



2021 Maryland Seat Belt Usage Report

THIS REPORT WAS PREPARED IN COOPERATION WITH THE
Maryland Department of Transportation
Highway Safety Office
And
U.S. Department of Transportation
National Highway Traffic Safety Administration

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Executive Summary

The National Study Center for Trauma and EMS at the University of Maryland, Baltimore conducted a comprehensive study of seat belt usage in the State of Maryland in June 2021. Seat belt usage data were collected on drivers and front seat outboard passengers observed in a total of 39,847 vehicles at 130 select sites located within 13 jurisdictions of the State. Observed vehicles included passenger cars, vans, sport utility vehicles (SUV), pick-up trucks, and other vehicles below 10,000 pounds of gross vehicle weight. Data were collected on occupants of vehicles traveling on Primary (interstate roadways), Secondary (arterial roadways), and Local roads.

Overall usage rate and standard error (SE) results of the Statewide study, following weighted adjustment by probability of road segment selection and proportion of jurisdiction-level vehicle miles traveled (VMT) and exclusion of unknown observations, were as follows:

	All Vehicles				Passenger Cars/SUVs				Pick-up Trucks		
	Number (N) of Occupants	Usage Rate (%)	SE (%)		N of Occupants	Usage Rate (%)	SE (%)		N of Occupants	Usage Rate (%)	SE (%)
All Roadways	46,717	91.4	0.6		40,480	92.3	0.5		6,237	86.0	1.3
Primary Roads	18,907	93.7	0.6		16,858	94.2	0.5		2,049	88.5	1.5
Secondary Roads	25,123	90.6	0.6		21,293	91.5	0.6		3,830	86.3	1.3
Local Roads*	2,687	84.8	0.0		2,329	87.8	0.0		358	72.8	0.0

*Standard Error = 0% because no more than 1 Local Road was observed per jurisdiction, thus no variability was measured.

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Introduction

The National Highway Traffic Safety Administration (NHTSA) published new Uniform Criteria for State Observational Surveys of Seat Belt Use in Federal Register Vol. 76 No. 63, April 1, 2011, Rules and Regulations, pp. 18042 – 18059. This report represents the tenth year of Maryland's response to the requirement to submit to NHTSA a data collection protocol and resulting observation findings of an annual State survey to estimate passenger vehicle occupant restraint use. This plan is fully compliant with the Uniform Criteria and has been used for the implementation of Maryland's 2021 seat belt survey. Using a consistent method to collect Statewide seat belt information will provide documentation for Maryland and the Nation on the success of occupant protection traffic safety programs.

Maryland is comprised of 24 jurisdictions, including 23 counties and Baltimore City; 13 of these jurisdictions account for about 86% of the passenger vehicle crash-related fatalities according to Fatality Analysis Reporting System (FARS) data averages for the period 2012 to 2014. These data contributed to the selection of roadway observation sites for use during the five-year period from 2017 to 2021 and were therefore employed to assess belt usage for this report. Road segments were mapped according to the latitude and longitude of their midpoints. A selected road segment was identified by an intersection or interchange that occurred within or just beyond the segment. If no intersection or interchange occurred within the segment, any point on that road could be used for observation. Data collection sites were selected such that traffic would be moving during the observation period. Data collection occurred as per the Site Assignment Sheets: at controlled intersections, ramps, overpasses, or on the side of the road. For interstate highways, data collection occurred on a ramp carrying traffic exiting the highway or on the next closest overpass. The observed direction of travel was randomly assigned for each road segment. The locations of the data collection sites were described on Site Assignment Sheets for each jurisdiction and maps were developed to aid the Data Observation Teams and Quality Control (QC) Monitors in traveling to the assigned locations.

Objective

This research initiative used the NHTSA Uniform Criteria for State Observational Surveys of Seat Belt Use to address the following objectives for 2021:

- Develop and implement a strategic process for observing seat belt use in the State of Maryland for drivers and right front seat passengers
- Determine the seat belt usage rate for Maryland
- Develop and implement a strategic process for observing driver's hand-held cell phone use
- Estimate driver's hand-held cell phone usage rate as it relates to seat belt use for Maryland
- Develop and implement a means of Quality Control to ensure that data were collected properly following all survey protocols.

