Traffic Stop Data Analysis and Findings

State of Connecticut

April 2015 Report

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This report was written by the Institute for Municipal and Regional Policy (IMRP) at Central Connecticut State University with the help of the Connecticut Economic Resource Center, Inc. (CERC). The authors from CERC applied the statistical tests known as the "Veil of Darkness," and "KPT Hit Rate." In addition to these statistical tests, CERC developed the descriptive statistics using the peer group methodology.

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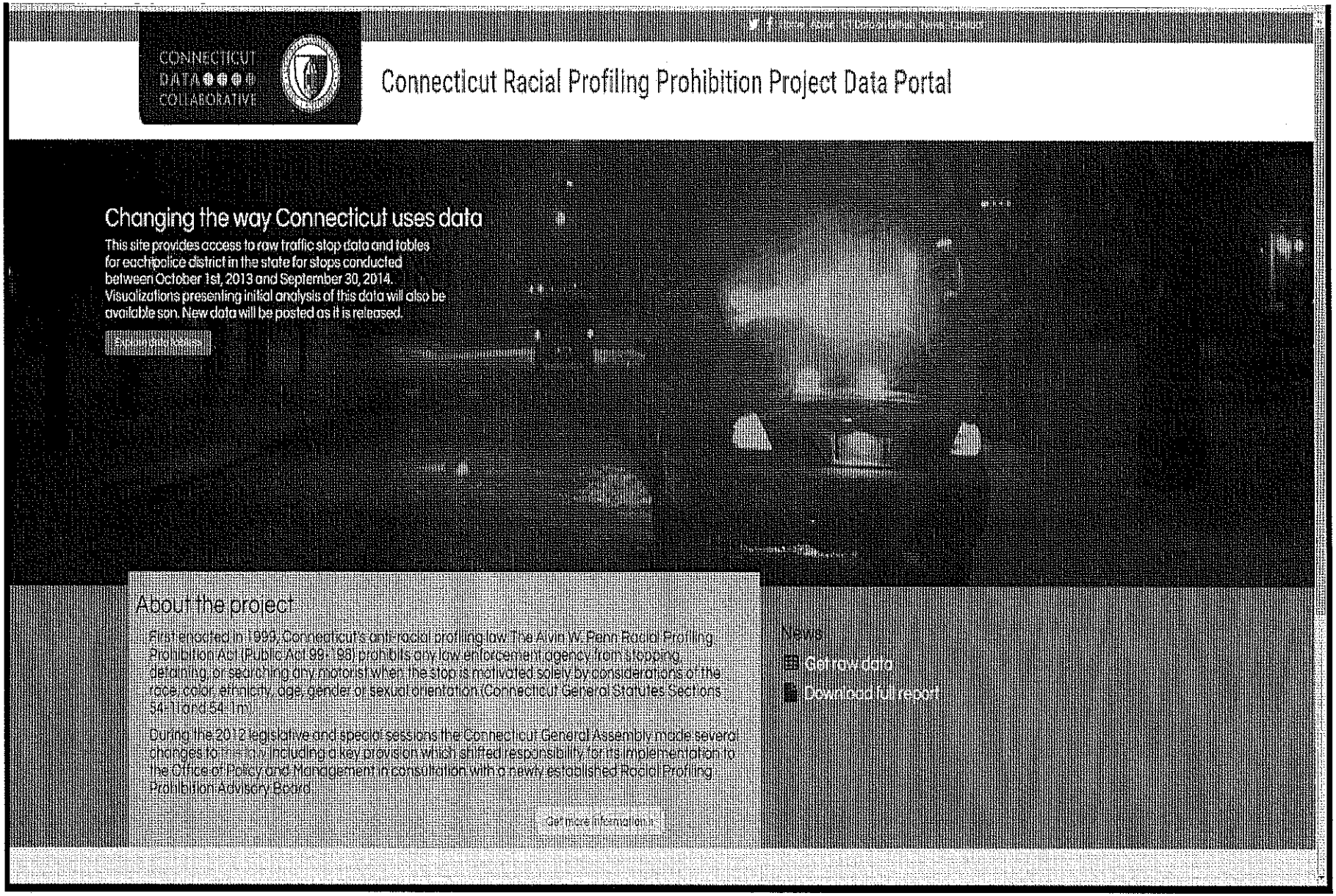

