

# Methodology and Variable Definitions for 2020 Vermont Traffic Stop Data Analysis

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## Methodology and Variable Definitions for 2020 Vermont Traffic Stop Data Analysis

The traffic stop data used in the Seguino, Brooks, and Autilio (2020) studies of Vermont traffic policing spans multiple years.<sup>1</sup> Each row of data received from Vermont law enforcement agencies corresponds to a single outcome (warning, ticket, or arrest) resulting from a traffic stop. There may be multiple outcomes of a stop. The date and time of a stop is not required by legislation, although some agencies have chosen to provide date and time.

Here we outline the methodology adopted in “cleaning” the data used in these studies.

### *A. Missing or Unknown Data Values by Field*

Many agency reports have missing data. In each of our agency studies, the appendix outlines the frequency of missing data/unknown data by field.

The definitions for missing or unknown values by field are:

- Stop ID (also called Profile Number or Incident Number) – Blank or Unusable to tie together outcomes from a single stop\*<sup>2</sup>
- Stop Date and Time - Blank\*
- Age – Blank or 0
- Race – Blank, “Business”, “Unknown - U” or “Other – U”
- Gender – Blank, Business, NA or “Transgendered - T”<sup>3</sup>
- Stop Reason – Blank or “O = Other violation”
- Search Reason – Blank or “Unknown”
- Search Outcome – Blank or “Unknown”
- Stop Result – Blank or “Unknown”

Fields with non-standard, unrecognized values are also treated as missing values.

Additional to traffic stop data, DMV Accident reports are used to estimate the percentage of drivers in the area by race. We also track and report on the number of accident reports that are missing race information.

The number of fields with problem values varies dramatically depending on the reporting agency and year of the data.

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<sup>1</sup> Individual agency studies will be posted periodically as they are completed at: <https://www.uvm.edu/cas/economics/profiles/stephanie-seguino>.

<sup>2</sup> This field is not required by law.

<sup>3</sup> The value “Transgendered – T” is identified in this study for 2019 data only.

### *B. Missing Months of Data*

Since dates are frequently absent from the data, it is difficult to determine if stops are omitted for any significant time spans. Missing data can lead to misleading year-on-year (annual) comparison of traffic stops. This is one of the many benefits of having the dates and times provided.

### *C. Duplicate Blocks of Data*

Occasionally, when date and time information is present, some agency data can have large segments of duplicate entries. This can be seen when each row in this time span appears twice with all field values matching exactly. When this situation is detected, the duplicate rows are removed prior to further analysis.

### *D. Stops with Multiple Outcomes*

Most Vermont traffic stop data files contain only one stop outcome per row (where an outcome can be one arrest, one ticket, one warning, etc.).<sup>4</sup> However, a single traffic stop can have multiple outcomes. For example, it is possible for a single stop to result in multiple tickets being issued, or other combinations such as a ticket and a warning, and so forth. It is important to be able to collect multiple outcomes into stops to avoid overcounting as well as to recognize stops where more than one ticket is issued.

Identifying multiple outcomes for a stop can be a challenge. Some datasets provide stop IDs that enable this association. When stop IDs are present, each one of a stop's outcomes will have the same stop ID and so can be associated and analyzed together.

When stop IDs are absent, a heuristic approach is used to attempt to group together outcomes. This technique associates outcomes using a combination of fields with matching values. Typically, the following set of fields is used to identify incidents: agency, date/time, age, gender, and race.

If any of the above fields is missing from the data, the heuristic approach cannot work. In this case, each row must be assumed to be a separate stop, i.e., each stop has only one outcome. The absence of Stop IDs, date, and time makes this approach necessary for a large swath of the currently available Vermont data.

### *E. Resolving Single-Row Data Inconsistencies*

In the traffic stop data, there are cases of apparent inconsistencies between values within stops. For example, a stop's search reason may be "reasonable suspicion" but its search outcome is "no search." This is an example of a conflict within a single outcome row. (There

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<sup>4</sup> One notable exception to this approach is Burlington data, which combines information from all outcomes into a single incident per row. <https://www.burlingtonvt.gov/Police/Data>.

can also be inconsistencies that appear across multiple outcome rows for a single stop. Those are covered in a later section.)

### 1. Conflicts Between Race and Ethnicity Fields

Some agency data files include both Race and Ethnicity fields. These must be merged into a single Race/Ethnicity field to be consistent with the standard designations used in Vermont policing, (“White”, “Black”, “Asian”, “Hispanic”, “Native American” and “Unknown”). It is most common for data files to lack an Ethnicity field. When one is present it is often blank or matches the value in the Race field. When they are in conflict, the following rules are used to merge Race and Ethnicity.

- If Ethnicity contains “Hispanic”, set Race/Ethnicity to Hispanic,
- Otherwise, set Race/Ethnicity to the value in the Race field.

### 2. Conflicts Between Search Reason and Search Outcome Fields

The primary source of discrepancies within a single data row occurs between search reason and search outcome. Table 1 details how these conflicts are resolved in our data analysis. If, for example, the search reason is listed as “no search conducted” but the search outcome is “contraband,” the search outcome is instead treated as “no search.” Law enforcement agencies have indicated to us that this scenario emerges when contraband is visible to the officer without a search.

