that make up the total county population. This seems to support the belief that hotspot policing provides more opportunity for officers to engage with members of communities within the hotspot areas.

The MPD Crime Analysis Section used ArcView GIS software to map the densities of vehicle stop, crime, population, and police workload information. The preferred method of assessing the data was to use uniform grids. This methodology was preferred over the census tract method because the grids resulted in uniform area (1.6 square miles) per grid. The grid method compared the locations of vehicle stop, crime, and police workload information against the addresses of Black, White, and Hispanic licensed drivers.

It is quite apparent by viewing the grid density maps that higher concentrations of vehicle stops occurred in the inner city area. Likewise, the maps depicted a higher concentration of minutes of officer activity, and number of officers at incidents, and crime (Part I offenses) in the inner city area. The grid density of the addresses of Black licensed drivers displays a significantly different pattern than White licensed drivers. The grid densities between Black licensed drivers and police workload, crime, and vehicle stop information displays closer patterns than those for White licensed drivers.

The MPD Crime Analysis Section used SPSS statistical software to calculate the bivariate correlation coefficients for the variables being tested. The coefficient of the correlation allowed us to compare the linear relationship between vehicle stop information against police workload, crime, and race. Correlation in no way can be used to determine *causation*. Results of the correlation analysis were:

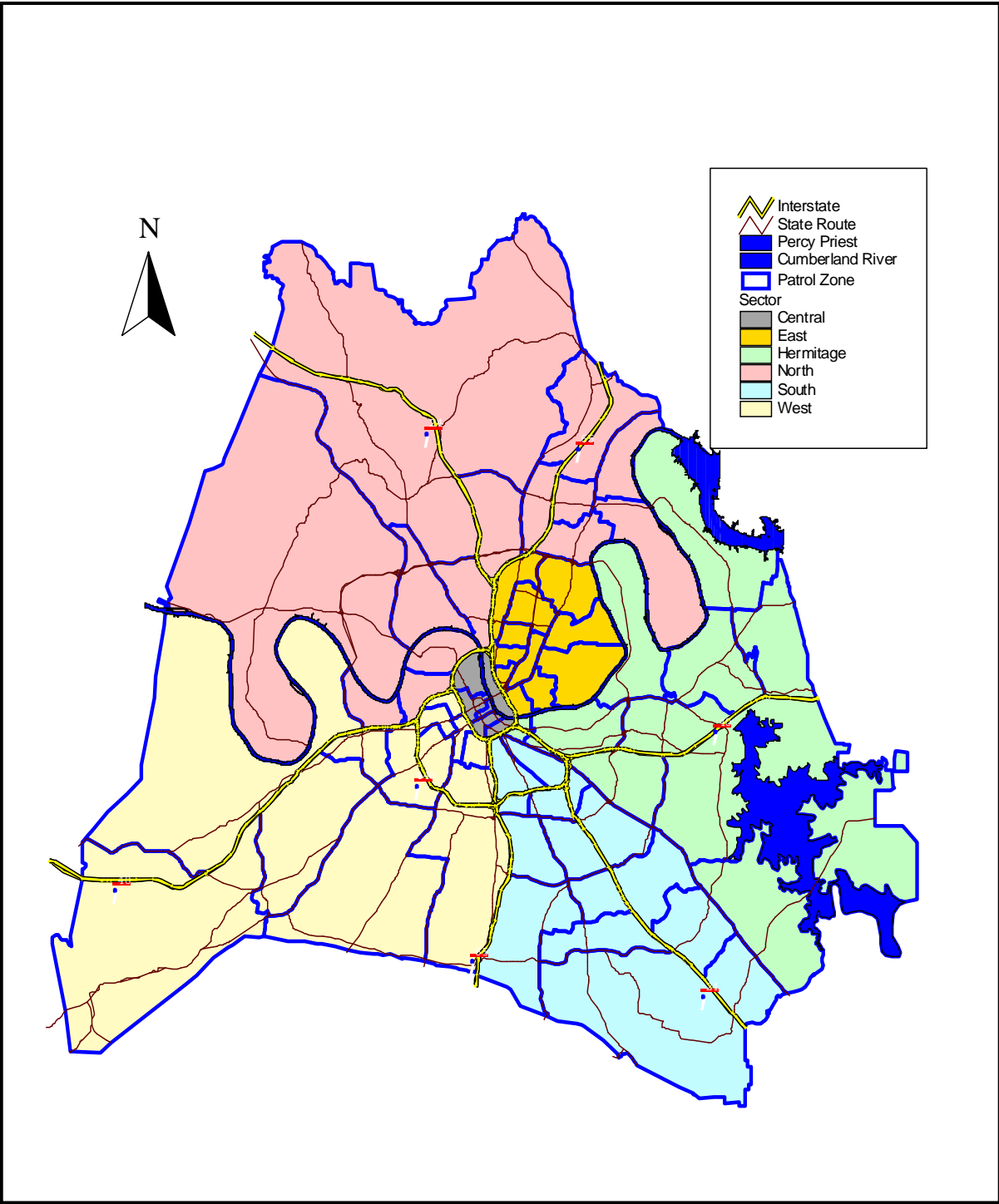
- A *VERY STRONG* positive correlation exists between the locations that police resources were deployed and the locations where Black and White drivers were stopped.
- A *VERY STRONG* positive correlation exists between where Black and Hispanic suspects are described and where Black and Hispanic drivers are stopped, issued citations, searched, and arrested. A *STRONG* positive correlation exists between where White suspects are described and where White drivers are stopped, issued citations, searched, and arrested.
- A *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. A *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. A *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.
- A higher ratio of White and Hispanic drivers are being stopped in areas that Black licensed drivers live than Black drivers are being stopped in areas where White drivers live.
- A *STRONG* positive correlation exists between residential addresses of Black licensed drivers and the geographic locations that police resources are deployed. On the other hand, a *MODERATE* positive correlation exists between the residential address of White and Hispanic licensed drivers and the geographic locations that police resources are deployed.