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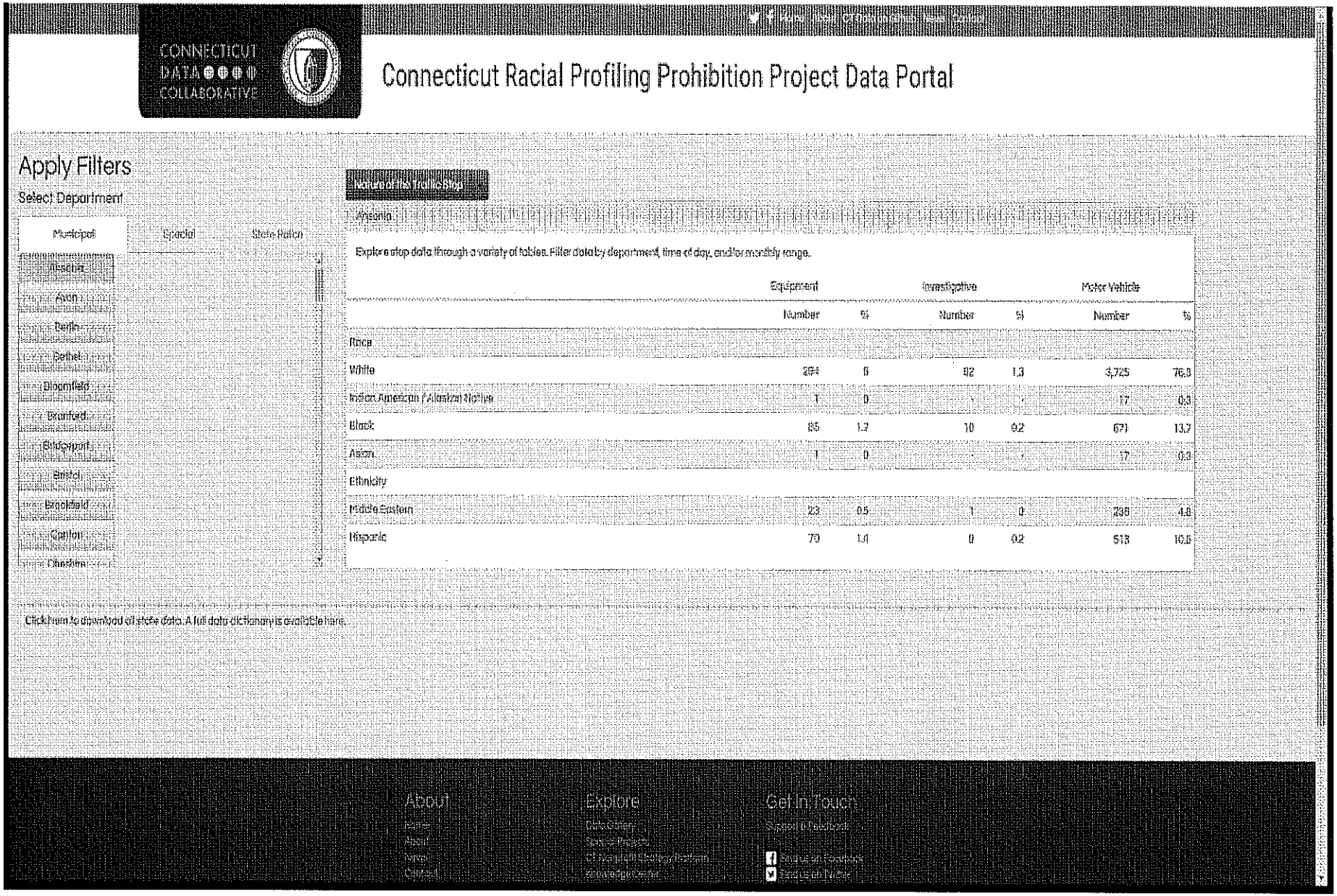


Outline of Report

- **Sections I and II** provide general background and the methodological approach used in the study.
- **Section III:** The analysis begins by first presenting the stop characteristics from the Connecticut policing data.
- **Section IV:** This section leads the reader through four descriptive measures that evaluate racial and ethnic disparities. There were seven distinct analytical tools used to evaluate whether racial and ethnic disparities exist in the policing data. The four techniques contained in Section IV are descriptive in nature and should be viewed with a degree of caution. These intuitive measures are less stringent than more sophisticated statistical tests, but provide a useful context from which to view the data.

Outline of Report (Cont.)

- **Section V:** This section analyzes racial and ethnic disparities in the rate of motor vehicle stops by applying a well-respected methodology known as the *Veil of Darkness*. The *Veil of Darkness* is a statistical technique that was developed by Jeffery Grogger and Greg Ridgeway (2006) and published in the *Journal of the American Statistical Association*. The analysis described in this section is considered to be the most rigorous and broadly applicable of all the tests presented in this analysis.

Outline of Report (Cont.)

- **Section VI:** This section assesses post-stop behavior, particularly the incidence of vehicular searches, by applying two estimation strategies. This section illustrates the application of an analysis of hit rates using the classic approach developed by Knowles, Persico and Todd (2001). In addition to this technique, a more recent contribution by Joseph Ritter (2013) that assesses the relative frequency of search rates across racial and ethnic groups is applied.

Guiding Principles for Statistical Analysis

- **Principle 1:** Acknowledge that statistical evaluation is limited to finding racial and ethnic disparities that are indicative of racial and ethnic bias but that, in the absence of a formal procedural investigation, cannot be considered comprehensive evidence.

- **Principle 2:** Apply a holistic approach for assessing racial and ethnic disparities in Connecticut policing data by using a variety of approaches that rely on well-respected techniques from existing literature.

- **Principle 3:** Outline the assumptions and limitations of each approach transparently so that the public and policy makers can use their judgment in drawing conclusions from the analysis.