Table 1. Resolving Conflicts Between Search Reason and Outcome

Search Reason	Search Outcome	Modified	Include in Number of Searches	Include in Number of Contraband Hits
		Search Outcome		
No Search Conducted	Contraband	No Search	No	No
No Search Conducted	No Contraband	No Search	No	No
No Search Conducted	No Search	No Search	No	No
No Search Conducted	Unknown	No Search	No	No
Probable Cause	Contraband	Contraband	Yes	Yes
Probable Cause	No Contraband	No Contraband	Yes	No
Probable Cause	No Search	No Contraband	Yes	No
Probable Cause	Unknown	Unknown	Yes	No
Reasonable Suspicion	Contraband	Contraband	Yes	Yes
Reasonable Suspicion	No Contraband	No Contraband	Yes	No
Reasonable Suspicion	No Search	No Contraband	Yes	No
Reasonable Suspicion	Unknown	Unknown	Yes	No
Warrant	Contraband	Contraband	Yes	Yes
Warrant	No Contraband	No Contraband	Yes	No
Warrant	No Search	No Contraband	Yes	No
Warrant	Unknown	Unknown	Yes	No

Unknown	Contraband	Unknown	No	No
Unknown	No Contraband	Unknown	No	No
Unknown	No Search	Unknown	No	No
Unknown	Unknown	Unknown	No	No

As an example, the Colchester Police Department data has eighteen stops that require modification based on single-row inconsistencies.<sup>5</sup> In the example in Table 2, which represents multiple rows for the same stop, the Search Outcomes are modified to “Contraband.”

Table 2. Specific Colchester Cases of Modification of Search Outcomes

Stop ID	Stop Reason	Search Reason	Search Outcome	Stop Outcome
18CC011715	Investigatory Stop	Probable Cause	No Search	Ticket
18CC011715	Investigatory Stop	Probable Cause	Contraband	Ticket
18CC011715	Investigatory Stop	Probable Cause	Contraband	Ticket

#### F. Resolving Multi-Row Data Inconsistencies

When stops include multiple outcomes, there are many opportunities for data inconsistencies across the rows. The primary types of conflict and their resolutions are described below.

##### 1. Stop Reasons

Each stop (and thus outcomes of that stop) should be assigned one and only one stop reason (of which the choices are externally generated stop, moving violation, suspicion of DWI, investigatory stop, vehicle equipment). However, sometimes multiple stop reasons appear across a stop’s outcome rows.

Table 3 shows the rules used to resolve conflicting stop reasons. Note that when “vehicle equipment,” “moving violation, and “suspicion of DWI” are found in combination, the stop reason is designated “multiple stop reasons.”

Table 3. Resolving Stop Reason Conflicts within Multi-Row Stops

Condition (in decreasing priority)	Action
1. “Externally Generated Stop” in combination with another reason	Use EGS as stop reason
2. “Investigatory Stop” in combination with another	Use “Investigatory Stop”

<sup>5</sup> Colchester is used as an example for no particular reason. We could easily have used any other agency’s data to illustrate the issues identified here.

reason (except EGS)	
3. Combinations of two or more of (vehicle equipment, moving violation, suspicion of DWI)	Use "Multiple Stop Reasons"
4. "Suspicion of DWI" in combination with "unknown"	Use "Suspicion of DWI"
5. "Moving Violation" in combination with "unknown"	Use "Moving Violation"
6. "Vehicle Equipment" in combination with "unknown"	Use "Vehicle Equipment"
7. "Unknown" as only stop reason	Use "Unknown"

Using Colchester as an example once again, the stop reasons in Table 4 are inconsistent and will be modified to "moving violation."

Table 4. Example of Colchester Stop Reason Conflicts and Resolution

Stop Agency	Stop ID	Stop Reason	Search Reason	Search Outcome	Stop Outcome
Colchester	18CC004170	Unknown	Probable Cause	Contraband	Arrest for Violation
Colchester	18CC004170	Moving Violation	Probable Cause	Contraband	Ticket
Colchester	18CC004170	Unknown	Probable Cause	Contraband	Arrest for Warrant

## 2. Stop Search Reasons

A stop should be assigned one and only one search reason (probable cause, reasonable suspicion, warrant, or no search conducted). However, sometimes multiple search reasons appear across a stop's outcome rows.

The Table 5 shows the rules used to resolve conflicting search reasons within single incidents.

Table 5. Resolving Search Reason Conflicts within Multi-Row Stops

Condition (in decreasing priority)	Action
"Probable cause" (PC) in combination with another search reason	Use "probable cause" as stop reason
"Reasonable suspicion" (RS) in combination with any other search reason (except PC)	Use "reasonable suspicion"
"Warrant" in combination with "no search" or "unknown"	Use "warrant"
"No search" in combination with "unknown"	Use "no search"
"Unknown" only	Use "unknown"

The search reasons in the Colchester example in Table 6 are inconsistent and will be resolved to "probable cause."

Table 6. Resolving Colchester Search Reason Conflicts within Multi-Row Stops

Stop Agency	Stop ID	Stop Reason	Search Reason	Search Outcome	Stop Outcome
Colchester	17CC004339	Moving Violation	Probable Cause	Contraband	Ticket
Colchester	17CC004339	Moving Violation	No Search Conducted	No Search	Ticket

### 3. Search Outcomes

A stop should be assigned one and only one search outcome (“no search,” “no contraband,” or “contraband”). However, sometimes multiple search outcomes appear across a stop’s outcome rows. Table 7 shows rules for resolving conflicting search outcomes.