Sampling Methodology

Study Design

All of Maryland's 24 jurisdictions were ranked in descending order of the average number of motor vehicle crash-related fatalities for the period of 2012 to 2014 (Table 1). Data from the FARS were used to determine the average number of crash-related fatalities per jurisdiction. It was determined that 13 jurisdictions accounted for at least 85% of Maryland's total crash-related fatalities during that time period. The 85% threshold is a requirement of the NHTSA Uniform Criteria. These 13 jurisdictions comprise the sample frame (NHTSA Defined) and accounted for 85.8% of Maryland's motor vehicle crash-related fatalities as determined by FARS. The remaining 11 jurisdictions were classified as 'Non-NHTSA Defined' with limited data collection.

*Table 1 - Maryland Average Motor Vehicle Crash-Related Fatalities
by Jurisdiction 2012-2014*

Jurisdiction	Average Fatality Counts (2012-2014)	Fatality Percentage Within Maryland	Cumulative Fatality Percentage
<i>NHTSA Defined</i>			
Prince George's	90.67	19.18	19.18
Baltimore County	63.33	13.40	32.58
Anne Arundel	42.33	8.96	41.54
Montgomery	38.67	8.18	49.72
Baltimore City	29.67	6.28	55.99
Harford	25.00	5.29	61.28
Washington	23.67	5.01	66.29
Frederick	18.00	3.81	70.10
Carroll	17.00	3.60	73.69
Howard	16.00	3.39	77.08
Cecil	15.67	3.31	80.39
Charles	13.00	2.75	83.14
Wicomico	12.33	2.61	85.75

**Table 1 Continued - Maryland Average Motor Vehicle Crash-Related Fatalities
by Jurisdiction 2012-2014**

Jurisdiction	Average Fatality Counts (2012-2014)	Fatality Percentage Within Maryland	Cumulative Fatality Percentage
<i>Non-NHTSA Defined</i>			
St. Mary's	9.67	2.05	87.80
Calvert	9.33	1.97	89.77
Worcester	8.33	1.76	91.54
Queen Anne's	8.33	1.76	93.30
Caroline	8.00	1.69	94.99
Garrett	6.00	1.27	96.26
Dorchester	5.00	1.06	97.32
Allegany	4.67	0.99	98.31
Talbot	3.33	0.71	99.01
Kent	2.33	0.49	99.51
Somerset	2.33	0.49	100.00

Road Segment Selection

After the 13 jurisdictions were identified, and to assure sufficient sample allocation and maintenance of errors below a threshold of 2.5% as mandated by the NHTSA Uniform Criteria, site sample sizes remained at 10 road segments per jurisdiction, for a total of 130 road segments. A probability proportional to size (PPS) sample was employed to select the road segments to be used as observation sites, using segment length as the measure of size (MOS). Maryland exercised the available exclusion option and removed non-public roads, unnamed roads, unpaved roads, vehicular trails, access ramps, cul-de-sacs, traffic circles and service drives from the dataset.

Maryland employed the Topologically Integrated Geographic Encoding and Referencing (TIGER) database from the Census Bureau, as provided by NHTSA, for the selection of road segments. The Maryland Department of Transportation – State Highway Administration estimates the jurisdiction level vehicle miles traveled (VMT) for each jurisdiction by functional class. Sample proportions within each jurisdiction were based on the jurisdictional VMT estimates applied in the creation of the 2017-2021 sample and partitioned relative to the three-way functional class grouping of Primary (interstate highways), Secondary (numbered arterial roadways), and Local/City roads using the TIGER Feature Class Code (MTFCC). A listing of the sample size allocation by jurisdiction and MTFCC classification, along with partitioned VMT estimates obtained as of January 1, 2021 for use as computation weights, is displayed in Table 2.