Characteristics of Traffic Stop Data

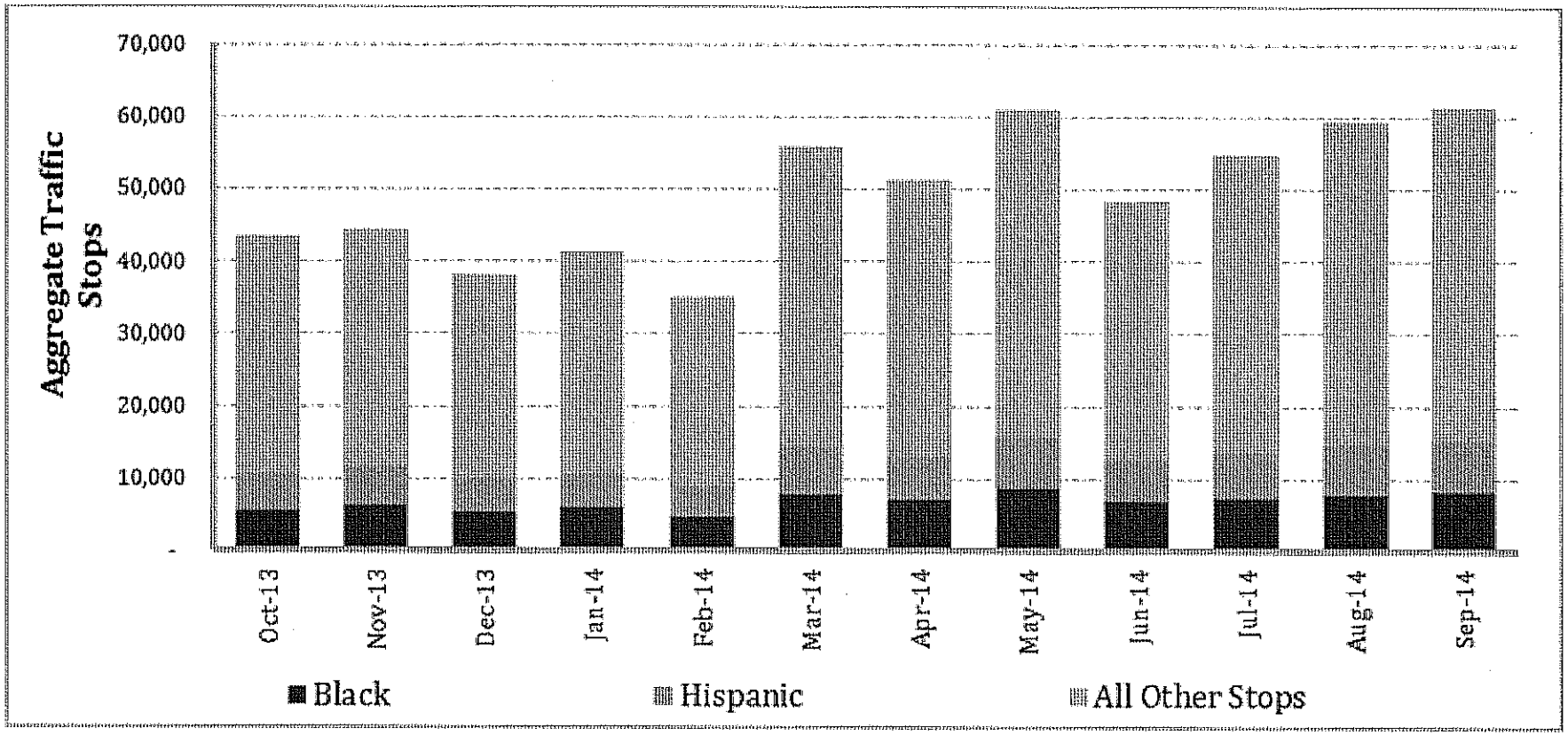
- Traffic Stop Data was analyzed from October 1, 2013 to September 30, 2014.

- More than **620,000 traffic stops** were conducted by **102 law enforcement agencies** during the 12 month study period.
  - 92 Municipal Police Agencies*
  - State Police
  - 9 Special Police Agencies

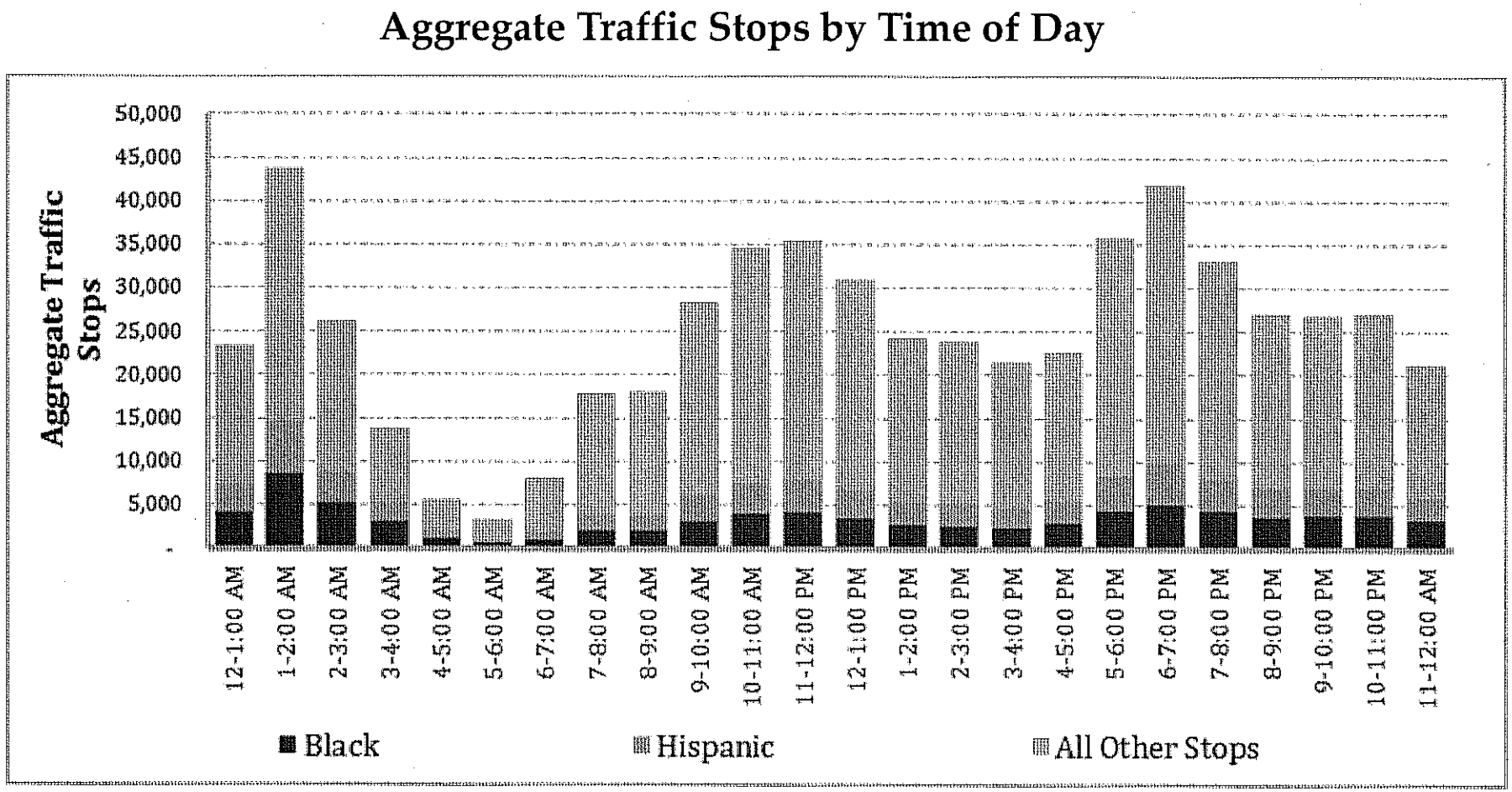
- *Stamford Police Department was excluded from the study period.
- Limited data was collected from New London, Suffield and West Haven.

