

Citation Data Collection 2020

WORK GROUP
PRESENTATION

2019 Hands-Free Bill (included data collection of Massachusetts Uniform Citations)

Collection period: February 23, 2020-December 31, 2020 (10 months)

Definitions to understand:

- **Veil of Darkness Theory (VoD):** “All things being equal, if officers are profiling motorists, the underlying assumption is that it would be easier to do during daylight than at night.”
 - This theory calculates the probabilities of drivers being stopped more/less during daylight. Measures non-white vs. white drivers.
 - **Intertwilight Period (ITP):** A specific period focused on sunrise and sunset only: 4:30am-7:01am & 4:30pm-9:01pm.
- **Criminal Application:** A citation which is issued for a criminal offense committed in a motor vehicle. They are generally issued in lieu of, or to avoid a custody arrest.
- **Triggering Offense:** The offense which initially drew the attention of the officer and is the reason for the stop.
- **Outcomes:** Statistics showing percentage of Warnings/Citations/Criminal Apps/Arrests/Searches for non-white vs. white

2019 Hands-
Free Bill
(included data
collection of
Massachusetts
Uniform
Citations (cont.)

- ❖ Study includes categories such as:
 - ❖ Total stops
 - ❖ Total percentage of in-Town stops vs. “passing through” stops
 - ❖ Stops of all races & genders measured against Town demographics
 - ❖ Stops of all races & genders measured against state averages
 - ❖ Veil of Darkness for Intertwilight stops measured for ALL stops and only ITP stops
 - ❖ Calculates percentages of outcomes for Other, White, Hispanic, and AA/Black

2019 Hands-Free Bill (included data collection of Massachusetts Uniform Citations (cont.)

Strengths (3 listed):

- More information is being gathered now than before (locations, times, age)
- Analysis is being made public & being discussed
- Multiple types of analysis and data are being used within the same study

Limitations/Warnings (11 Listed):

- Race is based on “best guess” from officer
- Does not consider multiple citations for a stop (counted as multiple stops).
- Only written citations are collected. Verbal warnings are not included and, “some motorists may have had numerous prior contacts with LE and have already been given prior warnings, this is not captured in the data” (p.36)

2019 Hands-Free Bill (included data collection of Massachusetts Uniform Citations (cont.)

Limitations/Warnings (11 Listed) (Cont.):

- “Triggering offense” or reason for stop is not identified by study. “This is important because certain types of traffic offenses are more discretionary (e.g., seat belt violations., equipment violations, etc.), and therefore potentially more likely to reflect an individual officer’s bias” (McDevitt et al., 2014) (Pg. 36-37).
- Does not include whether stop was discretionary, call for service, or due to warrant information.
- Does not include information on motorists' behavior after being stopped or prior contacts with LE (this could influence who gets a ticket, warning, or gets searched).
- Does not include outcome of any searches conducted (i.e., this could be why an arrest occurred).

2019 Hands-Free Bill (included data collection of Massachusetts Uniform Citations (cont.)

Limitations/Warnings (11 Listed) (Cont.):

- VoD analysis is missing several factors. “it is also important to note that there are limitations regarding the extent to which the visibility of race is truly tied to the time of day. Lighting, speed and other factors (i.e., tinted windows, weather) can also impact the officer’s ability to identify the race of the driver” (RIPA Report, 2021)(Pg. 38).
- Their study cannot account for community characteristics, “**Workplaces, malls, landmarks, recreational facilities and colleges** within a community are just a few examples of draws that can greatly influence the driving population in a particular city/town” (p. 39)
- Large cities affect the Statewide Average numbers

2019 Hands-Free Bill (included data collection of Massachusetts Uniform Citations (cont.)

Limitations/Warnings (11 Listed) (Cont.):

- Only 10 months of data collected and.....
- “The COVID-19 pandemic likely had an impact on not just driving patterns but also traffic enforcement patterns during much of 2020. For example, there were far fewer vehicles on the road for the lockdown periods. Additionally, the lockdowns likely had an impact on who was on the road and who was working from home (“essential” vs. “nonessential” workers). Williams et al. (2020) found that Blacks and Hispanics are more likely to be employed as essential workers as compared to Whites, which could potentially impact who was more likely to be driving during the lockdown.” (p. 39)

Town of Hadley

Approximately 25 Sq. Miles.
5,300 residents

Miles of Road- Town vs State
Highway (66 miles Town Road
and 9 miles State HWY)

Estimated Average Annual Daily
Count on all roads:
110,551

Traffic stops Hadley vs. Rest of
Mass (Display)

Settled in the center of the "Five
College Area" with large
portions of Umass inside of
Hadley

Speed complaints occur most
often: West, Middle(Rt. 47
north), Bay, Rocky Hill, North
Maple, South Maple,
Hockanum, Lawrence Plain, (Rt.
47 south), Huntington, and
Route 9, Route 9, Route 9.....

Hadley Stops Breakdown: What data are we given?

2020 UNIFORM CITATION DATA ANALYSIS REPORT

2020 MASSACHUSETTS UNIFORM CITATION DATA ANALYSIS REPORT HADLEY POLICE DEPARTMENT

Total Stops: 913	ZIP Code Match Analysis			Stop Rate by City/Town Population			
	Intown motorist:		6.9%	Stops per 1000 18+ residents:			
	Passing through:		93.1%	203.7			
All stops				ITP ¹ Stops (N = 344, 37.7% of stops)			
Mean age		34.48		Mean age		36.28	
Gender %				Gender %			
Female		35.4%		Female		35.8%	
Male		64.0%		Male		64.0%	
Non-binary		0.7%		Non-binary		0.3%	
Race %				Race %			
AA/Black		10.1%		AA/Black		7.4%	
Hispanic		5.0%		Hispanic		3.9%	
White		80.1%		White		85.2%	
Other		4.9%		Other		3.6%	
¹ Only stops occurring between 4:35am and 7:16am (dawn) or between 4:14pm and 9:02pm (dusk)							
Comparative Analyses							
Stops vs. City/Town Demographics				Stops vs. State Average ²			
Motorist Race	City Dem	% Dif		Motorist Race	State Avg	% Dif	
AA/Black	10.1%	7.9%	2.2%	AA/Black	10.1%	15.7%	-5.6%
Hispanic	5.0%	2.3%	2.7%	Hispanic	5.0%	14.7%	-9.7%
White	80.1%	84.6%	-4.5%	White	80.1%	65.5%	14.6%
Other	4.9%	5.7%	-0.8%	Other	4.9%	4.1%	0.8%
² State average represents racial/ethnic breakdown of all 2020 stops by all MA departments							
VoD Analysis							
All stops				ITP stops			
Race	N	Daylight	Darkness	Race	N	Daylight	Darkness
NW	168	19.2%	21.9%	NW	47	20.6%	8.2%
White	646	80.8%	78.1%	White	262	79.4%	91.8%
Chi-Square ³ :		.328 <i>not sig.</i>		Chi-Square ³ :		.003* <i>sig.</i>	
Odds ratio Exp(B) ⁴ :		.874 <i>not sig.</i>		Odds ratio Exp(B) ⁴ :		3.445* <i>sig.</i>	
³ Sig. <i>chi-square</i> indicates observed pattern in table is real, and <i>not</i> due to chance alone							
⁴ Odds ratio < 1 indicates NW drivers <i>less</i> likely to be stopped during the day than at night; > 1 indicates NW drivers <i>more</i> likely to be stopped during the day than at night. Only "sig." results can be interpreted.							
Stop Outcomes by Race							
	Warning	Civil	Criminal	Arrest	Search?		
AA/Black	53.9%	20.2%	24.7%	1.1%	NW	1	N/A
Hispanic	56.8%	13.6%	27.3%	2.3%	White	6	N/A
White	60.6%	21.9%	13.7%	3.8%			
Other	74.4%	16.3%	4.7%	4.7%		Counts	Percent
Chi-Square ³ :		.019* <i>sig.</i>					

My last question would be this- I know that you clearly point out that this data does not mean officers are engaging in profiling, but I'd like to know that if I were to look deeper into this (and I am currently pulling all of these citations from ITP stops), based upon the data, where would I look? Our statistics, when measured against State averages are lower in nearly every other category, so should I only look at ITP stops?