Table 2 - Roadway Functional Strata by Jurisdiction, Road Segments Population (N), 2021 VMT, and Number of Segments Selected (n)

Jurisdiction		MTFCC Strata			Total
		Primary	Secondary	Local	
Anne Arundel	Segment Frequency (N)	452	3,953	31,090	35,495
	VMT	2,608	2,184	453	5,245
	Sample (n)	5	4	1	10
Baltimore County	Segment Frequency (N)	1,127	4,574	62,958	68,659
	VMT	3,697	2,898	638	7,233
	Sample (n)	5	4	1	10
Carroll	Segment Frequency (N)	14	2,465	24,970	27,449
	VMT	35	963	128	1,126
	Sample (n)	1	8	1	10
Cecil	Segment Frequency (N)	130	2,072	15,888	18,090
	VMT	441	560	140	1,141
	Sample (n)	4	5	1	10
Charles	Segment Frequency (N)	0	3,131	26,350	29,481
	VMT	0	986	117	1,103
	Sample (n)	0	9	1	10
Frederick	Segment Frequency (N)	365	3,302	32,065	35,732
	VMT	1,534	932	315	2,781
	Sample (n)	4	5	1	10
Harford	Segment Frequency (N)	134	2,975	23,352	26,461
	VMT	771	1,243	224	2,238
	Sample (n)	4	5	1	10
Howard	Segment Frequency (N)	233	2,141	25,317	27,691
	VMT	2,141	1,146	353	3,640
	Sample (n)	6	3	1	10
Montgomery	Segment Frequency (N)	797	4,773	36,567	42,137
	VMT	2,569	3,440	546	6,555
	Sample (n)	4	5	1	10
Prince George's	Segment Frequency (N)	568	6,669	57,816	65,053
	VMT	3,976	3,367	647	7,990
	Sample (n)	5	4	1	10
Washington	Segment Frequency (N)	544	2,632	15,987	19,163
	VMT	872	698	227	1,797
	Sample (n)	5	4	1	10
Wicomico*	Segment Frequency (N)	0	2,574	19,631	22,205
	VMT	100	651	92	743
	Sample (n)	0	9	1	10
Baltimore City	Segment Frequency (N)	728	2,869	34,005	37,602
	VMT	1,002	1,735	234	2,971
	Sample (n)	3	6	1	10

*TIGER road segment data do not identify any road segment in Wicomico County as a primary roadway.

The jurisdictional and functional class specific proportions were merged by MTFCC (Primary, Secondary and Local) with the TIGER data containing road segments within each jurisdiction

and corresponding segment length. The list of eligible road segments in each jurisdiction was then sorted by segment length within MTFCC group to obtain an ordered list. Road segments were selected within each jurisdiction and MTFCC functional class with PPS using length as the MOS. Let $c = 1, 2, \dots, C$ be the jurisdiction strata, $h = 1, 2, \dots, H$ be the MTFCC strata, v_{chi} be the length for road segment i in stratum h in jurisdiction c , and $v_{ch} = \sum_{all\ i\ in\ ch} v_{chi}$ be the total length for all road segments in stratum h within jurisdiction c . Then the road segment inclusion probability is: $\pi_{chi} = n_{ch}v_{chi}/v_{ch}$, where n_{ch} is the sample size for the roadway stratum h that was allocated within jurisdiction c . In Maryland, there were no roadway segments whose MOS was equal to or exceeded v_{ch}/n_{ch} ; therefore, no roads were selected with certainty. SAS procedure SURVEYSELECT, with MOS and probability vector as described above, was used to obtain the road segment samples with PPS by three-way functional class grouping within each jurisdiction.

Reserve Site Selection

Maryland also identified reserve data collection sites. These sites were used in the event that a pre-identified site was unavailable due to temporary or permanent circumstances. Reserve road segments consisted of up to five additional road segments per original road segment selected, resulting in a reserve sample of 195 road segments. The reserve segments were also selected with PPS, stratifying by MTFCC within jurisdiction and using segment length as MOS; this was the same approach that was used to select all other roadway segments. Thus, for the purposes of data weighting, the reserve road segment inherited all probabilities of selection and weighting components up to and including the road segment stage of selection from the original road segments actually selected. Probabilities and weights for any subsequent stages of selection (e.g., the sampling of vehicles) were determined by the reserve road segment itself.

Table 3 outlines the survey methodology details used in Maryland in 2021.