Characteristics of Traffic Stop Data

Aggregate Traffic Stops by Month of the Year

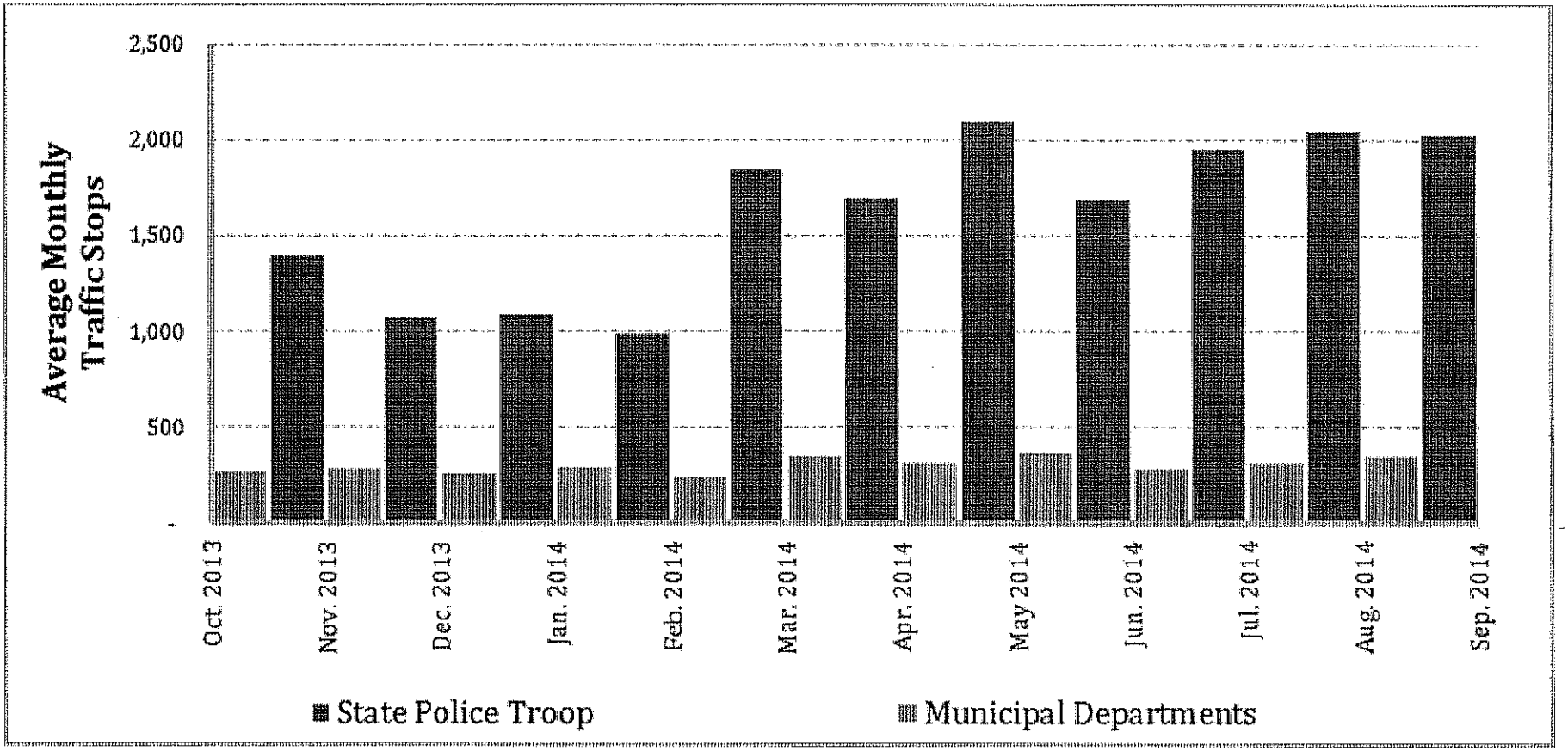


Characteristics of Traffic Stop Data



Characteristics of Traffic Stop Data

Average Number of Traffic Stops by Month for Police Agencies



Characteristics of Traffic Stop Data

- Volume of traffic stops vary across departments.
- **For every 1,000 CT residents, 211 are stopped.**
- Newtown (452) and Berlin (413) stop the highest number of residents per 1,000.
- Shelton (19) and Waterbury (21) stop the lowest number of residents per 1,000.