There are several analyses performed, beyond the VoD, and these are all part of understanding patterns. You can definitely emphasize some of the other positive patterns. As we highlight in the report, there are numerous limitations of the data itself, including that it does not factor in things like driver behavior, does not include verbal warnings, etc. If data were available on verbal warnings, this may show different patterns. Further, since we are unable to tell neighborhood contextual effects, it might be that the stops are geographically similar, or not. The ITP Veil of Darkness analysis was emphasized because it is the best measure available, but reflecting on more stops outside of ITP might be useful too. This is a new process, and there is really not yet a clear path forward following the report's findings.

Where do we look?

1. Positive Patterns
2. Community Context

Positive Patterns

1. Total Stops: 1869
2. Written Citations (Warnings, Civil, Criminal): 51% (949)
3. Verbal Warnings: 49% (920)
 - ❑ RMV does not collect race data, so we can only assume that based upon all other data showing leniency, that more Non-White drivers were given verbal warnings, and this would increase those percentages.

Comparative Analyses							
Stops vs. City/Town Demographics				Stops vs. State Average ²			
Motorist Race	City Dem	% Dif		Motorist Race	State Avg	% Dif	
AA/Black	10.1%	7.9%	2.2%	AA/Black	10.1%	15.7%	-5.6%
Hispanic	5.0%	2.3%	2.7%	Hispanic	5.0%	14.7%	-9.7%
White	80.1%	84.6%	-4.5%	White	80.1%	65.5%	14.6%
Other	4.9%	5.7%	-0.8%	Other	4.9%	4.1%	0.8%

²State average represents racial/ethnic breakdown of all 2020 stops by all MA departments

VoD Analysis				ITP stops			
All stops				ITP stops			
Race	N	Daylight	Darkness	Race	N	Daylight	Darkness
NW	168	19.2%	21.9%	NW	47	20.6%	8.2%
White	646	80.8%	78.1%	White	262	79.4%	91.8%
Chi-Square ³ :		.328	not sig.	Chi-Square ³ :		.003*	sig.
Odds ratio Exp(B) ⁴ :		.874	not sig.	Odds ratio Exp(B) ⁴ :		3.445*	sig.

³Sig. chi-square indicates observed pattern in table is real, and not due to chance alone
⁴Odds ratio < 1 indicates NW drivers less likely to be stopped during the day than at night; > 1 indicates NW drivers more likely to be stopped during the day than at night. Only "sig." results can be interpreted.

Stop Outcomes by Race							
	Warning	Civil	Criminal	Arrest		Search?	
AA/Black	53.9%	20.2%	24.7%	1.1%	NW	1	N/A
Hispanic	56.8%	13.6%	27.3%	2.3%	White	6	N/A
White	60.6%	21.9%	13.7%	3.8%			
Other	74.4%	16.3%	4.7%	4.7%			
Chi-Square ³ :		.019*	sig.				

Comparison

¹Only stops occurring between 4:35am and 7:16am (dawn) or between 4:14pm and 9:02pm (dusk)

Comparative Analyses						
Stops vs. City/Town Demographics				Stops vs. State Average ¹		
Motorist Race	City Dem	% Dif		Motorist Race	State Avg	%Dif
AA/Black	19.2%	N/A	N/A	AA/Black	19.2%	15.7% 3.5%
Hispanic	21.7%	N/A	N/A	Hispanic	21.7%	14.7% 7.0%
White	51.8%	N/A	N/A	White	51.8%	65.5% -13.7%
Other	7.3%	N/A	N/A	Other	7.3%	4.1% 3.2%

²State average represents racial/ethnic breakdown of all 2020 stops by all MA departments

VoD Analysis							
All stops				ITP stops			
Race	N	Daylight	Darkness	Race	N	Daylight	Darkness
NW	2,654	46.2%	52.7%	NW	641	48.1%	40.4%
White	2,828	53.8%	47.3%	White	755	51.9%	59.6%
Chi-Square ³ :		.000*	sig.	Chi-Square ³ :		.010*	sig.
Odds ratio Exp(B) ⁴ :		.759*	sig.	Odds ratio Exp(B) ⁴ :		1.153	not sig.

³sig. chi-square indicates observed pattern in table is real, and not due to chance alone
⁴Odds ratio < 1 indicates NW drivers less likely to be stopped during the day than at night; > 1 indicates NW drivers more likely to be stopped during the day than at night. Only "sig." results can be interpreted.

Stop Outcomes by Race							
	Warning	Civil	Criminal	Arrest		Search?	
AA/Black	51.7%	30.7%	14.2%	3.5%	NW	79	N/A
Hispanic	47.6%	29.3%	17.1%	6.0%	White	20	N/A
White	53.4%	38.4%	6.1%	2.1%			
Other	45.7%	49.5%	4.3%	0.5%		Counts	Percent
Chi-Square ³ :		.000*		sig.			

Comparison

¹Only stops occurring between 4:35am and 7:16am (dawn) or between 4:14pm and 9:02pm (dusk)

Comparative Analyses						
Stops vs. City/Town Demographics				Stops vs. State Average ²		
Motorist Race	City Dem	% Dif		Motorist Race	State Avg	% Dif
AA/Black	29.1%	N/A	N/A	AA/Black	29.1%	15.7% 13.4%
Hispanic	20.5%	N/A	N/A	Hispanic	20.5%	14.7% 5.8%
White	44.6%	N/A	N/A	White	44.6%	65.5% -20.9%
Other	5.8%	N/A	N/A	Other	5.8%	4.1% 1.7%

²State average represents racial/ethnic breakdown of all 2020 stops by all MA departments

VoD Analysis							
All stops				ITP stops			
Race	N	Daylight	Darkness	Race	N	Daylight	Darkness
NW	1,566	53.9%	58.2%	NW	446	56.1%	54.5%
White	1,272	46.1%	41.8%	White	360	43.9%	45.5%
Chi-Square ³ : .038* sig.				Chi-Square ³ : .645 not sig.			
Odds ratio Exp(B) ⁴ : .821* sig.				Odds ratio Exp(B) ⁴ : .999 not sig.			

³Sig. *chi-square* indicates observed pattern in table is real, and not due to chance alone
⁴Odds ratio < 1 indicates NW drivers less likely to be stopped during the day than at night. 1 indicates NW drivers more likely to be stopped during the day than at night. Only "sig." results can be interpreted.

Stop Outcomes by Race							
	Warning	Civil	Criminal	Arrest		Search?	
AA/Black	56.5%	29.0%	12.5%	2.0%	NW	10	N/A
Hispanic	47.1%	31.9%	17.4%	3.5%	White	3	N/A
White	58.6%	32.1%	7.9%	1.3%			
Other	55.4%	35.7%	8.9%	0.0%		Counts	Percent
Chi-Square ³ : .000* sig.							

Comparison

¹Only stops occurring between 4:35am and 7:16am (dawn) or between 4:14pm and 9:02pm (dusk)

Comparative Analyses							
Stops vs. City/Town Demographics				Stops vs. State Average ²			
Motorist Race		City Dem	% Dif	Motorist Race		State Avg	% Dif
AA/Black	17.5%	N/A	N/A	AA/Black	17.5%	15.7%	1.8%
Hispanic	19.6%	N/A	N/A	Hispanic	19.6%	14.7%	4.9%
White	58.0%	N/A	N/A	White	58.0%	65.5%	-7.5%
Other	4.8%	N/A	N/A	Other	4.8%	4.1%	0.7%

²State average represents racial/ethnic breakdown of all 2020 stops by all MA departments

VoD Analysis							
All stops				ITP stops			
Race	N	Daylight	Darkness	Race	N	Daylight	Darkness
NW	66,276	37.1%	50.6%	NW	17,262	40.7%	41.2%
White	91,403	62.9%	49.4%	White	25,009	59.3%	58.8%
Chi-Square ³ :		.000*	sig.	Chi-Square ³ :		.256	not sig.
Odds ratio Exp(B) ⁴ :		.583*	sig.	Odds ratio Exp(B) ⁴ :		.974	not sig.

