

## **Traffic Stop Data Analysis & Findings in Massachusetts, 2021 & 2022**

### **EXECUTIVE SUMMARY**

#### **About This Report**

The Massachusetts legislature passed Chapter 122 of the Acts of 2019, *An Act Requiring the Hands-Free Use of Mobile Telephones While Driving* (“the Act” or “the Hands Free Driving Law”), which prohibits operators of motor vehicles from using any electronic device, including mobile telephones, unless the device is used in hands-free mode. The law took effect on February 23, 2020 and the intent is to reduce crashes by identifying and limiting the number of distracted drivers on the public roadways in the Commonwealth (An Act Requiring the Hands-Free Use of Mobile Telephones While Driving, 2019).

As part of the law, all law enforcement agencies in Massachusetts are required to collect data from all written Uniform Citations issued<sup>3</sup>, including demographic information about the stopped motorist (gender, age, race/ethnicity) and information about the stop and resulting citation (the traffic infraction, the date and time of the offense, the municipality in which the offense was committed, whether a search was initiated during the stop, and whether the stop resulted in a warning, citation, or arrest). On an annual basis, this data must be analyzed, and a report of the findings published online.

Using data on traffic citations in 2021 and 2022, this report is a follow-up to the 2020 report. In comparison to 2020, the number of citations increased significantly in 2021 and 2022,

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<sup>3</sup>Traffic stops not resulting in a written Uniform Citation (i.e., verbal warnings) are excluded from the law’s requirements and therefore, not analyzed in this report.

post-COVID. Therefore, more departments met a minimum threshold of 100 citations<sup>4</sup> to be analyzed for each year.

The current study analyzes traffic stop/citation<sup>5</sup> data collected in Massachusetts during a two-year period from January 1, 2021, through December 31, 2022, for the Commonwealth as a whole and by municipality. In total, 1,270,129 unique traffic stops conducted during the 2-year period were analyzed, resulting in a total of 1,358,720 citations. Separate analyses were conducted for 2021 and 2022; results for each year are discussed separately in the sections that follow. The overall goal of this study is to learn more about potential patterns of racial disparities in traffic stops for the purpose of understanding the causes of these disparities.

We first discuss our methodological approach, including a description of the variables available for analysis, the unit of analysis for each method, and the types of analyses used in both the statewide evaluation and the department-level evaluations for each year. The current study utilizes multiple types of descriptive and associative statistical analyses. For the statewide study, we utilized three different analytical tools. For each department-level analysis, we utilized five different analytical tools or measures of disparity. The first three analytical tools examine potential racial disparities in the decision to stop. The last two examine potential racial disparities in post-stop outcomes, including the decision to issue a warning or a citation and the decision to conduct a search.

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<sup>4</sup>A minimum threshold of 100 citations was selected to ensure robust and valid statistical analyses.

<sup>5</sup>The analyses presented in this report differentiate between unique stops and citations; a single stop, for instance, may result in multiple citations written for the same motorist during one stop event. See “Unit of Analysis for Different Methods” section below in body of report for additional details.

One analytical tool utilized is the Veil of Darkness (VoD), which uses changes in natural light to assess disparate treatment in traffic stops. The VoD analysis compares stops made during the day when it is light to those made at night when it is dark to test for disparities when officers can more easily determine the race/ethnicity of the driver. The underlying assumption is that if law enforcement officers are profiling motorists, they are better able to do so during the daylight hours when race/ethnicity is more visible and easily observed. Separate VoD analyses are performed for stops occurring throughout the day and stops occurring *only* during the intertwilight period (ITP)<sup>6</sup>, a set window of time during which light conditions naturally fluctuate over the course of a year (i.e., conditions at 7:00p.m. EST are dark in November, but light in July).

Beyond Veil of Darkness analysis, the report summarizes the demographic and contextual characteristics of stop events and cited motorists in the Commonwealth overall (presented in report) and in individual department-level analyses for each data collection period (2021 and 2022). While we do not discuss each department's results in detail in this report, department-level analyses were conducted for *each* law enforcement agency that had a minimum of 100 citations. In total, about 364 of the 445 agencies/agency sub-divisions<sup>7</sup> (or 81.8%) had 100 or more citations during 2021 and about 370 of the 460 agencies/agency sub-divisions (or 80.4%) had 100 or more citations in 2022. Each department's report can be found listed in alphabetical order in Appendix C.