Table 3 - Methodology Summary Chart

Methodology	Multistage Stratified Cluster Design with Probability Proportional to Size Sampling		
Sources of Samples	2021 revised methodology, approved by Maryland Highway Safety Office (MHSO) and NHTSA; 2016 TIGER data developed by the U.S. Census Bureau based on the MAF/TIGER Feature Class Code (MTFCC)		
Geographic Coverage	State of Maryland		
Site Roadway Classification	Based on the VMT estimate for each jurisdictional roadway type: Primary, Secondary, Local		
Number of Sites		<i>NHTSA Defined</i>	<i>Non-NHTSA Defined</i>
	<i>Primary</i>	46	2
	<i>Secondary</i>	71	22
	<i>Local/City</i>	13	9
	TOTALS	130	33
Survey Period	June 6, 2021 – June 12, 2021		
Observation Duration Per Site	<i>Primary</i> : 20-minute survey <i>Secondary</i> : 40-minute survey <i>Local/City</i> : 60-minute survey		
Sample Size	39,847 vehicles		

Sampling Weights

The following is a summary of the notation used in this section:

- c* – Subscript for jurisdiction (PSU)
- h* – Subscript for road segment strata
- i* – Subscript for road segment
- j* – Subscript for time segment
- k* – Subscript for road direction
- l* – Subscript for lane
- m* – Subscript for vehicle
- n* – Subscript for front seat occupant

Under this stratified multistage sample design, the inclusion probability for each observed vehicle was the product of selection probabilities at all stages: π_c for jurisdiction, $\pi_{hi|c}$ for road segment, $\pi_{j|chi}$ for time segment, $\pi_{k|chij}$ for direction, $\pi_{l|chij}$ for lane, and $\pi_{m|chijl}$ for vehicle. The overall vehicle inclusion probability was:

$$\pi_{chijklm} = \pi_c \pi_{hi|c} \pi_{j|chi} \pi_{k|chij} \pi_{l|chij} \pi_{m|chijl}$$

The sampling weight (design weight) for vehicle m was:

$$w_{chijklm} = \frac{1}{\pi_{chijklm}}$$

Non-response Adjustment

Given the data collection protocol described in this plan, including the provision for the use of alternate observation sites, road segments with nonzero eligible volume and yet zero observations conducted should be a rare event. Nevertheless, if eligible vehicles passed an eligible site or an alternate eligible site during the observation time but no usable data were collected for some reason, then this site was considered as a “non-responding site.” The weight for a non-responding site was distributed over other sites in the same road type in the same PSU.

Let:

$$\pi_{chi} = \pi_c \pi_{hi|c}$$

be the road segment selection probability, and

$$w_{chi} = \frac{1}{\pi_{chi}}$$

be the road segment weight. The non-responding site non-response adjustment factor

$$f_{ch} = \frac{\sum_{all\ i} w_{chi}}{\sum_{responding\ i} w_{chi}}$$

would be multiplied by all weights of non-missing road segments of the same road type in the same jurisdiction and the missing road segments would be dropped from the analysis file. However, if no vehicles passed the site during the selected observation time (either 20, 40 or 60 minutes), then this site was simply an empty block; the site would not be considered as a non-responding site and would not require non-response adjustment.

Estimators

Noting that all front seat occupants were observed, let the driver/passenger seat belt use status be:

$$y_{chijklmn} = \begin{cases} 1, & \text{if belt used} \\ 0, & \text{otherwise} \end{cases}$$

VMT data were available for Maryland jurisdictions at the functional class level. Hence, the seat belt use rate estimator was a ratio estimator with VMT weights:

$$p_{VMT} = \frac{\sum_c \sum_h VMT_{ch} p_{chi}}{\sum_c \sum_h VMT_{ch}}$$

Here VMT_{ch} is the VMT for functional class h in jurisdiction c . Assuming that all vehicles observed at the same road segment i have equal probability for being selected, then the road segment level seat belt use rate p_{chi} can be reduced to the following:

$$p_{chi} = \frac{\sum_{all\ i\ in\ ch} w_{chi} y_{chijklmn}}{\sum_{all\ i\ in\ chi} w_{chi}}$$

where w_{chi} is the road segment selection weight.