³sig. chi-square indicates observed pattern in table is real, and not due to chance alone
⁴Odds ratio < 1 indicates NW drivers less likely to be stopped during the day than at night; > 1 indicates NW drivers more likely to be stopped during the day than at night. Only "sig." results can be interpreted

Stop Outcomes by Race							
	Warning	Civil	Criminal	Arrest		Search?	
AA/Black	53.3%	29.4%	13.6%	3.8%	NW	744	57.5%
Hispanic	47.0%	29.9%	18.9%	4.1%	White	551	42.5%
White	55.5%	35.4%	7.1%	2.0%			
Other	55.3%	37.5%	5.5%	1.7%		Counts	Percent
Chi-Square ³ :		.000*	sig.				

Comparison

¹Only stops occurring between 4:35am and 7:16am (dawn) or between 4:14pm and 9:02pm (dusk)

Comparative Analyses							
Stops vs. City/Town Demographics			Stops vs. State Average ²				
Motorist Race	City Dem	% Dif	Motorist Race	State Avg	%Dif		
AA/Black	19.4%	18.0%	1.4%	AA/Black	19.4%	15.7%	3.7%
Hispanic	29.9%	28.3%	1.6%	Hispanic	29.9%	14.7%	15.2%
White	42.5%	43.6%	-1.1%	White	42.5%	65.5%	-23.0%
Other	8.3%	14.0%	-5.7%	Other	8.3%	4.1%	4.2%

²State average represents racial/ethnic breakdown of all 2020 stops by all MA departments

VoD Analysis							
All stops				ITP stops			
Race	N	Daylight	Darkness	Race	N	Daylight	Darkness
NW	357	54.7%	71.5%	NW	92	57.9%	73.2%
White	256	45.3%	28.5%	White	56	42.1%	26.8%
Chi-Square ³ :		.001*	sig.	Chi-Square ³ :		.087	not sig.
Odds ratio Exp(B) ⁴ :		.506*	sig.	Odds ratio Exp(B) ⁴ :		.471	not sig.

³Sig. *chi-square* indicates observed pattern in table is real, and not due to chance alone

⁴*Odds ratio* < 1 indicates NW drivers less likely to be stopped during the day than at night; > 1 indicates NW drivers more likely to be stopped during the day than at night. Only "sig." results can be interpreted.

Stop Outcomes by Race							
	Warning	Civil	Criminal	Arrest		Search?	
AA/Black	50.7%	22.4%	21.6%	5.2%	NW	7	N/A
Hispanic	49.0%	16.0%	27.7%	7.3%	White	5	N/A
White	54.9%	19.1%	23.9%	2.0%			
Other	71.9%	24.6%	3.5%	0.0%		Counts	Percent
Chi-Square ³ :		.000*	sig.				

Comparison

¹Only stops occurring between 4:35am and 7:16am (dawn) or between 4:14pm and 9:02pm (dusk)

Comparative Analyses

Stops vs. City/Town Demographics				Stops vs. State Average ²			
Motorist Race		City Dem	% Dif	Motorist Race		State Avg	% Dif
AA/Black	19.7%	2.7%	17.0%	AA/Black	19.7%	15.7%	4.0%
Hispanic	2.1%	3.6%	-1.5%	Hispanic	2.1%	14.7%	-12.6%
White	77.6%	84.5%	-6.9%	White	77.6%	65.5%	12.1%
Other	0.6%	6.3%	-5.7%	Other	0.6%	4.1%	-3.5%

²State average represents racial/ethnic breakdown of all 2020 stops by all MA departments

VoD Analysis

All stops				ITP stops			
Race	N	Daylight	Darkness	Race	N	Daylight	Darkness
NW	69	22.0%	25.3%	NW	26	25.4%	28.1%
White	230	78.0%	74.7%	White	73	74.6%	71.9%
Chi-Square ³ :		.530	not sig.	Chi-Square ³ :		.771	not sig.
Odds ratio Exp(B) ⁴ :		.745	not sig.	Odds ratio Exp(B) ⁴ :		.607	not sig.

³Sig. *chi-square* indicates observed pattern in table is real, and not due to chance alone

⁴Odds ratio < 1 indicates NW drivers less likely to be stopped during the day than at night; > 1 indicates NW drivers more likely to be stopped during the day than at night. Only "sig." results can be interpreted.

Stop Outcomes by Race

	Warning	Civil	Criminal	Arrest		Search?	
AA/Black	27.4%	18.2%	43.9%	10.6%	NW	1	N/A
Hispanic	28.6%	28.6%	14.3%	28.6%	White	4	N/A
White	34.2%	21.9%	35.8%	8.1%			
Other	50.0%	50.0%	0.0%	0.0%		Counts	Percent
Chi-Square ³ :		.477	not sig.				

Comparison
**STATEWIDE
AVERAGE**

Table 3. Statewide Stop Outcomes by Race/Ethnicity

	Warning	Civil Citation	Criminal Citation	Arrest
African American/Black	59.7%	23.7%	13.5%	3.1%
Hispanic	52.4%	25.8%	18.0%	3.7%
White	63.7%	24.3%	9.6%	2.4%
Other	64.0%	29.5%	5.1%	1.3%
Chi-Square		.000*	sig	

Comparison STATEWIDE AVERAGE

Table 4. Statewide Non-Inventory Searches by Race/Ethnicity

	# of Searches	% Within Race Subject to Search
Non-White	1,718	1.21%
White	2,006	0.74%
Total Searches	3,724	N/A
Chi-Square	.000*	sig

As Table 4 shows, the results indicate that Non-White motorists were more likely to be subjected to a non-inventory, discretionary search. Specifically, the results show that while about .74% of White motorists were subjected to a non-inventory, discretionary search, 1.21% of Non-White motorists were subjected to a non-inventory, discretionary search.

The chi-square test tells us that there appears to be a statistically significant relationship between race/ethnicity of the stopped motorist and whether a non-inventory search is conducted (and that relationship is NOT due to chance alone) but that doesn't mean that the race/ethnicity of the stopped driver is the CAUSE of the search.

ized test, does not provide an estimate of the quantitative extent of racial profiling. As shown in the Appendix, we would have to know that $P(V|d=0) = 1$ and $P(V|d=1) = 0$ to quantify the extent of racial profiling as defined by K_{ideal} . The intuition is simple: Whereas a qualitative test requires only a restriction on the sign of the difference between $P(V|d=0)$ and $P(V|d=1)$, a quantitative measure requires a restriction on the actual magnitudes.

At the same time, Proposition 1 provides conditions under which K_{od} can be used to test the null hypothesis of no racial profiling. Although such a qualitative test may be less informative than a quantitative measure, it is nevertheless an object of considerable importance. Many interest groups and law enforcement agencies have adopted a “zero-tolerance” position on racial profiling, suggesting that they would seek or take remedial action for any value of $K_{\text{ideal}} > 1$ (Williams 2000; U.S. Department of Transportation 2000; American Civil Liberties Union 2003; Dworkowitz 2004; Schwab 2004). Language from the consent decree between the Los Angeles Police Department and the U.S. Justice Department underscores the importance of testing for the null of no racial profiling. According to this decree, “LAPD officers may not use race, color, ethnicity, or national origin (to any extent or degree) in conducting stops or detentions...” [emphasis ours] (Los Angeles Police Department 2000).

The assumptions underlying Proposition 1 merit some discussion. Assumption 1 obviously requires that racial profiling be present. Assumption 2 requires that visibility be lower during darkness than during daylight. This does not require complete race-blindness in darkness nor complete race-visibility during daylight, however. The test would be most powerful, and we would have $K_{\text{od}} = K_{\text{ideal}}$, if d and V were perfectly correlated, but in general this will not be the case.

Some evidence from the literature supports the sign restriction required by assumption 2. For example, Lamberth (2003) described a traffic survey in which the driver’s race could be identified in 95% of the vehicles but for which nighttime observations required auxiliary lighting. Greenwald (2001) canceled plans for evening surveys after his observer could identify the race of only 6% of the drivers viewed around dusk. In general, $P(V|d)$ is unknown, but provided that visibility is lower after dark, assumption 2 should hold.

Assumption 3 requires that relative risks be constant. Put differently, it requires that the race distribution of the at-risk population not change between daylight and dark. Because this assumption is not likely to hold in general, we relax it in the next section by controlling for clock time and limiting the sample to stops carried out during the intertwilight period.