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<sup>6</sup>See "Veil of Darkness Analysis (VoD)" section below in body of report for additional details on the intertwilight period (ITP) and justifications for its use as a natural control for more robust and valid study results.

<sup>7</sup> Data for the Boston Police Department and Massachusetts State Police are further broken down (and analyzed) by district/troop sub-divisions, respectively.

The report concludes with a summary of the major findings, followed by a discussion of the strengths and limitations of the data and some recommendations to improve the data and analytical approaches for future reports.

## **Major Findings (2021)**

### Characteristics of the Statewide Traffic Stop Data<sup>8</sup>

#### *Information About the Stops*

- There were a total of 594,213 motor vehicle stops, resulting in 637,605 citations during 2021 by a total of 445 agencies/agency sub-divisions including municipal police departments, the Massachusetts State Police, and a small number of other state law enforcement agencies (e.g., state university, Environmental, and MBTA Police).
- About 64% of the traffic stops were conducted by the municipal police departments and 36% of the total stops were conducted by the Massachusetts State Police and other state agencies.
- About 10.6% of stops occurred from 12:00 a.m. - 6:00 a.m., 29.5% of stops occurred from 6:01 a.m. - 12:00 p.m., 35% of stops occurred between 12:01 p.m. - 6:00 p.m. and the remaining 25% of stops occurred between 6:01 p.m. and 11:59 p.m.
- The total number of stops per month varied from a high of 61,403 in April 2021 to a low of 34,592 in February 2021. The average stops per day varied from a low of 1,235.42 stops per day in February 2021 to a high of 2,046.76 stops per day in April 2021.

#### *Demographics of Stopped Motorists*

- Regarding the gender of stopped drivers in Massachusetts during this period, 63.9% were male, 36% were female, and about 1/10 of 1% were non-binary.
- The mean age of stopped drivers was about 37 years old.
- About 37.6% of stopped drivers were 29 years old or younger and the remaining 62.4% were 30 years old or older.

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<sup>8</sup>Statewide analysis includes stops/citations from all agencies, including those with fewer than 100 citations.

- About 14.4% of stopped drivers in the state were African American/Black, 14.5% were Hispanic, 66.4% were White, and 4.6% were Other (Asian, Asian Pacific, American Indian, Middle Eastern or Pacific Islander).
- Nearly 69.7% of motor vehicle stops were not residents of the jurisdiction where the stop occurred. Additionally, 91.1% of stops were of Massachusetts drivers while the remaining 8.9% of stops were of out-of-state drivers.

## Major Findings of the Statewide Analyses

### *Veil of Darkness Analysis (VoD): Statewide Analysis for All Stops*

- The chi-square test for all Massachusetts stops (n = 594,213) was statistically significant, which is taken as evidence there is a relationship between the odds of a Non-White motorist (a motorist who is African American/Black, Hispanic, or Other race) being stopped during the day as compared to darkness (as well as a relationship between the odds of a White motorist being stopped during the day as compared to darkness). The results of this test for all stops indicates that White motorists are *more often* stopped in daylight than in darkness whereas Non-White motorists are *less often* stopped in daylight than in darkness.
- In the VoD logistic regression for all stops<sup>9</sup> statewide (n = 594,213), the VoD variable representing light/dark conditions at time of stop was also statistically significant in its relationship to the dependent variable of Non-White stops. Specifically, the odds ratio was .637. This means the odds of a daylight stop for Non-White motorists are 36% lower than the odds of a darkness stop. For this analysis, no support was shown for a pattern of racial disparity in total Massachusetts stops.

### *Veil of Darkness Analysis (VoD): Statewide Analysis for Intertwilight Period (ITP) Stops Only*

- The chi-square test for all Massachusetts ITP stops (n = 191,831) was also statistically significant, which is taken as evidence that there is a relationship between the odds of a Non-White motorist (a motorist who is African American/Black, Hispanic, or Other race) being stopped during the day as compared to darkness. The results indicate that Non-White motorists were slightly more often stopped in darkness as compared to daylight and White motorists were slightly more often stopped in daylight than in darkness.
- In the VoD logistic regression for ITP stops only statewide (n = 191,831), the VoD variable representing light/dark conditions at time of stop was statistically significant in

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<sup>9</sup>VoD analysis examining all stops may be considered less robust than analyses of the restricted intertwilight period (ITP) sub-sample.

its relationship to the dependent variable of Non-White stops. Specifically, the odds ratio was .852. This means the odds of a daylight stop for Non-White motorists are 15% lower than the odds of a darkness stop. For the ITP analysis, no support was shown for a pattern of racial disparity in total Massachusetts stops.