Characteristics of Traffic Stop Data

Statewide Driver Characteristics

Race and Ethnicity		Gender		Residency		Age	
White	73.1%	Male	63.9%	Connecticut Resident	87.2%	16 to 20	8%
Black	13.5%					21 to 30	30%
All Other Races	1.8%					31 to 40	19%
Hispanic	11.7%	Female	36.1%	Nonresident	12.8%	41 to 50	19%
						51 to 60	14%
						Older than 61	8%

Characteristics of Traffic Stop Data

Statewide Stop Characteristics

Classification of Stop		Basis for Stop	
Motor Vehicle Violation	88.0%	Speeding	26.9%
Equipment Violation	9.8%	Registration	9.4%
Investigatory	2.2%	Cell Phone	9.0%
Outcome of Stop		Defective Lights	8.9%
Uniform Arrest Report	0.9%	Misc. Moving Violation	7.5%
Misdemeanor Summons	5.5%	Traffic Control Signal	6.7%
Infraction Ticket	47.7%	Stop Sign	5.8%
Written Warning	17.9%	Seatbelt	4.1%
Verbal Warning	26.4%	Display of Plates	2.9%
No Disposition	1.6%	Suspended License	1.3%
Vehicles Searched	2.9%	All Other	17.4%

Characteristics of Traffic Stop Data

Highest Speeding Stop Rates Across All Departments

Department Name	Total Stops	Speed Related
New Milford	4,049	63.0%
Suffield	556	62.9%
Portland	160	62.5%
Southington	5,395	52.9%
Newtown	9,402	49.9%
Ridgefield	7,366	47.4%
Guilford	2,711	46.3%
Weston	410	45.4%
Wolcott	797	44.8%
Simsbury	3,281	42.7%

Characteristics of Traffic Stop Data

Highest Registration Violation Rates across All Departments

Department Name	Total Stops	Registration Violations
Branford	6,891	24.6%
North Branford	1,340	23.7%
Trumbull	2,974	23.1%
Watertown	1,784	20.5%
Stratford	2,956	19.6%
Greenwich	8,041	19.6%
West Hartford	8,221	19.2%
Wilton	3,893	18.5%
Hamden	5,442	17.6%
Troop L	13,790	17.51%

Characteristics of Traffic Stop Data

- Stops for defective lights, excessive window tint, or a display of plate violation are considered to have more Officer discretion.
  - Statewide average of 12.9% for these violations
  - 62 departments exceeded the statewide average.
    - Wethersfield (33%)
    - South Windsor (31.7%)
    - Clinton (31.6%)
    - Newington (31%)
    - Torrington (30.8%)

Characteristics of Traffic Stop Data

- 47.7% of all stops result in an infraction ticket

Department Name	Total Stops	Infraction Ticket
Highest Municipal Departments		
Danbury	6,182	82.3%
Meriden	3,209	70.2%
Derby	3,725	68.6%
Department of Motor Vehicle	2,317	66.5%
Trumbull	2,974	64.2%
Hartford	8,254	61.9%
Branford	6,891	59.1%
Bridgeport	4,717	59.1%
Greenwich	8,041	58.4%
Norwalk	7,900	56.4%
Highest State Police Troops		
Non-Troop State Police	15,636	85.9%
Troop F	25,617	77.7%
Troop G	27,506	77.1%
Troop H	18,790	73.2%
Troop C	27,826	70.7%

Characteristics of Traffic Stop Data

- 44.3% of all stops result in a warning

Department Name	Total Stops	Resulted in Warning
	Highest Municipal Departments	
Putnam	2,308	92.9%
Middlebury	266	92.9%
Suffield	556	87.2%
Portland	160	86.9%
Plainfield	1,240	84.0%
West Haven	3,865	82.6%
Plymouth	2,610	82.2%
Thomaston	942	82.0%
Guilford	2,711	81.9%
Redding	2,537	81.0%
	Highest State Police Troops	
Troop B	6,159	42.3%
Troop L	13,790	40.0%
Troop D	16,662	33.0%
Troop A	23,667	28.6%
Troop K	21,787	27.4%

Characteristics of Traffic Stop Data

- Less than 1% of all traffic stops result in an arrest

Department Name	Total Stops	Arrests
New London	1,524	7.3%
West Hartford	8,221	5.9%
Waterbury	1,742	5.3%
Canton	1,751	4.3%
Wallingford	9,178	3.7%
Hartford	8,254	3.4%
Plainfield	1,240	2.6%
Groton Town	6,252	2.5%
New Haven	11,159	2.4%
Farmington	4,525	2.1%

Characteristics of Traffic Stop Data

- 2.9% of all traffic stops result in a vehicle search

Department Name	Total Stops	Resulted in Search
Highest Municipal Departments		
Waterbury	1,742	28.8%
Bridgeport	4,717	11.1%
Milford	4,358	9.7%
New London	1,524	8.5%
West Hartford	8,221	8.2%
Derby	3,725	8.2%
Middletown	3,700	8.1%
Norwalk	7,900	8.0%
Yale University	1,050	7.5%
New Haven	11,159	7.5%
Highest State Police Troops		
Troop A	23,667	2.3%
Troop H	18,790	2.2%
Troop L	13,790	2.1%
Troop I	13,670	1.7%
Troop C	27,506	1.6%

Descriptive Statistics and Intuitive Measures

4 Intuitive Measures were used:

- Statewide Average Comparison
- Estimated Driving Population
- Resident Stops
- Peer Groups