4.3 Generalizing the Test

For a number of reasons, the assumption of constant relative risk is restrictive. One reason for this is that temporal travel patterns may vary by race due to differences in hours of work. If so, then the race distribution of the at-risk population may vary by time of day. Racial differences in police exposure or driving behavior could also cause the relative risks to vary. The

we introduce clock time t into the analysis, we generalize the simple test from Section 4.2 by basing our test for racial profiling on a test of $K(t)$ in the relation

$$\frac{P(S|B, t, d=0)}{P(S|\bar{B}, t, d=0)} = K(t) \frac{P(S|B, t, d=1)}{P(S|\bar{B}, t, d=1)} \quad (5)$$

In the absence of racial profiling, we should find that $K(t) = 1$ for all t . In the presence of racial profiling, we should find $K(t) > 1$, that is, that blacks are at greater relative risk of being stopped during the daylight than during the dark, when (by hypothesis) racial profiling is more difficult.

We proceed as before by applying Bayes’ rule to each of the four probability terms in (5), then solving for the logarithm of $K(t)$ to obtain

$$\begin{aligned} \log K(t) &= \log \frac{P(S|B, t, d=0) P(S|\bar{B}, t, d=1)}{P(S|\bar{B}, t, d=0) P(S|B, t, d=1)} \\ &= \log \frac{P(B|S, t, d=0) P(\bar{B}|S, t, d=1)}{P(\bar{B}|S, t, d=0) P(B|S, t, d=1)} \\ &\quad \times \frac{P(\bar{B}|t, d=0) P(B|t, d=1)}{P(B|t, d=0) P(\bar{B}|t, d=1)}. \end{aligned} \quad (6)$$

To analyze nonreporting, let R be a binary random variable indicating whether the officer reported the stop. We introduce nonreporting in the expression for $\log K(t)$ by means of the probability relation

$$P(B|S, t, d) = \frac{P(B|R, S, t, d) P(R|S, t, d)}{P(R|B, S, t, d)}. \quad (7)$$

Substituting (7) into (6), collecting similar terms, and making use of the fact that $P(\bar{B}|R, S, t, d) = 1 - P(B|R, S, t, d)$, we obtain

$$\begin{aligned} \log K(t) &= \log \frac{P(B|R, S, t, d=0)}{1 - P(B|R, S, t, d=0)} - \log \frac{P(B|R, S, t, d=1)}{1 - P(B|R, S, t, d=1)} \\ &\quad + \log \frac{P(\bar{B}|t, d=0) P(B|t, d=1)}{P(B|t, d=0) P(\bar{B}|t, d=1)} \\ &\quad + \log \frac{P(R|\bar{B}, S, t, d=0) P(R|B, S, t, d=1)}{P(R|\bar{B}, S, t, d=1) P(R|B, S, t, d=0)}. \end{aligned} \quad (8)$$

Equation (8) is the key to the analysis that follows. The probabilities in the first line condition only on reported stops, exactly the data that we observe. We can estimate this line from the observed data using logistic regression in which the dependent variable is a race indicator (black/non-black) with d (the darkness indicator) and t (clock time) as covariates. The logistic regression model estimates the regression $f(d, t)$ from the observed data as

$$\log \frac{P(B|R, S, t, d)}{1 - P(B|R, S, t, d)} = f(t, d). \quad (9)$$

The second line of (8) is then simply $f(t, 0) - f(t, 1)$. If the effect of darkness is additive, then this difference is simply the coefficient on the darkness variable times -1 .



Prince William signaling the birth of his third child.
But imagine this picture from another perspective...

It is important to note that one of the limitations of the driving population estimate is that it may be less accurate at measuring driving populations for jurisdictions where a larger proportion of drivers travel over 30 minutes to work, shop or recreate in that community. This limitation would be particularly important when examining the data for jurisdictions that experience heavy driving volume of tourists for example that is demographically different from their resident drivers.

Research on transportation has long shown that people will drive further if attractive features such as shopping, employment or entertainment exist in the target city.¹⁷ For example, the DPE model assumes that if distances were equal a driver is more likely to go to a city with some economic draw (e.g.: shopping, employment, entertainment) than a city without such draws

Why do **Community Characteristics** matter?

2004 vs Now (Driving Pop. Estimate vs VoD)

2004 vs Now (Driving Pop. Estimate vs VoD) Why do community characteristics matter?

Instructions on Reading Summary Tables

Overall Summary Table

The overall summary table summarizes the disparities found across multiple categories for each summary measure. For each agency an "*" is placed in each categories if the level of disparity falls above the specified threshold for that category. If no analysis could be conducted for that agency due to missing or insufficient data the category is marked with a "-." If disparities fall above the specified threshold for any category within a summary measure an "X" is placed at the end of that summary measure. The jurisdictions listed in this table are grouped alphabetically by the total number of summary measures in which that jurisdiction was found to have a disparity.

Summary Measure 1: Residents Cited Compared to the Residential Population

Threshold for disparities marked with * = above the statewide median.

- Disparities in Non-White vs. White Resident Citations Compared to the Residential Population.
- Disparities in Black vs. White Resident Citations Compared to the Residential Population.
- Disparities in Hispanic vs. White Resident Citations Compared to the Residential Population.
- Disparities in Non-White Male vs. White Male Resident Citations Compared to the Residential Population.

Summary Measure 2: All Citations Compared to the Driving Population Estimate

Threshold for disparities marked with * = above the statewide median.

- Disparities in Non-White vs. White Citations Compared to the Driving Population Estimate.
- Disparities in Black vs. White Citations Compared to the Driving Population Estimate.
- Disparities in Hispanic vs. White Citations Compared to the Driving Population Estimate.

Summary Measure 3: Searches

Threshold for disparities marked by * = statistically significant disparities.

IC indicates that departments had an insufficient number of searched upon which reliable analysis of disparities could be conducted.

- Disparities in Non-White Search Rates vs. White Search Rates
- Disparities in Black Search Rates vs. White Search Rates
- Disparities in Hispanic Search Rates vs. White Search Rates
- Disparities in Non-White Male Search Rates vs. White Male Search Rates

Summary Measure 4: Citations vs. Warnings

Threshold for disparities marked by * = statistically significant disparities.

- Disparities in Non-White Citation Rates vs. White Citation Rates
- Disparities in Black Citation Rates vs. White Citation Rates
- Disparities in Hispanic Citation Rates vs. White Citation Rates
- Disparities in Non-White Male Citation Rates vs. White Male Citation Rates

2004 vs Now (Driving Pop. Estimate vs VoD) Why do community characteristics matter?

Hadley had 1 total disparity.

207 Cities & Towns showed same disparity.

185 of those 207 Cities & Towns had more than one disparity.

We stop 26% more people now, total, NW and White than in the 2004 study.