### *Test for Disparities in Outcomes of Traffic Stops*

- The results indicate that motorists in the Other race category (Asian, Asian Pacific, American Indian, Middle Eastern or Pacific Islander) are most likely to receive a warning, followed by White motorists. Conversely, Hispanic motorists, followed by African American/Black motorists are least likely to receive a warning.
- When it comes to receiving a *civil* citation, motorists in the Other race category were most likely to receive a civil citation, followed by Hispanic motorists. White motorists were least likely to receive a civil citation, followed by African American/Black motorists.
- When it comes to receiving a *criminal* citation, Hispanic motorists, followed by African American/Black motorists are most likely to receive a criminal citation whereas motorists in the Other race category, followed by White motorists were least likely to receive a criminal citation.
- When examining arrests by race/ethnicity, Hispanic motorists were most likely to be arrested, followed by Black motorists. Conversely, motorists in the Other race category were least likely to be arrested, followed by White motorists.
- The chi-square test was statistically significant, which is taken as evidence that there is a relationship between race/ethnicity of the stopped motorist and the outcome of the stop (whether a motorist received a warning, citation, or is arrested). Although the chi square test tells us that there appears to be a statistically significant relationship between race/ethnicity of the stopped motorist and the outcome of the stop (and that relationship is NOT due to chance alone), that does not mean that the race/ethnicity of the stopped driver caused the specific stop outcomes. There is a lot we don't know about the circumstances of the stop that could justifiably influence the outcome of the stop.

### *Tests for Disparities in the Decision to Search*

- Less than 1% of traffic stops statewide resulted in a discretionary, non-inventory search<sup>10</sup> (n = 5,157). Due to the small number of non-inventory searches that were

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<sup>10</sup>An inventory search is a search conducted following police department policy when a vehicle is seized. If the police tow the car they will search and make an inventory of the contents. A non-inventory search represents all other discretionary (consent, plain view, etc.) searches that occur at the time of the traffic stop. See Massachusetts RMV codebook.

conducted *and* the fact that we are not able to determine the initial reason for the stop, caution should be used in interpreting these results, especially for agencies that had very small numbers of searches.

- The results indicate that Non-White motorists (a motorist who is African American/Black, Hispanic, or Other race) were more likely to be subjected to a non-inventory, discretionary search. Specifically, the results show that while about .70% of White motorists were subjected to a non-inventory, discretionary search, 1.09% 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 does not mean that the race/ethnicity of the stopped driver is the CAUSE of the search.

#### Major Findings of the Department-Level Analyses

- Department-level analyses were conducted for law enforcement agencies that had 100 or more citations during the 12-month data collection period. In total, 364 of the 445 (or 81.8%) agencies/agency sub-divisions who conducted traffic stops in 2021 had 100 or more citations.
- For the Veil of Darkness (VoD) analyses of the decision to stop, binary logistic regression<sup>11</sup> results showed that a total of 5 departments had odds ratios indicating the odds of stopping a Non-White driver (a motorist who is African American/Black, Hispanic, or Other race) were higher during the day than they were at night.
- The results of the VoD analysis for all stops<sup>12</sup> showed that two departments (Chelsea Police Department, Rochester Police Department) had odds ratios that indicated the odds of stopping a Non-White driver were higher during the day than they were at night.
- Binary logistic regression results of the VoD analysis for ITP stops only showed that three departments (Southwick Police Department, Westwood Police Department, Massachusetts State Police Troop C-4) had odds ratios that indicated the odds of stopping a Non-White driver were higher during the day than they were at night.

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<sup>11</sup>The technique of binary logistic regression and interpretation of odds ratios are discussed in greater detail in the “Veil of Darkness (VoD) Analysis” section below.

<sup>12</sup>VoD analysis examining all stops may be considered less robust than analyses of the restricted intertwillight period (ITP) sub-sample.

We caution that these findings DO NOT prove that any of the listed departments are engaging in racial profiling; there are many explanations for racial disparities in traffic enforcement other than officer bias. These findings simply serve as a starting point for further discussion and reflection.

Additionally, stakeholders are encouraged to consider the other key measures provided in individual department data sheets (and not VoD alone) when starting conversation(s) about racial profiling, acceptable thresholds, and appropriate solutions and responses. VoD is one way of studying the *decision to stop*, but patterns evident in outcomes (warnings, civil, criminal, arrest citations) and searches vary significantly across agencies and are important to examine in detail, case-by-case as well.