Descriptive Statistics and Intuitive Measures

All measures were analyzed in 3 categories:

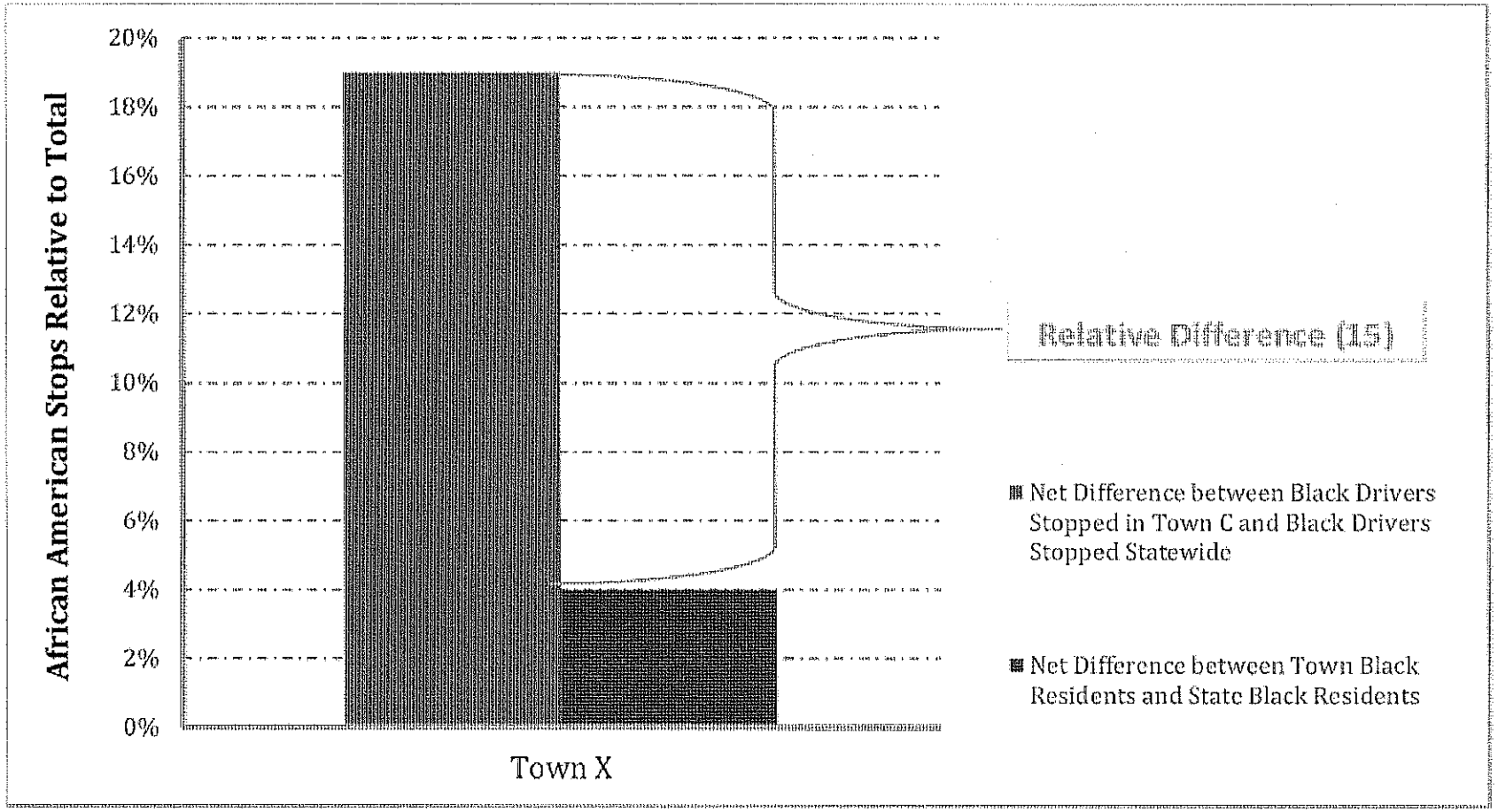
1. Minority (all non-white)
2. Black (non-Hispanic)
3. Hispanic

Descriptive Statistics and Intuitive Measures

- Statewide Average
  - The method chosen to make the statewide average comparison is as follows:
    - The towns' that exceeded the statewide average for the three racial categories being compared to the state average were selected.
    - The amount that each town's stop percentage exceeded the state average stop percentage was determined.
    - The amount that each town's resident driving age population exceeded the state average for the racial group being measured was determined.
    - The net differences in these two measures was determined and used to assess orders of magnitude differences in these factors.

Descriptive Statistics and Intuitive Measures

Statewide Average: Illustration of the Relative Difference between Stops and Residents



Descriptive Statistics and Intuitive Measures

- Statewide Average Continued
  - We only identified those departments that had a relative difference of 10 or more points.
  - Identified towns that border the target town that have a resident population that exceeds the statewide average.
  - Identified the percent of nonresident stops.

Descriptive Statistics and Intuitive Measures

- Estimated Driving Population
  - For each town, LODES data was used to identify all those employed in the town, but residing in some other location regardless of how far away they lived from the target community.
  - ACS five-year average estimated data was used to adjust for individuals commuting by some means other than driving, such as those using public transportation.
  - For all Connecticut towns contributing commuters, racial and ethnic characteristics of the commuting population were determined by using the jurisdictions' 2010 census demographics.
  - For communities contributing fewer than 10 commuters who live outside of Connecticut, racial and ethnic characteristics of the commuting population were determined using the demographic data for the county in which they live.
  - The numbers for all commuters from the contributing towns were totaled and represent the nonresident portion of the given town's EDP. This was combined with the town's resident driving age population. The combined nonresident and resident numbers form the town's complete EDP.