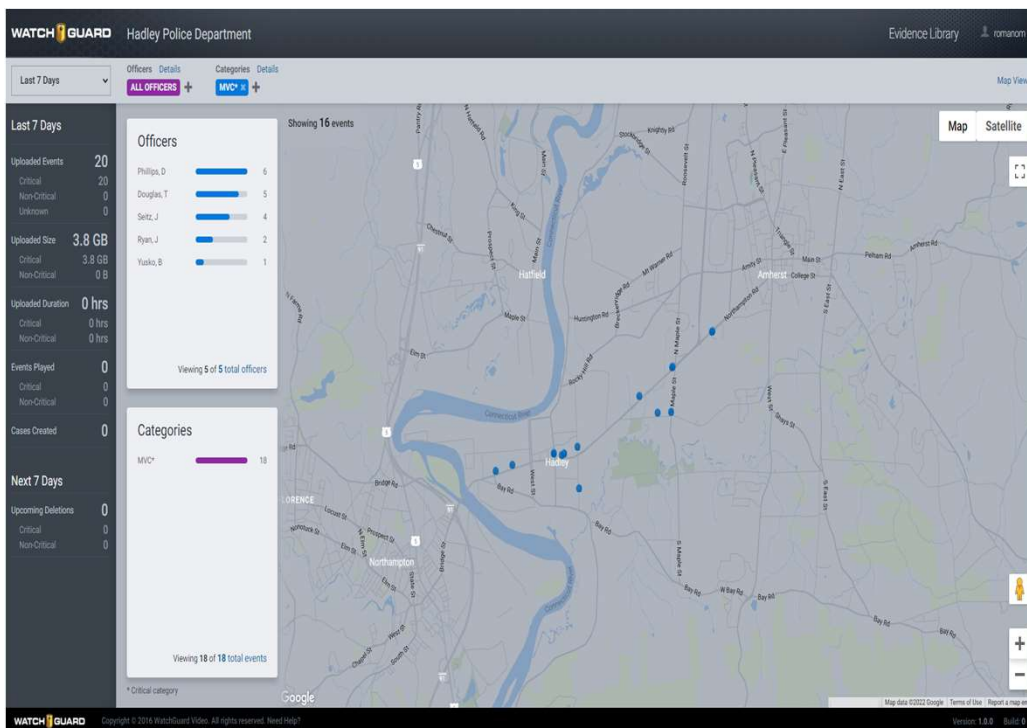
Summary Table	1. Resident Citations				2. Driving Population				3. Search Disparities					4. Citations vs. Warnings				Overall
	Non-White	Black	Hispanic	NW Male	Non-White	Black	Hispanic	Non-White	Black	Hispanic	NW Male	NW no arrest	Non-White	Black	Hispanic	NW Male		
Agencies with Disparity																		
Goshen					*	*	X	-	-	-	-	-	-	-	-	-		
Granby					*	*	*	X	-	-	-	-	-	-	-	-		
Granville						*		X	-	-	-	-	-	-	-	-		
Greenfield	*			X					-	-	-	-	-	-	-	-		
Groveland					*		*	X	-	-	-	-	-	-	-	-		
Hadley					*	*	*	X	-	-	-	-	-	-	-	-		
Hampden						*		X	-	-	-	-	-	-	-	-		
Heath					*		*	X	-	-	-	-	-	-	-	-		

Comparative Analyses							
Stops vs. City/Town Demographics				Stops vs. State Average ²			
Motorist Race	City Dem	% Dif		Motorist Race	State Avg	% Dif	
AA/Black	10.1%	7.9%	2.2%	AA/Black	10.1%	15.7%	-5.6%
Hispanic	5.0%	2.3%	2.7%	Hispanic	5.0%	14.7%	-9.7%
White	80.1%	84.6%	-4.5%	White	80.1%	65.5%	14.6%
Other	4.9%	5.7%	-0.8%	Other	4.9%	4.1%	0.8%
² State average represents racial/ethnic breakdown of all 2020 stops by all MA departments							
VoD Analysis							
All stops				ITP stops			
Race	N	Daylight	Darkness	Race	N	Daylight	Darkness
NW	168	19.2%	21.9%	NW	47	20.6%	8.2%
White	646	80.8%	78.1%	White	262	79.4%	91.8%
Chi-Square ³ : .328 not sig.				Chi-Square ³ : .003* sig.			
Odds ratio Exp(B) ⁴ : .874 not sig.				Odds ratio Exp(B) ⁴ : 3.445* sig.			
³ Sig. chi-square indicates observed pattern in table is real, and not due to chance alone							
⁴ Odds ratio < 1 indicates NW drivers less likely to be stopped during the day than at night; > 1 indicates NW drivers more likely to be stopped during the day than at night. Only "sig." results can be interpreted.							
Stop Outcomes by Race							
	Warning	Civil	Criminal	Arrest	Search?		
AA/Black	53.9%	20.2%	24.7%	1.1%	NW	1	N/A
Hispanic	56.8%	13.6%	27.3%	2.3%	White	6	N/A
White	60.6%	21.9%	13.7%	3.8%			
Other	74.4%	16.3%	4.7%	4.7%		Counts	Percent
Chi-Square ³ : .019* sig.							