Table 7. Conflicting Search Outcomes within Multi-Row Stops

Search Reason	Search Outcome	Conflicting	Use Search Outcome
		Search Outcome	
No Search with Arrest (report separately)	Contraband	No Search	No Search
No Search with no arrest (report separately)	Contraband	No Search	No Search
No search conducted	Contraband	Unknown	No Search
No search conducted	Contraband	Unknown	No Search
No search conducted	No Contraband	No Search	No Search
No search conducted	No Contraband	Unknown	No Search
No search conducted	No Search	Unknown	No Search
Probable cause	Contraband	No Contraband	Contraband
Probable cause	Contraband	No Search	Contraband
Probable cause	Contraband	Unknown	Contraband
Probable cause	No Contraband	No Search	No Contraband
Probable cause	No Contraband	Unknown	No Contraband
Probable cause	No Search	Unknown	No Search
Reasonable suspicion	Contraband	No Contraband	Contraband
Reasonable suspicion	Contraband	No Search	Contraband
Reasonable suspicion	Contraband	Unknown	Contraband
Reasonable suspicion	No Contraband	No Search	No Contraband
Reasonable suspicion	No Contraband	Unknown	No Contraband
Reasonable suspicion	No Search	Unknown	No Search
Warrant	Contraband	No Contraband	Contraband
Warrant	Contraband	No Search	Contraband
Warrant	Contraband	Unknown	Contraband



Warrant	No Contraband	No Search	No Contraband
Warrant	No Contraband	Unknown	No Contraband
Warrant	No Search	Unknown	No Search
Unknown	Contraband	No Contraband	Unknown
Unknown	Contraband	No Search	Unknown
Unknown	No Contraband	No Search	Unknown

By way of example, Table 8 shows that search outcomes for a specific Colchester stop are inconsistent and are modified to “contraband.”

Table 8. Resolving Colchester Search Outcome Conflicts within Multi-Row Incidents

Stop Agency	Stop ID	Stop Reason	Search Reason	Search Outcome	Stop Outcome
Colchester	18CC011715	Investigatory Stop	Probable Cause	Contraband	Ticket
Colchester	18CC011715	Investigatory Stop	Probable Cause	Contraband	Ticket
Colchester	18CC011715	Investigatory Stop	Probable Cause	No Search	Ticket

### G. Variable Definitions

Table 9 defines the variables used in the 2020 Vermont law enforcement studies by Seguino, Brooks, and Autilio which can be found at this website:

<https://www.uvm.edu/cas/economics/profiles/stephanie-seguino>.

Table 9. Variable Definitions

Variable	Formula
<b>Total Traffic Stops</b>	
Including externally generated stops	Count of all stops
Excluding externally generated stops	Count of all stops except where stop reason is “externally generated stop”
<b>Reasons For Stops</b>	
<i>Safety Stops</i>	Count of all stops where stop reason is “moving violation” or “suspicion of DWI”
Moving Violation	Count of all stops where stop reason is “moving violation”
Suspicion of DWI	Count of all stops where stop reason is “suspicion of DWI”
<i>Investigatory/Pretextual Stops</i>	Count of all stops where stop reason is “investigatory stop” or “vehicle equipment”
Investigatory Stop	Count of all stops where stop reason is “investigatory stop”
Vehicle Equipment	Count of all stops where stop reason is “vehicle equipment”
Externally Generated Stop	Count of all stops where stop reason is “externally generated stop”
<i>Multiple Reasons - Moving Violation &amp; Suspicion of DWI</i>	Count of all stops where stop reasons include both “moving violation” and “suspicion of DWI”
<i>Multiple Reasons - Moving Violation &amp; Vehicle</i>	Count of all stops where stop reasons include both

<b>Variable</b>	<b>Formula</b>
<i>Equipment</i>	“moving violation” and “vehicle equipment”
<i>Multiple Reasons - Suspicion of DWI &amp; Vehicle Equipment</i>	Count of all stops where stop reasons include both “suspicion of DWI” and “vehicle equipment”
<i>Unknown Stop Reason</i>	Count of all stops where stop reason is “unknown”
<b>Outcomes (excl. EGS)</b>	
Ticket	Count of all stops where at least one ticket was issued.
Warning	Count of all stops where at least one warning was issued.
No action taken	Count of all stops where no action was taken was issued.
Arrest for violation	Count of all stops where there was an arrest for violation.
Arrest for warrant	Count of all stops where there was an arrest for warrant.
<b>Searches</b>	
<i>Total stops with no search</i>	Count of all stops where search reason was “no search”
No Search & Contraband & Arrest for violation	Count of all stops where search reason was “no search” and stop search outcome was “contraband” and there was an arrest for violation
No Search & Contraband & No Arrest	Count of all stops where search reason was “no search” and stop search outcome was “contraband” and there was not an arrest for violation
No Search (all others)	Count of all stops where search reason was “no search” and stop search outcome was not “contraband”
<i>Total Stops with Unknown Search</i>	Count of all stops where search reason was “unknown”
<i>Total Stops with Search</i>	Count of all stops where search reason was one of “probable cause,” “reasonable suspicion,” or “warrant”
<i>Search with Probable Cause (PC)</i>	Count of all stops where search reason was “probable cause”
Stops with PC Searches, No contraband	Count of all stops where search reason was “probable cause” and search outcome was “no contraband” or “no search”
Stops with PC Searches, Unknown contraband	Count of all stops where search reason was “probable cause” and search outcome was “unknown”
Stops with PC Searches, Contraband	Count of all stops where search reason was “probable cause” and search outcome was “contraband”
<i>Outcomes of PC Search*</i>	
Stops with PC Searches, Contraband & Warning, No Action or Unknown*	Count of all stops where search reason was “probable cause” and search outcome was “contraband” and one or more of the following outcomes were recorded: “warning,” “no action,” or “unknown” but no tickets or arrests
Stops with PC Searches, Contraband and Ticket*	Count of all stops where search reason was “probable cause” and search outcome was “contraband” and one or more tickets were issued but no arrest
Stops with PC Searches, Contraband and Arrest*	Count of all stops where search reason was “probable cause” and search outcome was “contraband” and one or more arrests were made (for Violation or Warrant)
Search with Reasonable Suspicion (RS)	Count of all stops where search reason was “reasonable suspicion”
Stops with RS Searches, No contraband	Count of all stops where search reason was “reasonable suspicion” and search outcome was “no contraband” or “no search”
Stops with RS Searches, Unknown contraband	Count of all stops where search reason was “reasonable suspicion” and search outcome was “unknown”
Stops with RS Searches, Contraband	Count of all stops where search reason was “reasonable