## Major Findings (2022)

### Characteristics of the Statewide Traffic Stop Data<sup>13</sup>

#### *Information About the Stops*

- There were a total of 675,916 motor vehicle stops, resulting in 721,115 citations during 2022 by a total of 460 agencies/agency sub-divisions including municipal police departments, the Massachusetts State Police, and a small number of other state law enforcement agencies (e.g., state university, Environmental, and MBTA Police).
- About 60% of the traffic stops were conducted by the municipal police departments and 40% of the total stops were conducted by the Massachusetts State Police and other state agencies.
- About 10.8% of stops occurred from 12:00 a.m. - 6:00 a.m., 29.9% of stops occurred from 6:01 a.m. - 12:00 p.m., 34.4% of stops occurred between 12:01 p.m. - 6:00 p.m. and the remaining 24.8% of stops occurred between 6:01 p.m. and 11:59 p.m.
- The total number of stops per month varied from a high of 71,001 in April 2022 to a low of 45,296 in January 2022. The average stops per day varied from a low of 1,461.16 stops per day in January 2022 to a high of 2,366.70 stops per day in April 2022.

#### *Demographics of Stopped Motorists*

- Regarding the gender of stopped drivers in Massachusetts during this period, 63.9% were male, 36.1% were female, and about 1/10 of 1% were non-binary.
- The mean age of stopped drivers was about 38 years old.

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<sup>13</sup>Statewide analysis includes stops/citations from all agencies, including those with fewer than 100 citations.



- About 35.9% of stopped drivers were 29 years old or younger and the remaining 64.1% were 30 years old or older.
- About 14.5% of stopped drivers in the state were African American/Black, 15.2% were Hispanic, 65.1% were White, and 5.2% were Other (Asian, Asian Pacific, American Indian, Middle Eastern or Pacific Islander).
- Nearly 69.9% of motor vehicle stops were not residents of the jurisdiction where the stop occurred. Additionally, 90.1% of stops were of Massachusetts drivers while the remaining 9.9% of stops were of out-of-state drivers.

### Major Findings of the Statewide Analyses

#### *Veil of Darkness Analysis (VoD): Statewide Analysis for All Stops*

- The chi-square test for all Massachusetts stops (n = 675,916) was statistically significant, which is taken as evidence there is a relationship between the odds of a Non-White motorist (a motorist who is African American/Black, Hispanic, or Other race) being stopped during the day as compared to darkness (as well as a relationship between the odds of a White motorist being stopped during the day as compared to darkness). The results of this test for all stops indicates that White motorists are *more often* stopped in daylight than in darkness whereas Non-White motorists are *less often* stopped in daylight than in darkness.
- In the VoD logistic regression for all stops<sup>14</sup> statewide (n = 675,916) the VoD variable representing light/dark conditions at time of stop was also statistically significant in its relationship to the dependent variable of Non-White stops. Specifically, the odds ratio was .641. This means the odds of a daylight stop for Non-White motorists are 36% lower than the odds of a darkness stop. For this analysis, no support was shown for a pattern of racial disparity in total Massachusetts stops.

#### *Veil of Darkness Analysis (VoD): Statewide Analysis for Intertwilight Period (ITP) Stops Only*

- The chi-square test for all Massachusetts ITP stops (n = 222,111) was also statistically significant, which is taken as evidence that there is a relationship between the odds of a Non-White motorist (a motorist who is African American/Black, Hispanic, or Other race) being stopped during the day as compared to darkness. The results indicate that Non-White motorists were slightly more often stopped in darkness as compared to daylight and White motorists were slightly more often stopped in daylight than in darkness.

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<sup>14</sup>VoD analysis examining all stops may be considered less robust than analyses of the restricted intertwillight period (ITP) sub-sample.

- In the VoD logistic regression for ITP stops only statewide (n = 222,111), the VoD variable representing light/dark conditions at time of stop was statistically significant in its relationship to the dependent variable of Non-White stops. Specifically, the odds ratio was .862. This means the odds of a daylight stop for Non-White motorists are 14% lower than the odds of a darkness stop. For the ITP analysis, no support was shown for a pattern of racial disparity in total Massachusetts stops.