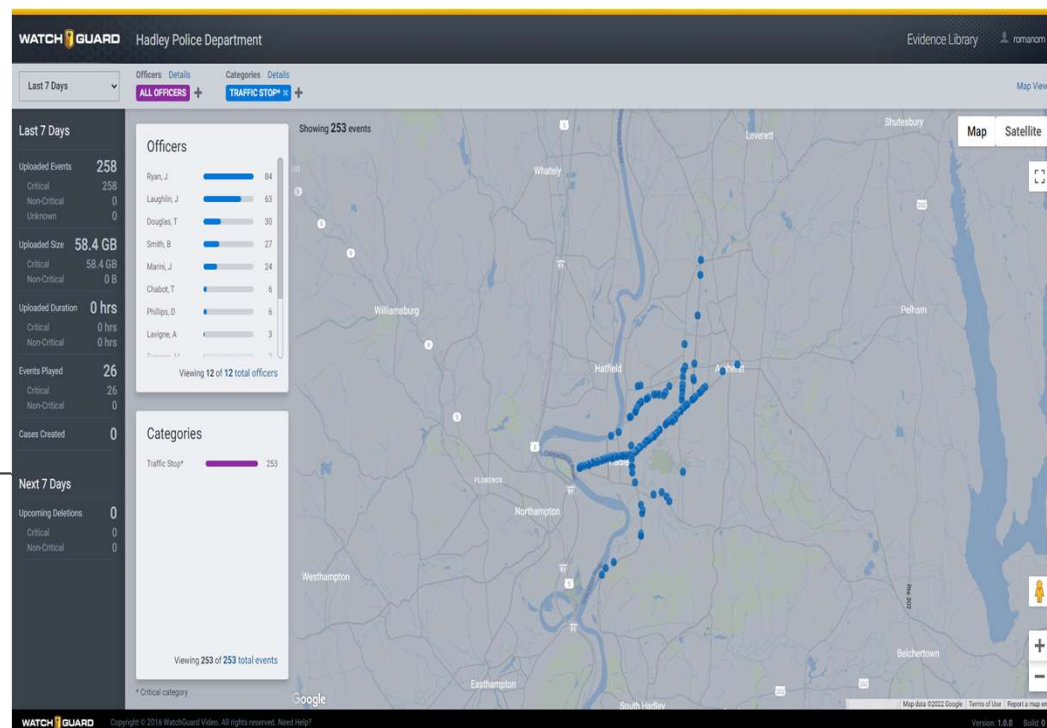


Motor Vehicle Crashes vs. Traffic Stops Over 7 Days

February 17th, 2021, through February 24th, 2021



Motor Vehicle Crashes

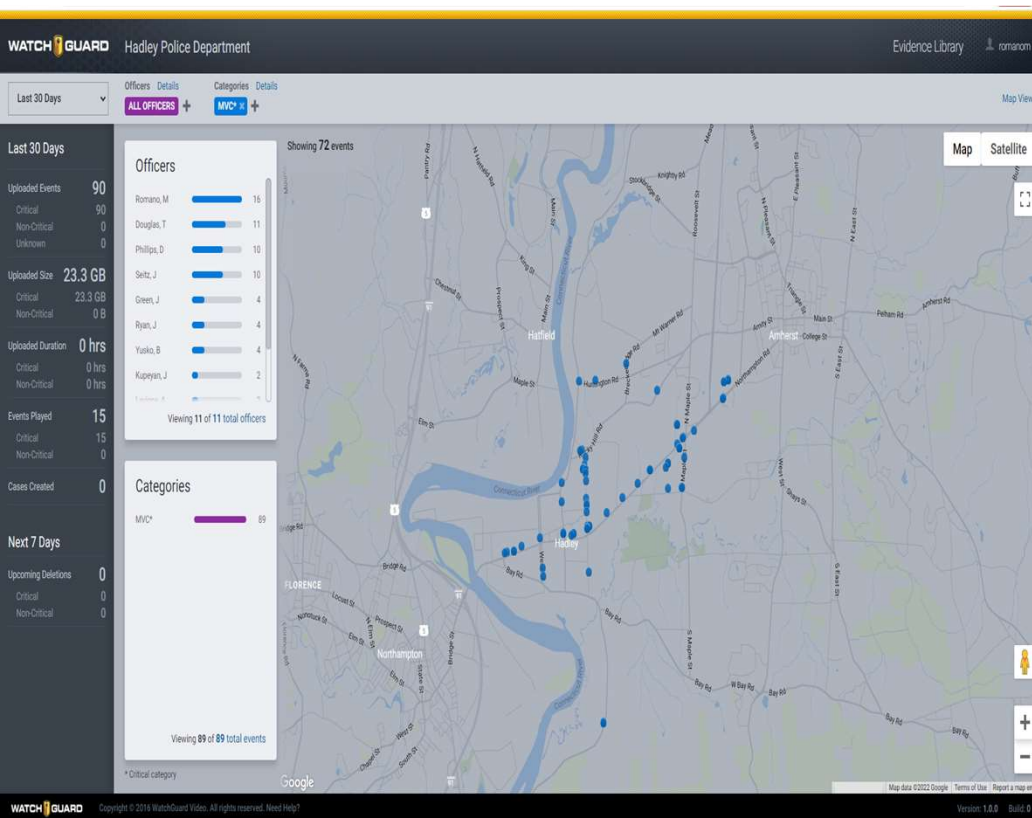


Motor Vehicle Stops

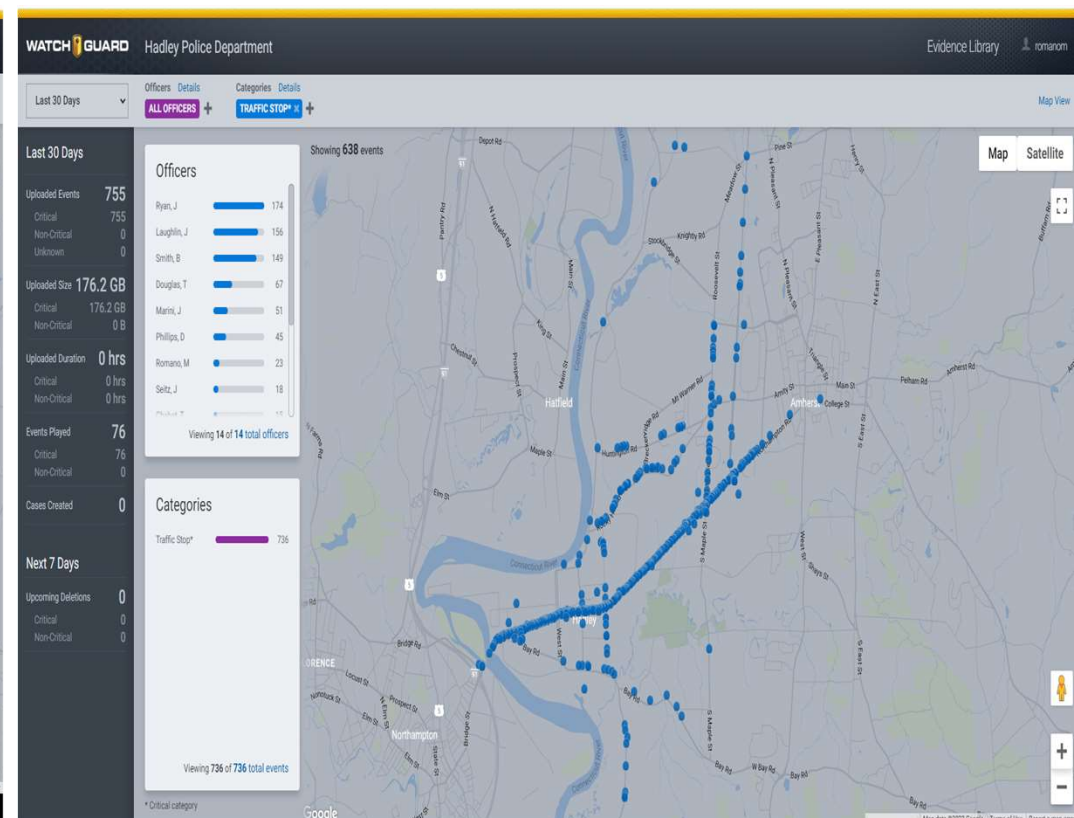


Motor Vehicle Crashes vs. Traffic Stops Over One Month

January 26th, 2021, through February 24th, 2021



Motor Vehicle Crashes

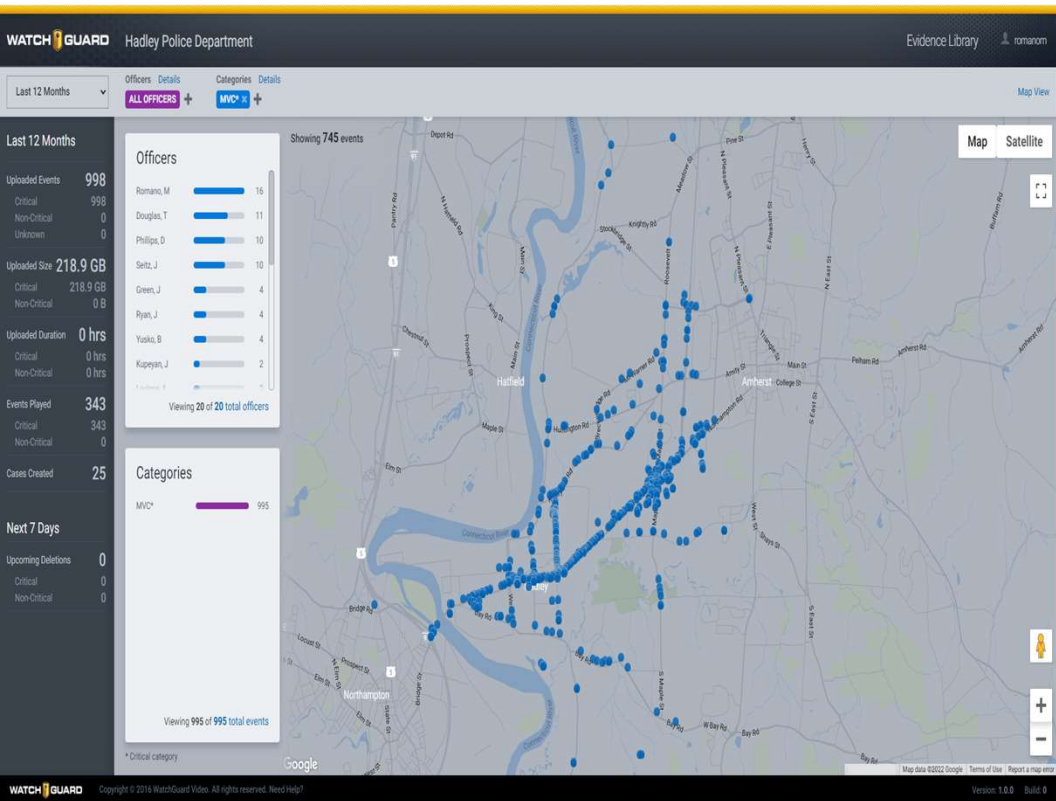


Motor Vehicle Stops

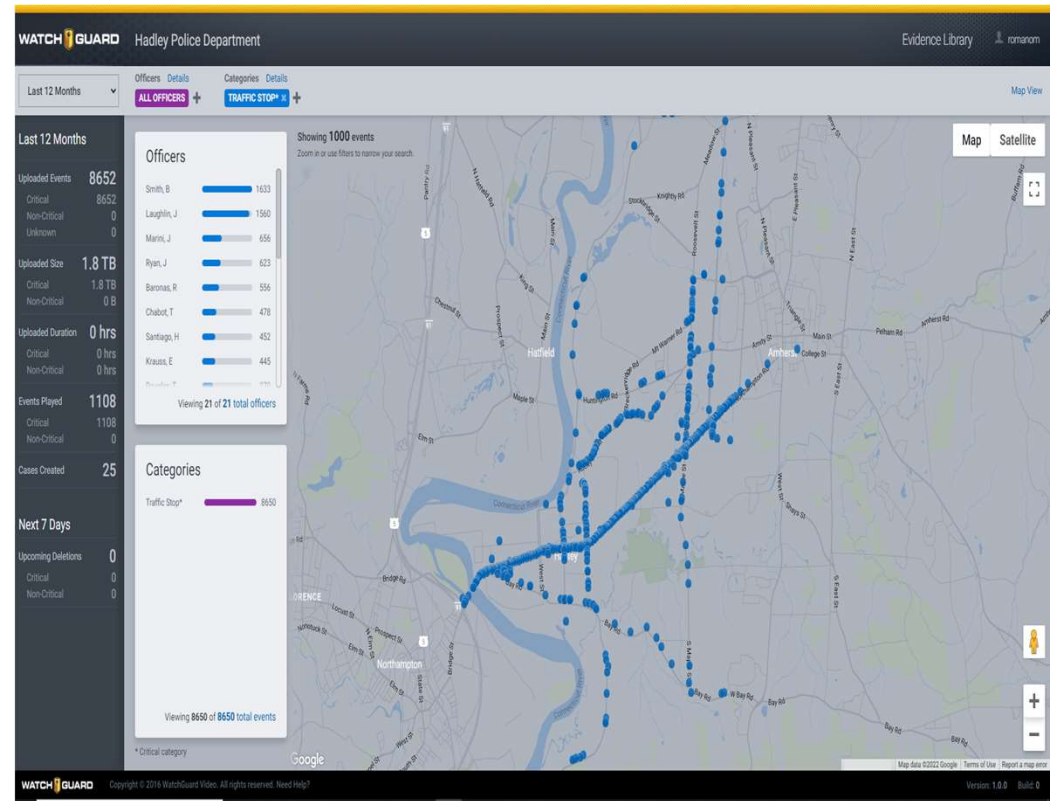


Motor Vehicle Crashes vs. Traffic Stops over One Year

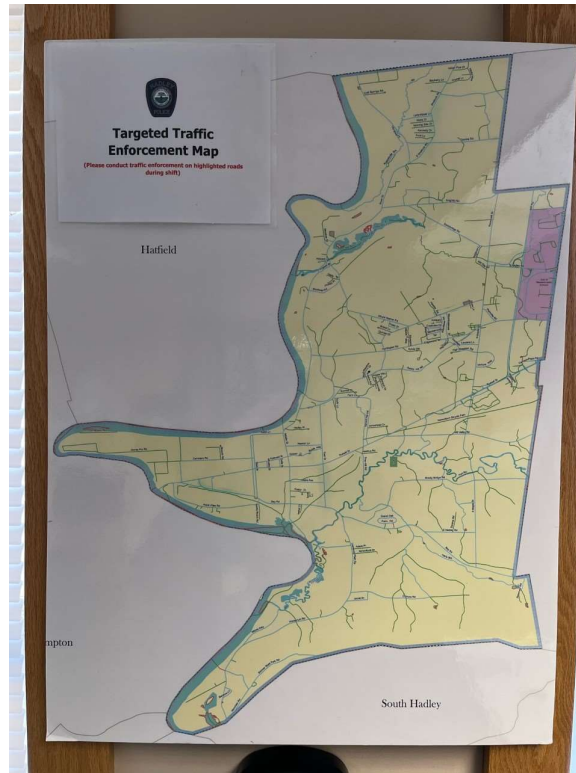
February 24th, 2021, through February 24th, 2022



Motor Vehicle Crashes



Motor Vehicle Stops



- All six traffic measuring devices used by HPD collect useable data (average speed, highest speed, times, dates, traffic volume, photos of highest speed offender vehicles, etc.) that is used to direct enforcement efforts
- Targeted Traffic Enforcement Map is used to direct officers to locations of needed enforcement in town.
- Residents are also encouraged to file traffic complaints on town website, which is another means to target traffic enforcement





HADLEY ACTUAL STOP DATA

- Steps Taken
- Stop Data Replication (because the state will not give us our own data)
- Individual Stop Analysis



▼
HADLEY
ACTUAL
STOP DATA

Steps to analyze questioned stops;

1. Determine the “included” and “light” stops
2. Determine where actual enforcement is taken (where the motorist has a fine to pay, or court)
3. Analyze each stop to determine leniency (summons where arrest was possible, reduction in fines)

HADLEY ACTUAL STOP DATA

- Included Light Stops- 39 (two citations are issued to the same motorist)
- 3.9 stops per month on average.
- 35 of 39 stops include **Speeding or Moving Violations** (not “discretionary” stops)
- 26 resulted in **Warnings**
- 10 Different Officers (13 total)

T2293546	387 7:07am	#####	5:22am	Included	Light	Speeding/Passing	Civil	
T1738539	396 6:53am	#####	5:20am	Included	Light	Speeding/Susp	Crim App	
T2293548	387 5:53am	#####	5:18am	included	Light	Speeding	Civil	
T1739880	367 5:51am	#####	5:13am	Included	Light	Speeding	Warning	
T2293552	387 6:01am	#####	5:13am	Included	Light	Speed/Inspect	Civil	
T2293554	387 05:52am	#####	5:14am	Included	Light	Speeding	Warning	