Descriptive Statistics and Intuitive Measures

- Estimated Driving Population
  - Identified all stops conducted Monday – Friday during peak commuting hours (6:00am – 10:00am and 3:00pm – 7:00pm).
  - Compared stops conducted during peak commuting hours to the EDP.
  - Only identified those departments that exceeded their EDP by 10 or more percentage points.

Descriptive Statistics and Intuitive Measures

- Resident Only Stop Comparison
  - Identified all drivers stopped that were residents of the town that stopped them.
  - Compared resident drivers stopped to the 16+ resident population.
  - Only identified those departments that exceeded their resident population by 10 or more percentage points.

Descriptive Statistics and Intuitive Measures

- Peer Group
  - Create a benchmark that is based on data from the five most similar departments (Peer towns) and estimate the proportion of stops across several minority definitions.
    - Peer towns were selected by applying a matching function used by the US Census
    - Variables used to evaluate similarity were from a variety of sources including the US Census Bureau, Department of Labor, and CT Department of Public Safety
    - A very intuitive measure that has a statistical foundation
  - Only identified the 10 towns with the largest disparities (Over 10 percentage points)

Descriptive Statistics and Intuitive Measures

- These 4 measures became the descriptive statistic matrix that was used to screen departments.
  - 33 departments were identified in the descriptive analysis with benchmark disparities greater than 10% points in any of the 4 measures.
  - 12 departments were identified as exceeding the benchmarks by 10 or more percentage points in 3 of the 4 measures.

Descriptive Statistics and Intuitive Measures

Department Name	Statewide Average			Estimated Driving Population			Resident Population			Peer Group			Total
	M	B	H	M	B	H	M	B	H	M	B	H	
Tier 1													
Wethersfield	X	X	X	X	X	X	X			X		X	9
Hamden	X	X		X	X		X	X		X	X		8
Manchester	X	X		X	X		X	X		X	X		8
New Britain	X		X	X		X	X		X	X		X	8
Stratford	X	X		X	X		X	X		X	X		8
Waterbury	X			X	X		X	X		X	X	X	8
East Hartford				X	X		X	X		X	X	X	7
Tier 2													
Meriden	X			X			X		X	X		X	6
New Haven				X	X		X	X		X	X		6
Newington	X		X	X		X				X		X	6
Norwich				X	X		X	X		X	X		6
Windsor				X	X		X	X		X	X		6

Veil of Darkness

- If racial bias is driven by the ability of officers to observe the race of drivers before making a stop, then we should observe a statistical disparity between the rate of minority stops occurring in daylight vs. darkness.
  - Developed by Jeffery Grogger (U. Chicago) and Greg Ridgeway (U. Penn and NIJ) in 2006
  - Restricts sample to intertwilight window
  - Control statistically for a number of factors that could change risk-set
    - Time of the day, day of the week, state traffic volume, police department, time of day*department fixed effects, day of the week*department fixed effects, and volume*department
  - Estimates are for several minority definitions
  - Considered by CERC/IMRP to be the strongest and most accurate test

Veil of Darkness (Continued)

State Level Results

	(1)	(2)	(3)	(4)	(5)
	Non-Caucasian	Non-Caucasian or Hispanic	Black	Hispanic	Black or Hispanic
Darkness	-0.131***	-0.138***	-0.078**	-0.094***	-0.102***
	(0.047)	(0.042)	(0.033)	(0.03)	(0.033)
Psuedo-R2	0.1	0.11	0.12	0.08	0.12
N	158,473	162,542	156,078	157,260	162,044

Veil of Darkness (Continued)

Department Level Results

		(1)	(2)	(3)	(4)	(5)
		Non-Caucasian	Non-Caucasian or Hispanic	Black	Hispanic	Black or Hispanic
Granby	Darkness	-1.352*	-1.088*	-1.352*	-0.514	-1.088*
		(0.754)	(0.58)	(0.754)	(0.874)	(0.58)
Groton Town	Darkness	-0.665***	-0.516***	-0.706***	-0.179	-0.504***
		(0.218)	(0.178)	(0.234)	(0.25)	(0.183)
Waterbury	Darkness	-0.588	-0.532	-0.561	0.094	-0.497
		(0.392)	(0.372)	(0.392)	(0.373)	(0.368)
State Police- Troop C	Darkness	-0.624***	-0.569***	-0.408***	-0.395**	-0.418***
		(0.122)	(0.0995)	(0.137)	(0.154)	(0.106)
State Police- Troop H	Darkness	-0.495***	-0.406***	-0.420***	-0.065	-0.340***
		(0.134)	(0.115)	(0.138)	(0.158)	(0.116)

KPT Hit Rate Analysis

- If drivers and motorists behave rationally and optimize behavior, in equilibrium they are expected to have equal hit rates across races i.e. guilt/searches.
  - Developed by Knowles (IZA) Persico (NYU) and Todd (U. Penn) in 2001
  - Utilizes only post stop data and restricts sample to discretionary searches
  - Estimated across several minority definitions and compared to control group
  - Has known shortcomings but can be used to confirm other tests

KPT Hit Rate Analysis (Continued)

State Level Results

	(1)	(2)	(3)	(4)	(5)
Variable	Non-Caucasian	Non-Caucasian or Hispanic	Black	Hispanic	Black or Hispanic
Chi2 P-Value	0.000***	0.000***	0.000***	0.000***	0.000***
N	5,026	6,270	4,988	4,541	6,233
Differential	-0.018	0.006	-0.017	0.025	0.007