### *Test for Disparities in Outcomes of Traffic Stops*

- The results indicate that motorists in the Other race category (Asian, Asian Pacific, American Indian, Middle Eastern or Pacific Islander) are most likely to receive a warning, followed by White motorists. Conversely, Hispanic motorists, followed by African American/Black motorists are least likely to receive a warning.
- When it comes to receiving a *civil* citation, motorists in the Other race category were most likely to receive a civil citation, followed by Hispanic motorists. White motorists were least likely to receive a civil citation, followed by African American/Black motorists.
- When it comes to receiving a *criminal* citation, Hispanic motorists, followed by African American/Black motorists are most likely to receive a criminal citation whereas motorists in the Other race category, followed by White motorists were least likely to receive a criminal citation.
- When examining arrests by race/ethnicity, Hispanic motorists were most likely to be arrested, followed by African American/Black motorists. Conversely, motorists in the Other race category were least likely to be arrested, followed by White motorists.
- Additionally, the chi-square test was statistically significant, which is taken as evidence that there is a relationship between race/ethnicity of the stopped motorist and the outcome of the stop (whether a motorist received a warning, citation, or is arrested). Although the chi square test tells us that there appears to be a statistically significant relationship between race/ethnicity of the stopped motorist and the outcome of the stop (and that relationship is NOT due to chance alone), that does not mean that the race/ethnicity of the stopped driver causes the specific stop outcomes. There is a lot we do not know about the circumstances of the stop that could justifiably influence the outcome of the stop.

### *Tests for Disparities in the Decision to Search*

- Less than 1% of traffic stops statewide resulted in a discretionary, non-inventory search<sup>15</sup> (n = 4,867). Due to the small number of non-inventory searches that were conducted *and* the fact that we are not able to determine the initial reason for the stop, caution should be used in interpreting these results, especially for agencies that had very small numbers of searches.
- The results indicate that Non-White motorists (a motorist who is African American/Black, Hispanic, or Other race) were more likely to be subjected to a non-inventory, discretionary search. Specifically, the results show that while about .58% of White motorists were subjected to a non-inventory, discretionary search, .90% 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 does not mean that the race/ethnicity of the stopped driver is the CAUSE of the search.

### Major Findings of the Department-Level Analyses

- Department-level analyses were conducted for law enforcement agencies that had 100 or more citations during the 12-month data collection period. In total, 370 of the 460 (or 80.4%) agencies/agency sub-divisions who conducted traffic stops in 2022 had 100 or more citations.
- For the Veil of Darkness (VoD) analyses of the decision to stop, binary logistic regression<sup>16</sup> results showed that a total of 6 departments had odds ratios indicating the odds of stopping a Non-White driver were higher during the day than they were at night.
- The results of the VoD analysis for all stops<sup>17</sup> showed that one department (Marshfield Police Department) had an odds ratio that indicated the odds of stopping a Non-White driver were higher during the day than they were at night.

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<sup>15</sup>An inventory search is a search conducted following police department policy when a vehicle is seized. If the police tow the car they will search and make an inventory of the contents. A non-inventory search represents all other discretionary (consent, plain view, etc.) searches that occur at the time of the traffic stop. See Massachusetts RMV codebook.

<sup>16</sup>The technique of binary logistic regression and interpretation of odds ratios are discussed in greater detail below in the “Veil of Darkness (VoD) Analysis” section below.

<sup>17</sup>VoD analysis examining all stops may be considered less robust than analyses of the restricted intertwilight period (ITP) sub-sample.

- Binary logistic regression results of the VoD analysis for ITP stops only showed that five departments (Hanover Police Department<sup>18</sup>, Ludlow Police Department, Wrentham Police Department, Boston Police Department District E-18, Massachusetts State Police Troop C-3) had odds ratios that indicated the odds of stopping a Non-White driver were higher during the day than they were at night.

We caution that these findings do NOT prove any of the listed departments are engaging in racial profiling; there are many explanations for racial disparities in traffic enforcement other than officer bias. These findings simply serve as a starting point for further discussion and reflection.

Additionally, stakeholders are encouraged to consider the other key measures provided in individual department data sheets (and not VoD alone) when starting conversation(s) about racial profiling, acceptable thresholds, and appropriate solutions and responses. VoD is one way of studying the *decision to stop*, but patterns evident in outcomes (warnings, civil, criminal, arrest citations) and searches vary significantly across agencies and are important to examine in detail, case-by-case as well.

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<sup>18</sup>Hanover PD had a significant portion (23.2%) of its cases not analyzed due to missingness. See “Some Notes on Missing Data” section below for more information on how patterns of missingness might affect results.