Sample Size

A standard error of less than 2.5% for the seat belt use estimates is required by NHTSA Uniform Criteria. From 1999-2011, Maryland conducted the Annual Seat Belt Use Study and historically obtained standard errors well below this threshold (e.g., 0.4%, 0.4% and 0.5% in the most recent three years) via observed sample sizes of approximately 58,000-73,000 motor vehicle front seat occupants. These observed sample sizes were obtained from previous sample designs using 12 jurisdictions and 1-16 road segments per jurisdiction. The roadway set was revised in 2012, and again five years later in 2017, as required by the Uniform Criteria. From 2012 to 2017, the average annual number of observed occupants with known seat belt use hovered just below 50,000, with an average standard error of 0.6%. In 2020, despite the complications offered by the COVID-19 pandemic, 48,832 front seat occupants with known belt use were observed with a standard error of 0.7%. Thus, the sample size with known belt use for the 2021 seat belt use survey sample was projected to be approximately 45,000 to 50,000 occupants.

Data Collection

Data Collection Team Training and Quality Control

As described in the FFY2021 grant application to the MHSO, the NSC was planning to conduct the training as had been done in previous years. However, in February 2021, the NSC was informed by MHSO that *“the MHSO will assume training and quality control responsibilities for Maryland’s seatbelt survey. The MHSO would like for NSC to coordinate the annual certification of our seat belt survey results and to coordinate site selection for FFY 2022. Staff from the NSC are more than welcome to attend training sessions or quality control checks.”* To facilitate this change, the NSC developed a “train the trainer” manual and power point presentation and conducted a training session for the MHSO staff. Later, the NSC attended the on-line and in-person training sessions of the Data Collection Teams that were conducted by the MHSO, offering input when appropriate. The NSC was also preparing to conduct quality control site visits; however, after much discussion, the MHSO decided prior to the start of the observations that QC checks would be conducted by in-house staff only. It was agreed that the QC forms would be sent to the NSC for review upon the completion of the site visit.

Data Collection Agent

The MHSO hired the same contractor as in 2020 to conduct the data collection in an accurate, timely, and efficient manner. That contractor, known as the Data Collection Agent (DCA), was responsible for:

- hiring and retaining observers for the duration of the survey period;
- observing and recording seat belt use data at 130 designated seat belt observation sites;
- collecting the resulting data and submitting the data to the MHSO or its designated data analysis partner (the NSC); and
- responding to any questions from the MHSO or NHTSA concerning the hiring, observation, and reporting processes.

Data Collection Teams

Each Data Collection Team (DCT) was comprised of a Data Observer and a Data Recorder. The Data Observer was responsible for observing the flow of traffic and spotting, or calling out, vehicle seat belt observation information. The Data Recorder was responsible for documenting and recording the data as observed on the Maryland Seat Belt Observation Form. Observation at each site was conducted by a complete DCT consisting of both members.

Data Collection Lanes

Before starting the actual data collection at a particular site or Observation Post, the DCT determined, through observation, the traffic flow and number of lanes that could be observed without error. The Data Observer observed, at a minimum, the right-most lane on the roadway. If traffic was light enough to survey an additional lane(s), the team may have done so, provided that 100% of the traffic in the observed lanes was recorded for the duration of the survey at that site. Each DCT was requested to observe more than one lane when possible; in previous years, observation of a single lane at some sites led to small sample sizes.

Only one direction of traffic was observed at any given site unless otherwise noted on the Site Assignment Sheet (pre-determined roads may have required observation in both directions of travel). The direction of travel was predetermined and identified on the Site Assignment Sheet. If an intersection contained a turning lane, the DCT was instructed to strategically move its location so that the traffic in the turning lane could be included in the count. Should the site not allow for the collection team to move due to safety concerns, the DCT observed both the turn lane and the next right-most lane.

Vehicles and Occupants

Directions given to the DCT to observe belt usage included:

- Stand on the right-hand curb or roadside of the selected roadway as directed on the Site Assignment Sheet
- Face the assigned direction of traffic
- Never stand in any traffic lane
- Look for the vehicle “B-pillar,” integrated seat belt or seat back mount to determine if the belt is being utilized.

All passenger vehicles with a gross vehicle weight up to 10,000 pounds were observed in the survey. The target population included all drivers and right front seat passengers.