These relationships may help explain why a disproportionate amount of Black drivers were stopped. Unfortunately, locations with higher police officer presence may provide opportunities for police to engage Black drivers more often than White drivers. However, Black drivers were issued citations significantly fewer times than White or Hispanic drivers.

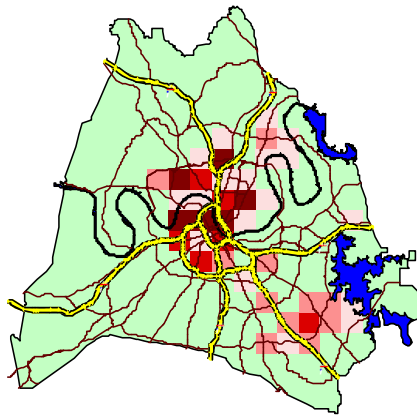
A significantly higher percentage of Hispanic drivers were searched and arrested as a result of a vehicle stop when compared to Non-Hispanic drivers. Arrest charge information would provide a clearer picture of the reason(s) for such a large disparity between Hispanic and Non-Hispanic arrests/searches as a result of a vehicle stop. Unfortunately, the arrest charge is not available in this dataset. Future analysis would be warranted in order to attempt to shed light on the significant disparity of vehicle stop arrests/searches between Hispanic and Non-Hispanic drivers.

Although the Metropolitan Police Department would like to get ahead of the curve and continue collecting vehicle stop data, it is extremely challenging to determine the best approach to analyze the data. A cost-effective method of assessing the data to reach valid and reliable conclusions needs to be developed.

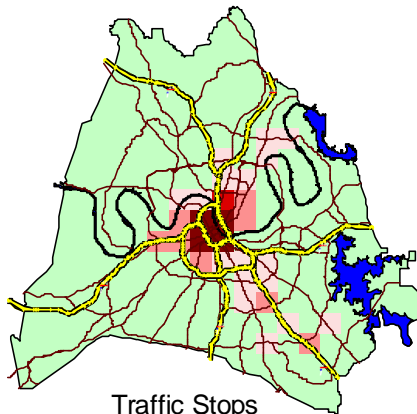
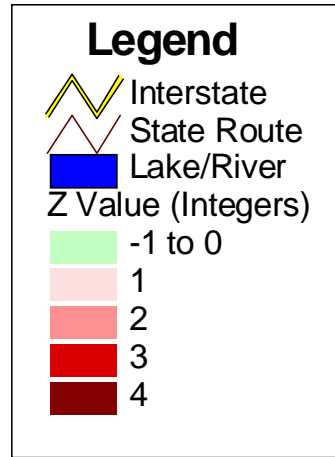
Appendix A. Illustration of Patrol Boundaries to Include Patrol Zones