Variable	Formula
	suspicion” and search outcome was “contraband”
<i>Outcomes of RS Search*</i>	
Stops with RS Searches, Contraband & Warning, No Action or Unknown*	Count of all stops where search reason was “reasonable suspicion” and search outcome was “contraband” and one or more of the following outcomes were recorded: “warning,” “no action,” or “unknown” but no tickets or arrests
Stops with RS Searches, Contraband & Ticket*	Count of all stops where search reason was “reasonable suspicion” and search outcome was “contraband” and one or more tickets were issued but no arrest
Stops with RS Searches, Contraband & Arrest*	Count of all stops where search reason was “reasonable suspicion” and search outcome was “contraband” and one or more arrests were made (for Violation or Warrant)
Search with Warrant	Count of all stops where search reason was “warrant”.
Stops with Warrant Searches, No contraband	Count of all stops where search reason was “warrant” and search outcome was “no contraband” or “no search”
Stops with Warrant Searches, Unknown contraband	Count of all stops where search reason was “warrant” and search outcome was “unknown”
Stops with Warrant Searches, Contraband	Count of all stops where search reason was “warrant” and search outcome was “contraband”
<i>Outcomes of Warrant Search*</i>	
<i>Stops with Warrant Searches, Contraband &amp; Warning, No Action or Unknown*</i>	Count of all stops where search reason was “warrant” and search outcome was “contraband” and one or more of the following outcomes were recorded: “warning,” “no action,” or “unknown” but no tickets or arrests
Stops with Warrant Searches, Contraband & Ticket*	Count of all stops where search reason was “warrant” and search outcome was “contraband” and one or more tickets were issued but no arrest
Stops with Warrant Searches, Contraband & Arrest*	Count of all stops where search reason was “warrant” and search outcome was “contraband” and one or more arrests were made
<b>Racial Shares of Stops</b>	
Including externally generated stops	Number of stops for a race divided by number of stops for all races
Excluding externally generated stops	Number of non-EGS stops for a race divided by number of non-EGS stops for all races (excluding “Unknown”)
Racial share of stops (ACS)	Percentage of area residents of a particular race as determined by the American Community Survey (ACS) five-year estimates for 2013-2017 (See <a href="https://www.census.gov/programs-surveys/acs">https://www.census.gov/programs-surveys/acs</a> )
Racial share of stops (DMV accident data)	Percentage of drivers of a particular race with accident reports logged by the agency as determined by Vermont DMV Accident data for 2013-19.
Disparity Index (using ACS)	For a particular race, the Disparity Index (ACS) is the % of non-EGS stops for that race divided by the % of area residents for that race based on the ACS 5-year estimates from 2013-2017.
Disparity Index (using DMV Accident data)	For a particular race, the Disparity Index (DMV) is the % of non-EGS stops for that race by the % of drivers for that race with accident reports based on Vermont DMV accident data for 2013-2019.
<b>Stop Reason as % of All Stops</b>	
<i>Safety Stops</i>	% of all stops (including EGS) where stop reason is

Variable	Formula
	“moving violation” or “suspicion of DWI”
Moving Violation	% of all stops (including EGS) where stop reason is “moving violation”
Suspicion of DWI	% of all stops (including EGS) where stop reason is “suspicion of DWI”
<i>Investigatory/Pretextual Stops</i>	% of all stops (including EGS) where stop reason is “investigatory stop” or “vehicle equipment”
Investigatory Stops	% of all stops (including EGS) where stop reason is “investigatory stop”
Vehicle Equipment	% of all stops (including EGS) where stop reason is “vehicle equipment”
<i>Externally Generated Stops</i>	% of all stops (including EGS) where stop reason is “externally generated stop”
<i>Multiple Reasons</i>	% of all stops (including EGS) where there are multiple stop reasons in the following combinations: “moving violation” and “suspicion of DWI” or “moving violation” and “vehicle equipment” or “suspicion of DWI” and “vehicle equipment”
<i>Unknown Reason</i>	% of all stops (including EGS) where stop reason is “unknown”
<b>Outcome Rates as a % of All Stops</b>	
<i>Warning Rate</i>	% of non-EGS stops where at least one warning was issued
<i>Ticket Rate</i>	% of non-EGS stops where at least one ticket was issued
<i>Arrest for Violation Rate</i>	% of non-EGS stops where there was an arrest for violation
<i>Arrest for Warrant Rate</i>	% of non-EGS stops where there was an arrest for warrant
<i>No Action Rate</i>	% of non-EGS stops where there was no action taken
<i>Search Rates</i>	
<i>Search rate (excl. searches on warrant)</i>	% of non-EGS stops where the search reason was “probable cause” or “reasonable suspicion”
<i>Search rate (incl. searches on warrant)</i>	% of non-EGS stops where the search reason was “probable cause,” “reasonable suspicion,” or “warrant search”
<i>Hit rates (as a % of PC, RS, &amp; Warrant Searches)</i>	
<i>Hit rates (incl. all outcomes)</i>	% of non-EGS stops where the search reason was “probable cause,” “reasonable suspicion,” or “warrant” and contraband was found
<i>Hit rates (excl. warnings as outcomes)</i>	% of non-EGS where the search reason was “probable cause,” “reasonable suspicion,” or “warrant” and contraband was found, and the stop resulted in at least one ticket or arrest
<i>Hit rates (outcome = arrest)</i>	% of non-EGS stops where the search reason was “probable cause,” “reasonable suspicion,” or “warrant” and contraband was found, and the stop resulted in an arrest for violation or warrant

\*Does not appear in all reports

#### H. Vermont Law Enforcement Agencies

Table 10 shows the complete list of Vermont law enforcement agencies that required to provide traffic stop data. Agency groupings, such as “All Police,” are also listed near end of the table.