The only right front seat occupants excluded from this study were child passengers who were traveling in child passenger safety seats with harness straps. If a child in the right front seat was in a child passenger safety seat, the DCT did not record anything, treating the observation as if

that seat was empty. If there was more than one front seat passenger, only the driver and the outboard passenger seating positions were observed.

If the vehicle was equipped with shoulder belts, but they appeared to be improperly used, the person was considered to be NOT belted.

Unknowns

Maryland developed a structure for the inclusion of unknowns in its observation counts. Data Observers and Recorders were instructed to report known belt use only if they were absolutely sure that the occupant was or was not wearing his/her seat belt; otherwise, belt use was to be reported as unknown. Unknowns included any individual in the front seat of a motor vehicle who could not be identified as being properly or improperly restrained.

Classic cars were counted only if the DCT could directly observe the use of a lap belt, as these vehicles were manufactured prior to the legislative mandate requiring vehicles to have both lap and shoulder belt harness systems. If the lap belt could not be seen, these vehicles were excluded and not documented as unknowns.

Site Locations

Maps displaying the locations of all observation sites were provided to each DCT and Quality Control (QC) Monitor on Site Assignment Sheets. Each jurisdiction had a Site Assignment Sheet with an overview of all sites within that set. Site Assignment Sheets indicated the observed road name, the crossroad included within the road segment (or nearest crossroad), assigned date, assigned time, and written directions. A detailed map was included for the observation teams, marking the Observation Post and the direction of traffic to be observed. In addition, each DCT was provided with XY coordinates indicating where to stand to conduct the observations.

Sites within relatively close geographic proximity were assigned as data collection clusters (Site Set). The first site within each cluster was assigned a random day and time for completion. All other sites within a cluster were then assigned to the same day to minimize travel costs.

Pre-Survey Site Modifications / Changes:

- Citing safety concerns, the DCA Requested that certain Baltimore City, Howard County, and Wicomico County sites be modified or changed. With the approval of NHTSA and MHSO, a meeting with both MHSO and the DCA resulted in the following changes:
 - Baltimore City Site A-A, I-895 North at Frankfurst Ave and the Toll Plaza Building, was still under construction in 2021. Therefore, the reserved road segment site used in 2020 was used again in 2021.
 - New locations from the reserve segments were selected for Baltimore City (A-C, A-D, B-B and B-C) and Howard County (B-E).
 - Observation locations were shifted for Baltimore City (A-B, A-E), Howard County (A-D, B-D), and Wicomico County (A-B, A-D).

Scheduling and Rescheduling

All seat belt observations were conducted during daylight hours. The schedule included rush hour (before 9:30 AM, after 3:30 PM) and non-rush hour observation times. It was anticipated that fewer than 60 minutes of observation would provide sufficient sample sizes for highways and arterial roads. Thus, data collection was conducted for 20 minutes (Primary), 40 minutes (Secondary), or 60 minutes (Local) at each site, depending on road classification. Multiple sites were scheduled each day. In 2021, the MHSO authorized the observations to be conducted Sunday through Saturday, as opposed to Monday through Sunday, which had been the schedule during each of the previous four years. There were a few occasions where the teams were delayed in their start times due to circumstances beyond their control, such as increased traffic.

Data Collection Forms

Observation Form Cover Sheet

The Observation Form Cover Sheet was designed to allow for documentation of descriptive site information, such as date, site location, jurisdiction, start and end times for observation, weather conditions, and more. The Cover Sheet was completed by the DCT at each site before data collection began.

Data Collection Sheet(s)

Scantron Data Collection Sheet(s) were used to record seat belt use by drivers and right front seat passengers, and hand-held cell use by drivers for up to 100 vehicles per sheet. Multiple sheets were used for each site if needed.

Observation Form Summary Sheet

The Observation Summary Sheet was used to certify complete and accurate data submission by the DCA as well as to document any comments or concerns related to the site.