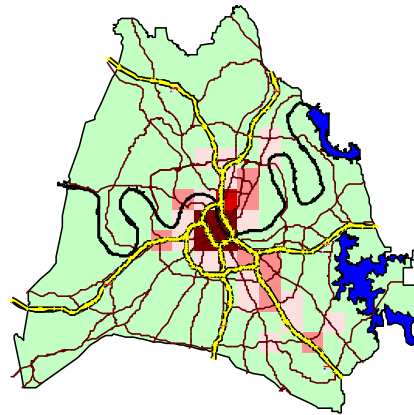
Appendix B - 1. Grid Density Maps of Vehicle Stops with Black Drivers



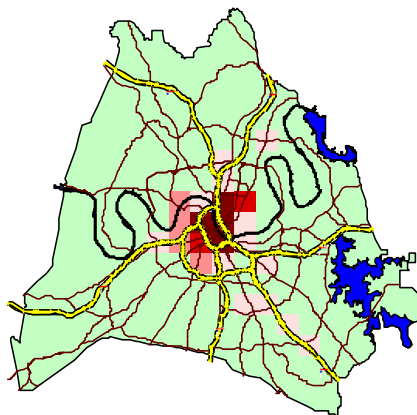
Licensed Drivers
(Black)



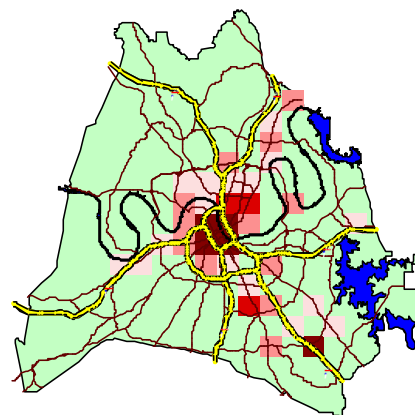
Traffic Stops
(Black)



Citations Issued From Stops
(Black)

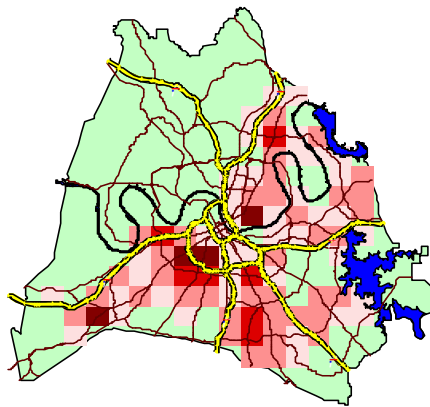


Arrests from Stops
(Black)

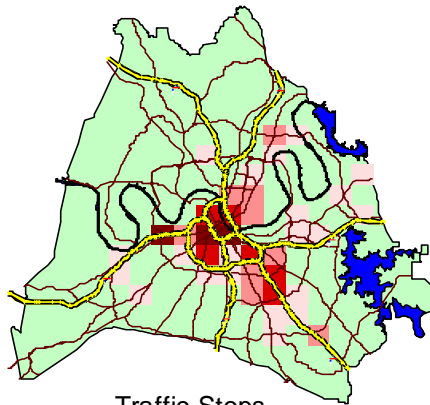
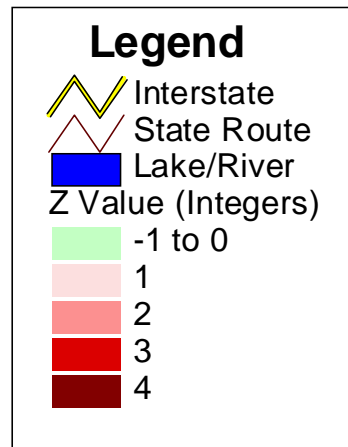


Black Suspects
Described by Victims

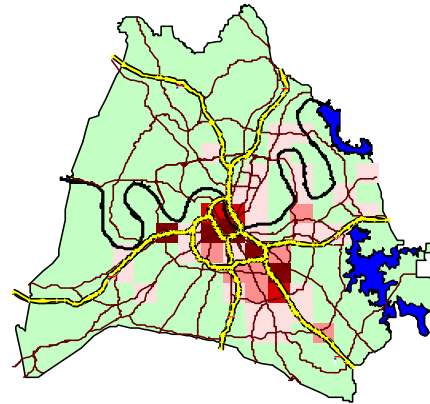
Appendix B - 2. Grid Density Maps of Vehicle Stops with White Drivers