Each agency is associated with a “Driver Entity.” This signifies the geographical area that is within the agency’s jurisdiction. A Driver Entity is used to map an agency to the correct entries in the American Community Survey data. (See also Table 11).

Table 10. Vermont Law Enforcement Agencies

<b>Agency - Full Name</b>	<b>Agency - Short Name</b>	<b>Agency Type</b>	<b>Driver Entity / ACS Place</b>
<b>Barre City Police</b>	Barre City	police	Barre City
<b>Barre Town Police</b>	Barre Town	police	Barre Town
<b>Bellows Falls Police</b>	Bellows Falls	police	Bellows Falls
<b>Bennington Police</b>	Bennington	police	Bennington
<b>Berlin Police</b>	Berlin	police	Berlin
<b>Bethel Police</b>	Bethel	police	Bethel
<b>Bradford Police</b>	Bradford	police	Bradford
<b>Brandon Police</b>	Brandon	police	Brandon
<b>Brattleboro Police</b>	Brattleboro	police	Brattleboro
<b>Brighton Police</b>	Brighton	police	Essex County
<b>Bristol Police</b>	Bristol	police	Bristol
<b>Burlington Police</b>	Burlington	police	Burlington
<b>Canaan Police</b>	Canaan	police	Canaan
<b>Castleton Police</b>	Castleton	police	Castleton
<b>Chester Police</b>	Chester	police	Chester
<b>Colchester Police</b>	Colchester	police	Colchester
<b>Dover Police</b>	Dover	police	Dover
<b>Essex Police</b>	Essex	police	Essex
<b>Fair Haven Police</b>	Fair Haven	police	Fair Haven
<b>Fairlee Police</b>	Fairlee	police	Fairlee
<b>Hardwick Police</b>	Hardwick	police	Hardwick
<b>Hartford Police</b>	Hartford	police	Hartford
<b>Hinesburg Police</b>	Hinesburg	police	Hinesburg
<b>Killington Police</b>	Killington	police	Killington
<b>Ludlow Police</b>	Ludlow	police	Ludlow
<b>Lyndon Police</b>	Lyndon	police	Lyndon
<b>Manchester Police</b>	Manchester	police	Manchester
<b>Middlebury Police</b>	Middlebury	police	Middlebury
<b>Milton Police</b>	Milton	police	Milton
<b>Montpelier Police</b>	Montpelier	police	Montpelier
<b>Morristown Police</b>	Morristown	police	Morristown
<b>Newport Police</b>	Newport	police	Newport
<b>Northfield Police</b>	Northfield	police	Northfield
<b>Norwich Police</b>	Norwich	police	Norwich
<b>Pawlet Constabulary</b>	Pawlet	police	Pawlet
<b>Pittsford Police</b>	Pittsford	police	Pittsford
<b>Poultney Constabulary</b>	Poultney	police	Poultney
<b>Randolph Police</b>	Randolph	police	Randolph
<b>Richmond Police</b>	Richmond	police	Richmond

<b>Royalton Police</b>	Royalton	police	Royalton
<b>Rutland Police</b>	Rutland	police	Rutland
<b>Rutland Town Police</b>	Rutland Town	police	Rutland Town
<b>S. Burlington Police</b>	S. Burlington	police	S. Burlington
<b>Shelburne Police</b>	Shelburne	police	Shelburne
<b>Springfield Police</b>	Springfield	police	Springfield
<b>St. Albans Police</b>	St. Albans	police	St. Albans
<b>St. Johnsbury Police</b>	St. Johnsbury	police	St. Johnsbury
<b>Stowe Police</b>	Stowe	police	Stowe
<b>Swanton Police</b>	Swanton	police	Swanton
<b>Thetford Police</b>	Thetford	police	Thetford
<b>UVM Police</b>	UVM	police	Burlington
<b>Vergennes Police</b>	Vergennes	police	Vergennes
<b>VT DMV</b>	VT DMV	police	All Vermont
<b>VT Fish and Wildlife</b>	VT Fish and Wildlife	police	All Vermont
<b>Waterbury Police</b>	Waterbury	police	Waterbury
<b>Weathersfield Police</b>	Weathersfield	police	Weathersfield
<b>Wells Constabulary</b>	Wells	police	Wells
<b>Williston Police</b>	Williston	police	Williston
<b>Wilmington Police</b>	Wilmington	police	Wilmington
<b>Windsor Police</b>	Windsor	police	Windsor
<b>Winhall Police</b>	Winhall	police	Winhall
<b>Winooski Police</b>	Winooski	police	Winooski
<b>Woodstock Police</b>	Woodstock	police	Woodstock
<b>Addison County Sheriff</b>	Addison County	sheriff	Addison County
<b>Bennington County Sheriff</b>	Bennington County	sheriff	Bennington County
<b>Caledonia County Sheriff</b>	Caledonia County	sheriff	Caledonia County
<b>Chittenden County Sheriff</b>	Chittenden County	sheriff	Chittenden County
<b>Essex County Sheriff</b>	Essex County	sheriff	Essex County
<b>Franklin County Sheriff</b>	Franklin County	sheriff	Franklin County
<b>Grand Isle Sheriff</b>	Grand Isle County	sheriff	Grand Isle County
<b>Lamoille County Sheriff</b>	Lamoille County	sheriff	Lamoille County
<b>Orange County Sheriff</b>	Orange County	sheriff	Orange County
<b>Orleans County Sheriff</b>	Orleans County	sheriff	Orleans County
<b>Rutland County Sheriff</b>	Rutland County	sheriff	Rutland County
<b>Washington County Sheriff</b>	Washington County	sheriff	Washington County
<b>Windham County Sheriff</b>	Windham County	sheriff	Windham County
<b>Windsor County Sheriff</b>	Windsor County	sheriff	Windsor County
<b>VSP HQ - BCI/SIU/NIU</b>	VSP HQ - BCI/SIU/NIU	state police	All Vermont