T2293662	387 6:24am	#####	5:42am	Included	Light	Speed/Neg Op	Criminal	
T1738462	393 6:22am	#####	5:45am	Included	Light	Red/Light/Susp	Criminal	
T1738465	393 6:38am	#####	5:48am	Included	Light	Speed	Civil	
T2293665	387 6:32am	#####	5:48am	Included	Light	Speed	Civil	
T1738506	389 4:29pm	#####	5:43pm	Included	Light	Speeding	Warning	
T1739517	349 4:33pm	#####	5:47pm	Included	Light	Speeding	Warning	
T2293518	387 4:23pm	#####	6:53pm	Included	Light	Speeding	Warning	
T2293754	389 4:47pm	#####	6:55pm	Included	Light	Speeding	Warning	
T2293759	389 6:22pm	#####	7:59pm	Included	Light	Speeding	Warning	
T2293760	389 5:54pm	#####	8:00pm	Included	Light	Wrong Way	Warning	
T1738218	392 5:53pm	#####	8:12pm	Included	Light	Failure to Stop	Warning	
T1738220	392 6:55pm	#####	8:12pm	Included	Light	Speeding	Warning	
T2293565	392 6:29pm	#####	8:14pm	Included	Light	Speeding	Warning	
T1738331	350 5:57pm	#####	8:17pm	Included	Light	Speeding	Warning	
T2293909	388 5:58pm	#####	8:31pm	Included	Light	Failure to Stop	Warning	
T2293531	389 4:34pm	#####	8:33pm	Included	Light	Speeding	Warning	
T2293534	389 5:36pm	#####	8:28pm	Included	Light	Speeding	Warning	
T2293916	388 7:33pm	#####	8:25pm	Included	Light	Speeding	Warning	
T2293917	388 7:46pm	#####	8:25pm	Included	Light	Speeding/Open c	Civil	
T2293536	389 4:39pm	#####	8:24pm	Included	Light	Speeding	Warning	
T2293847	392 7:23pm	#####	8:14pm	Included	Light	Speeding	Warning	
T2293850	392 7:29pm	#####	8:12pm	Included	Light	Speeding	Warning	
T2293924	388 4:45pm	#####	8:06pm	Included	Light	Unreg/Inspect	Warning	
T2293863	389 4:26pm	#####	8:05pm	Included	Light	Speeding/Unreg	Warning	
T2293934	388 4:27pm	#####	7:41pm	Included	Light	Speeding	Warning	
T1739527	390 6:17pm	#####	7:33pm	Included	Light	Unreg/Marked	Arrest	Same
T1739526	390 6:17pm	#####	7:33pm	Included	Light	Suspended	Arrest	Stop
T1738338	350 4:22pm	#####	7:16pm	Included	Light	Speeding	Warning	
T1738339	350 5:27pm	#####	6:55pm	Included	Light	Speeding	Warning	
T2293898	388 4:42pm	#####	6:39pm	Included	Light	Suspended/Unins	Criminal	
T2293899	388 5:38pm	#####	6:31pm	Included	Light	Speed/Fail to stop	Civil	
T2292902	388 5:19pm	#####	6:27pm	Included	Light	Speeding	Warning	
T2292911	388 5:25pm	#####	5:57pm	Included	Light	Insp/Plate	Warning	
T2292791	389 4:56pm	#####	4:27pm	Included	Light	Unlic	Criminal	