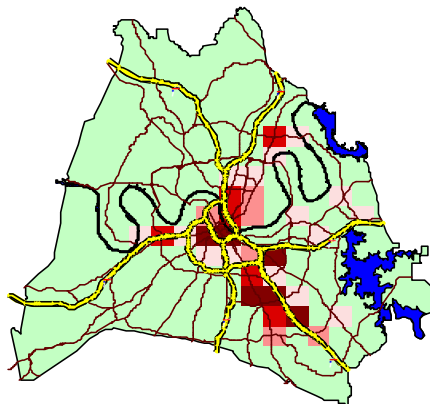
Licensed Drivers
(White)



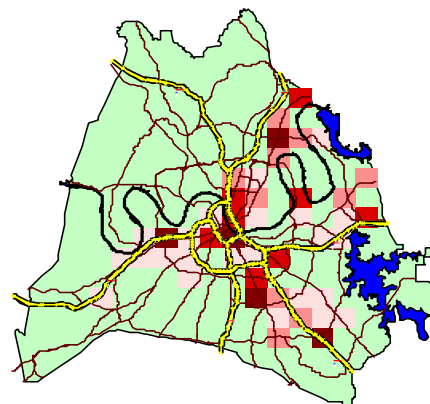
Traffic Stops
(White)



Citations Issued From Stops
(White)

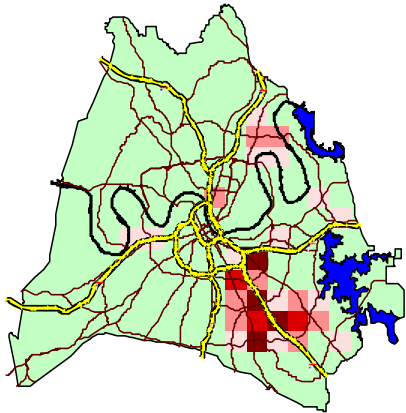


Arrests from Stops
(White)

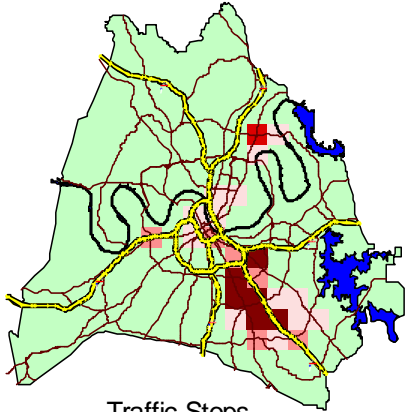
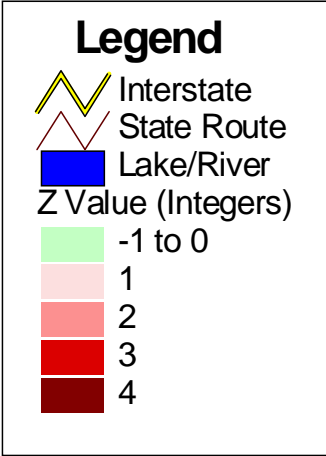


White Suspects
Described by Victims

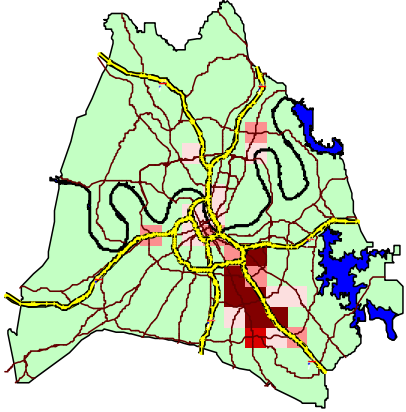
Appendix B - 3. Grid Density Maps of Vehicle Stops with Hispanic Drivers



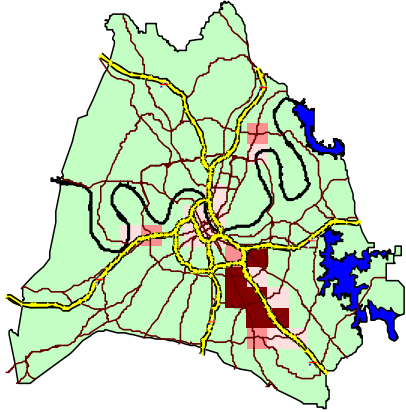
Licensed Drivers
(Hispanic)