<b>VSP Headquarters</b>	VSP HQ - Field Force	state police	All Vermont
<b>VSP_Bradford State Police</b>	VSP_Bradford	state police	Orange County
<b>VSP_Brattleboro State Police</b>	VSP_Brattleboro	state police	Windham County
<b>VSP_Derby State Police</b>	VSP_Derby	state police	Orleans County
<b>VSP_Middlesex State Police</b>	VSP_Middlesex	state police	Washington County
<b>VSP_New Haven State Police</b>	VSP_New Haven	state police	Addison County
<b>VSP_Rockingham State Police</b>	VSP_Rockingham	state police	Windham County
<b>VSP_Royalton State Police</b>	VSP_Royalton	state police	Windsor County
<b>VSP_Rutland State Police</b>	VSP_Rutland	state police	Rutland County
<b>VSP_Shaftsbury State Police</b>	VSP_Shaftsbury	state police	Bennington County
<b>VSP_St. Albans State Police</b>	VSP_St. Albans	state police	Franklin County
<b>VSP_St. Johnsbury State Police</b>	VSP_St. Johnsbury	state police	Caledonia County
<b>VSP_Westminster State Police</b>	VSP_Westminster	state police	Windham County
<b>VSP_Williston State Police</b>	VSP_Williston	state police	Chittenden County
<b>AGGREGATES</b>			
<b>All Police</b>	All Police	multiple	All Vermont
<b>All Sheriffs</b>	All Sheriffs	Multiple	All Vermont
<b>All Vermont Agencies</b>	All Vermont	multiple	All Vermont
<b>VSP - All</b>	VSP – All	state police	All Vermont

### I. Vermont Places (“Entities”)

Table 11 shows geographic places or “Entities” in Vermont. Each place has a GEOID code used to map it to the American Community Survey data. This mapping combined with the mapping shown in Table 10 allows each law enforcement agency to be tied to the correct ACS data.

Table 11. Vermont Places (“Entities”)

Entity/Place	Entity Type	Geo_GEOID			
<b>Addison County</b>	county	05000US50001	<b>Bennington</b>	township	16000US5004750
<b>Albany</b>	township	16000US5000400	<b>Bennington County</b>	county	05000US50003
<b>Alburgh</b>	township	16000US5000850	<b>Benson</b>	township	16000US5005125
<b>Arlington</b>	township	16000US5001375	<b>Berlin</b>	township	06000US5002305650
<b>Barnet</b>	township	16000US5002800	<b>Bethel</b>	township	16000US5005725
<b>Barre City</b>	city	16000US5003175	<b>Bradford</b>	township	16000US5007225
<b>Barre Town</b>	township	06000US5002303250	<b>Brandon</b>	township	16000US5007675
<b>Barton</b>	township	16000US5003475	<b>Brattleboro</b>	township	16000US5007975
<b>Bellows Falls</b>	village	16000US5004225	<b>Bristol</b>	township	16000US5008950
			<b>Burlington</b>	city	16000US5010675



<b>Cabot</b>	township	16000US5011050
<b>Caledonia County</b>	county	05000US50005
<b>Cambridge</b>	township	16000US5011425
<b>Canaan</b>	township	16000US5011725
<b>Castleton</b>	township	16000US5011875
<b>Cavendish</b>	township	16000US5012175
<b>Chelsea</b>	township	16000US5013450
<b>Chester</b>	township	16000US5013600
<b>Chittenden County</b>	county	05000US50007
<b>Colchester</b>	township	06000US5000714875
<b>Concord</b>	township	16000US5015175
<b>Coventry</b>	township	16000US5016075
<b>Danville</b>	township	16000US5017050
<b>Dorset</b>	township	16000US5017650
<b>Dover</b>	township	06000US5002517875
<b>East Montpelier</b>	township	16000US5021850
<b>Essex</b>	township	16000US5024400
<b>Essex County</b>	county	05000US50009
<b>Fair Haven</b>	township	16000US5025450
<b>Fairfax</b>	township	16000US5024850
<b>Fairlee</b>	township	16000US5025600
<b>Franklin County</b>	county	05000US50011
<b>Glover</b>	township	16000US5028000
<b>Grand Isle County</b>	county	05000US50013
<b>Greensboro</b>	township	16000US5030100
<b>Groton</b>	township	16000US5030475
<b>Hardwick</b>	township	16000US5031750
<b>Hartford</b>	township	06000US5002732275
<b>Hartland</b>	township	16000US5032350
<b>Hinesburg</b>	township	16000US5033400
<b>Hyde Park</b>	township	16000US5034975
<b>Irasburg</b>	township	16000US5035500
<b>Jericho</b>	township	16000US5036625
<b>Johnson</b>	township	16000US5037000
<b>Killington</b>	township	06000US5002137685
<b>Lamoille County</b>	county	05000US50015
<b>Lowell</b>	township	16000US5040450
<b>Ludlow</b>	township	16000US5041200
<b>Lyndon</b>	township	16000US5041950
<b>Manchester</b>	township	16000US5042700
<b>Marshfield</b>	township	16000US5043525
<b>Middlebury</b>	township	16000US5044275
<b>Milton</b>	township	16000US5045175
<b>Montpelier</b>	city	16000US5046000
<b>Morristown</b>	township	06000US5001546675