KPT Hit Rate Analysis (Continued)

Department Level Results

		(1)	(2)	(3)	(4)	(5)
		Non-Caucasian	Non-Caucasian or Hispanic	Black	Hispanic	Black or Hispanic
West Hartford	Chi2 P-Value	0.379	0.002***	0.379	0.001***	0.002***
	Differential	0.12	0.202	0.12	0.208	0.202
State Police-Troop C	Chi2 P-Value	0.013**	0.002***	0.017**	0.042**	0.003***
	Differential	0.206	0.201	0.199	0.104	0.194
State Police-Troop F	Chi2 P-Value	0.012**	0.002***	0.012**	0.033**	0.002***
	Differential	0.199	0.238	0.199	0.208	0.238
State Police-Troop I	Chi2 P-Value	0.003***	0.005***	0.005***	0.233	0.007***
	Differential	0.033	0.068	0.029	0.064	0.065
Waterbury	Chi2 P-Value	0.004***	0.004***	0.004***	0.007***	0***
	Hit Rate	0.018	0.112	0.014	0.114	0.146

Solar-Powered Search Rates

- If racial bias is driven by the ability of officers to observe the race of drivers before making a stop, then we should observe a statistical disparity between the search-rate of minority stops occurring in daylight vs. darkness.
  - Developed by Ritter (U. Minnesota) in 2013
  - Utilizes pre and post-stop data to develop a second-stage test
  - Restricts sample to intertwilight window
  - Control statistically for a number of factors that could change risk-set
    - Time of the day, day of the week, state traffic volume, police department, time of day*department fixed effects, day of the week*department fixed effects, and volume*department
  - Estimates are for several minority definitions
  - Sample size is very small for many departments

Solar-Powered Search Rates (Continued)

State Level Results

	(1)	(2)	(3)	(4)	(5)
	Non-Caucasian	Non-Caucasian or Hispanic	Black	Hispanic	Black or Hispanic
Darkness	-0.217	-0.233	-0.362	-0.316	-0.281
	(0.289)	(0.215)	(0.311)	(0.275)	(0.214)
R2	0.177	0.132	0.178	0.167	0.126

Solar-Powered Search Rates (Continued)

Department Level Results

		(1)	(2)	(3)	(4)	(5)
		Non-Caucasian	Non-Caucasian or Hispanic	Black	Hispanic	Black or Hispanic
Glastonbury	Darkness	-33.29	1.965		4.511*	2.342
		(6212.0)	(1.296)		(2.624)	(1.465)
Waterbury	Darkness		2.177*		2.858*	2.151*
			(1.202)		(1.602)	(1.199)
State Police-Troop A	Darkness	1.307*	1.037*	1.348*	0.758	1.048*
		(0.694)	(0.537)	(0.708)	(1.007)	(0.537)
State Police-Troop C	Darkness	3.047**	1.024	2.692**	-0.512	0.948
		(1.340)	(0.729)	(1.274)	(1.295)	(0.716)

Summary of Findings

- **Statewide Results**
  - A total of 13.5 % of motorists stopped during the analysis period were observed to be Black. A comparable 11.7 % of stops were of motorists from a Hispanic descent. The results from the *Veil of Darkness* analysis indicated that minority stops were more likely to have occurred during daylight hours than at night. The statistical disparity provides evidence in support of the claim that certain officers in the state are engaged in racial profiling during daylight hours when motorist race and ethnicity is visible.
  - The results from the post-stop analysis confirm that the disparity carries through to post-stop behavior for Hispanics.

It is important to note that it is specific officers and departments that are driving these statewide trends

Summary of Findings

Departmental Results

- The results from the ***Veil of Darkness*** indicated that minority motorists, across all racial and ethnic categories, were more likely to have been stopped during daylight as opposed to darkness hours. The analysis using the *Veil of Darkness* produced sufficiently strong results to make a determination that these results indicate the presence of a **significant racial and ethnic disparity** for:
  - **Groton Town**
  - **Granby**
  - **Waterbury**
  - **State Police Troop C**
  - **State Police Troop H**

Summary of Findings

Departmental Results

- The results from the **post-stop analysis** indicated that minority motorists, as compared to their Caucasian counterparts, were being searched more frequently relative to the rate at which they were found with contraband. The results of the post-stop analysis produced sufficiently strong results to make a determination that these results indicate the presence of a **significant racial and ethnic disparity** for:
  - **Waterbury**
  - **State Police Troop C**

Summary of Findings

- 12 Departments were identified using 4 the descriptive measures.
  - 7 Departments exceeded the disparity threshold levels in at least 3 of the 4 benchmarks as well as a majority of the 12 possible measures. These departments will be reviewed further by the project staff.
    - **Wethersfield**
    - **Hamden**
    - **Manchester**
    - **New Britain**
    - **Stratford**
    - **Waterbury**
    - **East Hartford**
  - 5 Departments exceeded the disparity threshold levels in at least 2 of the 4 benchmarks as well as 6 of 12 measures. These departments will be monitored to determine if changes relative to the benchmarks indicate the need for further analysis.
    - Meriden
    - New Haven
    - Newington
    - Norwich
    - Windsor

Next Steps

- Further analysis will be conducted on the 10 municipal police departments and 2 state police troops.
- A more robust report will be conducted with the collection of additional data.
- In the coming weeks the project staff will publish a detailed guide of steps that can be taken by all law enforcement agencies to address disparities in their communities.
  - Fair and Impartial Policing training will be offered to the above mentioned departments.
  - We will work with law enforcement and local officials to host community dialogues.