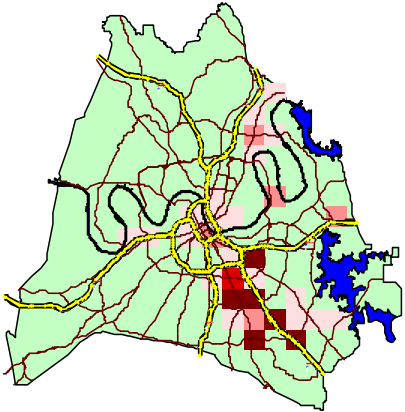
Traffic Stops
(Hispanic)



Citations Issued From Stops
(Hispanic)

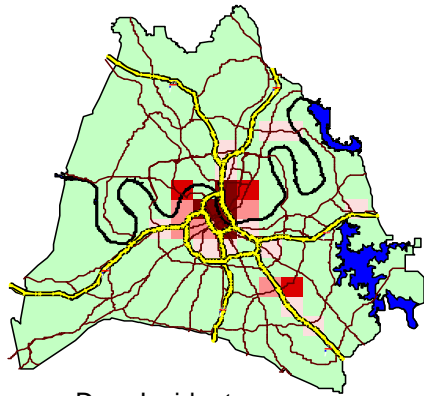


Arrests from Stops
(Hispanic)

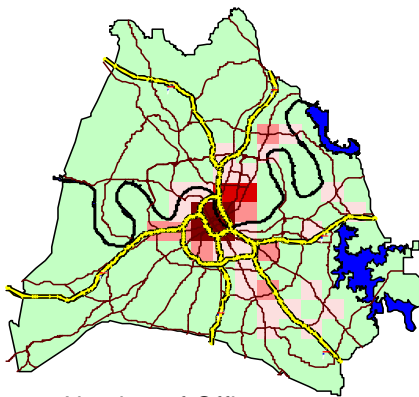
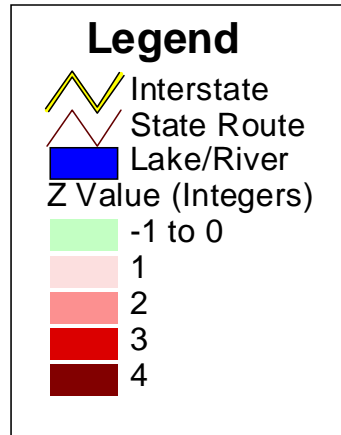


Hispanic Suspects
Described by Victims

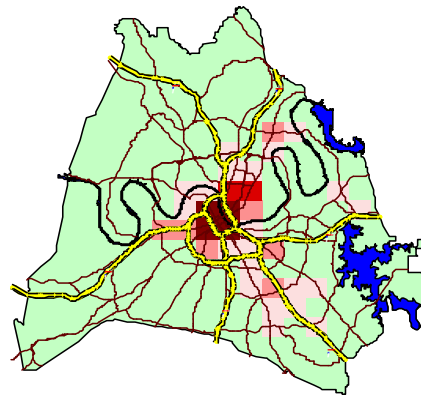
Appendix B - 4. Grid Density Maps of Officer Activity and Part I Crimes



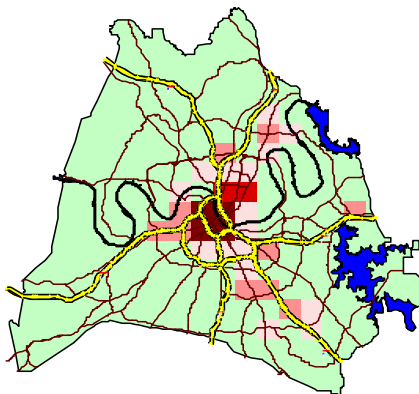
Drug Incidents



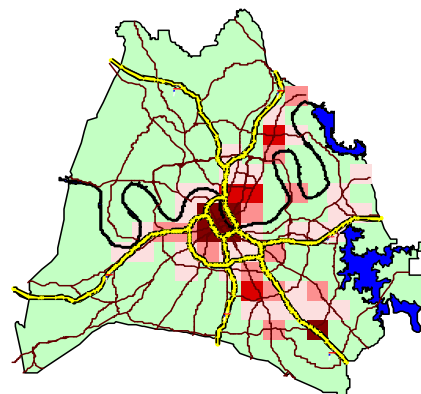
Number of Officers at Incidents



Minutes of Officer Activity



Violent Part I Crimes



Property Part I Crimes