<b>Newbury</b>	township	16000US5048100
<b>Newfane</b>	township	16000US5048325
<b>Newport</b>	city	16000US5048850
<b>Northfield</b>	township	16000US5050200
<b>Norwich</b>	township	16000US5052825
<b>Orange County</b>	county	05000US50017
<b>Orleans County</b>	county	05000US50019
<b>Pawlet</b>	township	06000US5002154250
<b>Pittsford</b>	township	16000US5055525
<b>Plainfield</b>	township	16000US5055750
<b>Poultney</b>	township	16000US5056800
<b>Putney</b>	township	16000US5057625
<b>Randolph</b>	township	16000US5058000
<b>Readsboro</b>	township	16000US5058525
<b>Richford</b>	township	16000US5059050
<b>Richmond</b>	township	16000US5059200
<b>Rochester</b>	township	16000US5060025
<b>Royalton</b>	township	06000US5002760850
<b>Rutland</b>	city	16000US5061225
<b>Rutland County</b>	county	05000US50021
<b>Rutland Town</b>	township	06000US5002161300
<b>S. Burlington</b>	city	16000US5066175
<b>Shelburne</b>	township	16000US5064225
<b>Springfield</b>	township	16000US5069475
<b>St. Albans</b>	city	16000US5061675
<b>St. Johnsbury</b>	township	16000US5062125
<b>Stowe</b>	township	16000US5070450
<b>Swanton</b>	township	16000US5071650
<b>Thetford</b>	township	06000US5001772400
<b>Troy</b>	township	16000US5073450
<b>Vergennes</b>	city	16000US5074650
<b>Waitsfield</b>	township	16000US5075250
<b>Wallingford</b>	township	16000US5075850
<b>Washington County</b>	county	05000US50023
<b>Waterbury</b>	township	16000US5076900
<b>Weathersfield</b>	township	06000US5002777500
<b>Wells</b>	township	16000US5077875
<b>West Rutland</b>	township	16000US5082375
<b>Westminster</b>	township	16000US5081325
<b>Williamstown</b>	township	16000US5084100
<b>Williston</b>	township	06000US5000784475
<b>Wilmington</b>	township	16000US5084625
<b>Windham County</b>	county	05000US50025
<b>Windsor</b>	township	16000US5085000
<b>Windsor County</b>	county	05000US50027

<b>Winhall</b>	township	06000US5000385075
<b>Winooski</b>	city	16000US5085150

<b>Woodstock</b>	township	16000US5085900
<b>Worcester</b>	township	16000US5086050

*J. Methodology for using US Census American Community Survey (ACS)*

For each place covered by the American Community Survey, the data is disaggregated by race, gender, and age group. For example, the data field “B01001C025” provides an estimated count of “People Who Are American Indian and Alaska Native Alone: Female: 30 to 34 Years.” (“Alone” signifies these people do not identify as multi-racial). In spite of the large number of data categories, not all combinations are available. (See notes below.)

Table 12 shows the association between ACS racial categories and the race categories used in this study.

Table 12. ACS Racial Categories Used with Mappings

<b>ACS Racial Category</b>	<b>ACS Racial Category IDs</b>	<b>Maps to Race used in this study</b>	<b>Maps to Gender used in this study</b>
White Alone - Male	B01001A006 through B01001A016	White	Male
White Alone - Female	B01001A021 through B01001A031	White	Female
Black or African American Alone – Male	B01001B006 through B01001B016	Black	Male
Black or African American Alone - Female	B01001B021 through B01001B031	Black	Female
Population of Two Races: White; Black or African American	C02003013	Black	Unknown
Population of Two Races: Black or African American; American Indian and Alaska Native	C02003016	Black	Unknown
Asian Alone – Male	B01001D006 through B01001D016, B01001D021 through B01001D031	Asian	Male
Asian Alone – Female	B01001D006 through B01001D016, B01001D021	Asian	Female

	through B01001D031		
Native Hawaiian and Other Pacific Islander Alone – Male	B01001E006 through B01001E016	Asian	Male
Native Hawaiian and Other Pacific Islander Alone – Female	B01001E021 through B01001E031	Asian	Female
Population of Two Races: White; Asian	C02003015	Asian	Unknown
American Indian and Alaska Native Alone – Male	B01001C006 through B01001C016	Native American	Male
American Indian and Alaska Native Alone – Female	B01001C021 through B01001C031	Native American	Female
Population of Two Races: White; American Indian and Alaska Native	C02003014	Native American	Unknown
Total Population: Population of One Race: Some Other Race	C02003008	Unknown	Unknown
Total Population: Population of Two or More Races: Population of Two Races: All Other Two Race Combinations	C02003017	Unknown	Unknown
Total Population: Population of Two or More Races: Population of Three Races	C02003018	Unknown	Unknown
Total Population: Population of Two or More Races: Population of Four or More Races	C02003019	Unknown	Unknown

Notes on ACS Data Mappings:

- The U.S. Census Bureau considers “Hispanic” an ethnicity, so no Hispanic population counts were available in this race-focused ACS data set. For the study, only DMV accident data is used to estimate Hispanic driver counts.
- To identify all potential drivers in a population, we would want to have counts of all people of legal driving age, 16 and older. However, breakpoints in ACS occur at ages 15 and 18. To avoid under-estimating, we use ages 15 and up for the driving-age population.