T2293546	387 7:07am	#####	5:22am	Included	Light	Speeding/Passing	Civil	
T1738539	396 6:53am	#####	5:20am	Included	Light	Speeding/Susp	Crim App	
T2293548	387 5:53am	#####	5:18am	included	Light	Speeding	Civil	
T2293552	387 6:01am	#####	5:13am	Included	Light	Speed/Inspect	Civil	
T2293662	387 6:24am	#####	5:42am	Included	Light	Speed/Neg Op	Criminal	
T1738462	393 6:22am	#####	5:45am	Included	Light	Red/Light/Susp	Criminal	
T1738465	393 6:38am	#####	5:48am	Included	Light	Speed	Civil	
T2293665	387 6:32am	#####	5:48am	Included	Light	Speed	Civil	
T2293917	388 7:46pm	#####	8:25pm	Included	Light	Speeding/Open c	Civil	
T1739527	390 6:17pm	#####	7:33pm	Included	Light	Unreg/Marked	Arrest	Same
T1739526	390 6:17pm	#####	7:33pm	Included	Light	Suspended	Arrest	Stop
T2293898	388 4:42pm	#####	6:39pm	Included	Light	Suspended/Unins	Criminal	
T2293899	388 5:38pm	#####	6:31pm	Included	Light	Speed/Fail to stop	Civil	
T2292791	389 4:56pm	#####	4:27pm	Included	Light	Unlic	Criminal	

HADLEY ACTUAL STOP DATA

- 13 Motorists had actual enforcement taken against them.

T1738539	396 6:53am	#####	5:20am	Included	Light	Speeding/Susp	Crim App	Summons instead of arrest
T2293548	387 5:53am	#####	5:18am	included	Light	Speeding	Civil	Reduced fine
T2293552	387 6:01am	#####	5:13am	Included	Light	Speed/Inspect	Civil	Citation for Inspec, Warn for speed
T2293662	387 6:24am	#####	5:42am	Included	Light	Speed/Neg Op	Crim	Summons instead of arrest
T1738462	393 6:22am	#####	5:45am	Included	Light	Suspended	Crim	Summons instead of arrest
T1738465	393 6:38am	#####	5:48am	Included	Light	Speed	Civil	Cite for seatbelt, warn for speed
T2293665	387 6:32am	#####	5:48am	Included	Light	Speed	Civil	Reduced fine, 190 to 105
T2293917	388 7:46pm	#####	8:25pm	Included	Light	Speeding/Open c	Civil	Reduced fine, warning for open container marij
T2293898	388 4:42pm	#####	6:39pm	Included	Light	Suspended/Unins	Crim	Summons instead of arrest
T2293899	388 5:38pm	#####	6:31pm	Included	Light	Speed/Fail to stop	Civil	Cite for turn signal, warn for speed
T2292791	389 4:56pm	#####	4:27pm	Included	Light	Unlic	Crim	Summons instead of arrest

HADLEY ACTUAL STOP DATA

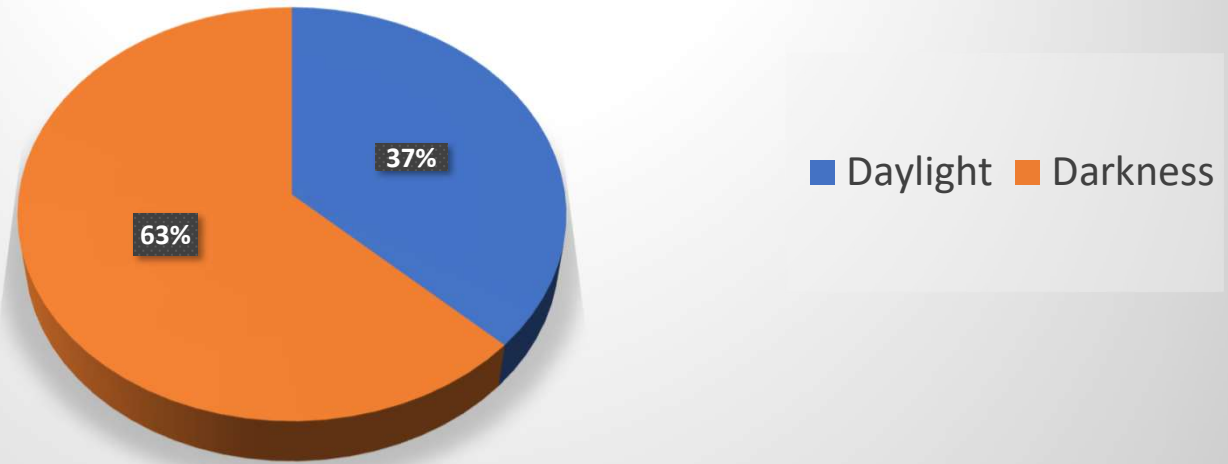
- 11 of the 13 Motorists received stepped down, or reduced enforcement.
- Ex.- Summons instead of arrest, Reduced Fines

HADLEY ACTUAL STOP DATA

T2293546	3877:07am	#####	5:22am	Included	Light	Speeding/Passing	Civil	
T1739527	3906:17pm	#####	7:33pm	Included	Light	Unreg/Marked	Arrest	Same
T1739526	3906:17pm	#####	7:33pm	Included	Light	Suspended	Arrest	Stop

- Two of 39 motorists did not receive stepped-down enforcement or reductions.
- One Motorist had attached plates from another vehicle onto an uninsured and unregistered vehicle and had a suspended license.
- Second Motorist was observed making numerous violations by an off-duty officer and was mailed a citation.
- **If the officers are acting with bias, why these results?**

Non-White Stops, Daylight vs. Darkness



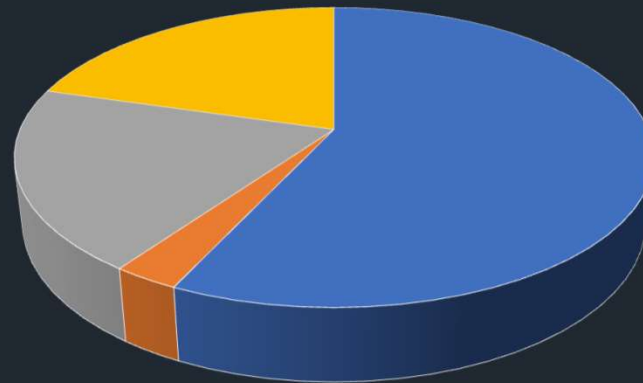
HADLEY ACTUAL STOP DATA

All Non-White:

- Hadley Total- 247 Citations (vs. the state's 168)
- Daylight- 92 (37.2%)
- Darkness- 157 (63.5%)

HADLEY ACTUAL STOP DATA

All NW Stops, Enforcement Action



- Warnings 56.2%
- Arrest 2.8%
- Civil 19.4%
- Summons 20.2%

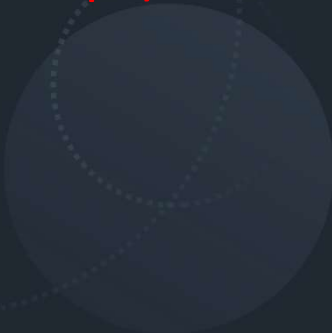
All Non-White Stops:

- Almost 60% Warnings
- 42 of 50 Summons were for arrestable offenses
- Of 5 Arrests, 4 were for OUI
- Of 48 civil, 25 were “step down”, of which five were stepped down from arrestable offenses



HADLEY ACTUAL STOP DATA

All Non-White Stops (Reasons for Stops):

- Speeding, 148
 - Red Light/ Stop Sign, 13
 - Other Moving-15
- 



Actual Stops vs. VoD Theory

Implicit and Unconscious biases are REAL.

We acknowledge that biases exist in everyone, but for VoD to be valid, we must know that the officers are LOOKING AT and able to SEE motorists.

3 cruiser camera videos to follow:







Recommendations to improve study and follow-up investigation

- Veil of Darkness looks through the lens of Bias. Find a study which doesn't require ASSUMPTIONS to be made before interpreting the data.
- Use some form of Driving Population Estimate (DPE) study to increase the odds of disparate data meaning something to the casual reader.
- If departments are “flagged” in any area, request deeper data before announcing completion of the study.
 - Request total outcome data
 - Request random cruiser camera video's (if using VoD study)
 - Request data on traffic volume, demographics, and any complaints received directly relating to Bias.