- Counts for biracial and multi-racial groups are not disaggregated by age. For multi-racial counts, it is assumed the entire count is of driving age. The effect of this is to slightly overestimate the non-white racial shares of the driving population.
- Counts for biracial and multi-racial groups are not disaggregated by gender. Therefore, these counts are not used for any analysis requiring gender identification and are classified as Gender Unknown.

When calculating counts (“PopCount”) by place and race, values are first grouped and summed by gender using the mappings show above:

$$PopCount(Place, Race) = MalePopCount(Place, Race) + FemalePopCount(Place, Race) + UnknownGenderPopCount(Place, Race)$$

Then race percentages can be calculated as follows:

$$PopPercentage(Place, Race) = PopCount(Place, Race) / PopCount(Place, All Races)$$

#### K. Data Quality Field Values Explained

Each individual law enforcement agency study contains *Appendix Tables A.3a-3c.*, which summarize our analysis of the quality of the data reported. Table 13 (below) defines how each category in that table is defined.

Table 13. Field Values Explained for Appendix Table A.3a

*(Table rotated for ease of viewing)*

Stop Years		...		...	
Stops	<b>Count of Blank or Unknown Stops</b>	Count of all stops excluding Externally Generated Stops (EGS)	<b>Percentage of Blank or Unknown Stops</b>	Count of all stops excluding Externally Generated Stops (EGS)	
Stop ID		Count of all non-EGS stops where Stop ID is missing or cannot be used to tie together multiple outcomes		% of all non-EGS stops where Stop ID is missing or cannot be used to tie together multiple outcomes	
Stop Date/Time		Count of all non-EGS stops where Stop Date & Time is unknown		% of all non-EGS stops where Stop Date & Time is unknown.	
Age		Count of all non-EGS stops where Age of driver is unknown		% of all non-EGS stops where Age of driver is unknown	
Race		Count of all non-EGS stops where Race of driver is unknown		% of all non-EGS stops where Race of driver is unknown	
Gender		Count of all non-EGS stops where Gender of driver is unknown		% of all non-EGS stops where Gender of driver is unknown	
Stop Reason		Count of all stops (incl. EGS) where stop reason is unknown.		% of all stops (incl. EGS) where stop reason is “unknown”	
Search Reason		Count of all non-EGS stops where search reason is unknown		% of all non-EGS stops where search reason is “unknown”	
Contraband		Count of all non-EGS outcomes where search reason was one of “probable cause,” “reasonable suspicion,” or “warrant” and it is unknown if contraband was found.		% of all probable cause, reasonable suspicion, or warrant searches where it is unknown if contraband was found (excl. EGS stops)	
Stop Outcome		Count of all non-EGS stop outcome rows (may be more than one outcome per stop) where Stop Outcome is unknown		% of all stop outcomes where Outcome is “unknown” (excl. EGS)	
Reported Accidents				Count of all reported accidents	Count of all reported accidents

<b>Race in Reported Accidents</b>		Count of reported accidents where Race is unknown		% of reported accidents where Race is unknown
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Table 14. Field Values Explained for Appendix Table A.3b

<b>Stop Years</b>	<b>Total Stops</b>	<b>Rows Missing Value(s)</b>	<b>% of Rows Missing Value(s)</b>
...	Count of all stops excluding Externally Generated Stops (EGS)	Count of all non-EGS stops where at least one required field values is unknown	% of all non-EGS stops where at least one required field values is unknown

Table 15. Field Values Explained for Appendix Table A.3c

<b>Count of Blank or Unknown Rows</b>	
<i>Total Stop Rows (excl. EGS)</i>	Count of all stops excluding Externally Generated Stops (EGS)
<i>Unknown Stop Reason</i>	Count of all stops where stop reason is unknown
<i>Unknown Stop Outcome</i>	Count of all non-EGS stop outcome rows (may be more than one outcome per stop) where Stop Outcome is unknown
<i>Unknown if Search occurred</i>	Count of all non-EGS stops where search reason is unknown
<i>Unknown if Contraband found subsequent to a search</i>	Count of all non-EGS stops where search reason was one of “probable cause,” “reasonable suspicion,” or “warrant” and it is unknown if contraband was found
<i>Unknown Outcome if contraband found</i>	Count of all non-EGS stops where search reason was one of “probable cause,” “reasonable suspicion,” or “warrant” and contraband was found but stop outcome is unknown
<b>Percentage of Blank or Unknown Rows</b>	
<i>Unknown Stop Reason as % of all stops</i>	% of all stops (incl. EGS) where stop reason is “unknown”
<i>Unknown Stop Outcome as % of all stops</i>	% of all stop outcomes where Outcome is “unknown” (excl. EGS)
<i>Unknown if Search occurred as % of all stops</i>	% of all non-EGS stops where search reason is “unknown”
<i>Unknown if Contraband found as % of all searches</i>	% of all probable cause, reasonable suspicion, or warrant searches where it is unknown if contraband was found (excl. EGS stops)
<i>Unknown Outcome if contraband found as % of all searches</i>	% of all probable cause, reasonable suspicion, or warrant searches where contraband was found but stop outcome is unknown (excl. EGS stops)