Quality Control

As stated earlier, the MHSO made the decision that QC checks would be conducted by in-house staff only and the QC forms would be sent to the NSC for review upon the completion of the site visit. During these visits, the QC Monitors used standardized forms to document and evaluate Maryland's process. On one form, the QC monitor indicated that he allowed the DCT to conduct the survey north of the selected intersection, as it was a safer location and involved the same traffic. On another occasion, it was noted that a site was particularly difficult due to the height of the bridge, the lighting, and the speed of the traffic and probably should not be used again. In response to another QC check, the NSC asked that the teams be reminded that observers may observe additional lanes provided they are able to capture 100% of the vehicles in those lanes.

Data Entry

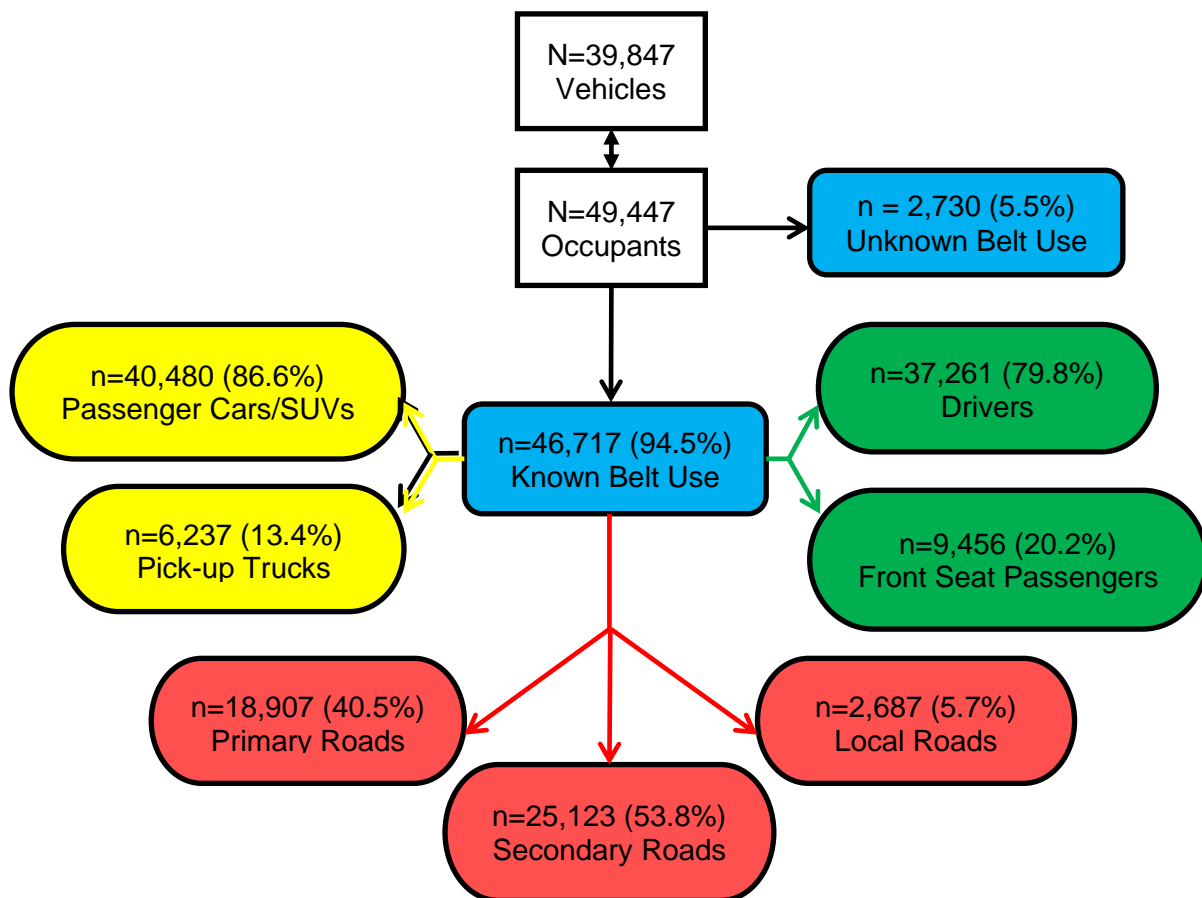
The DCTs inserted all completed data collection forms into the provided Jurisdiction/Site Set envelope and submitted it to the DCA. The DCA forwarded the envelopes to the NSC (designated analysis partner) upon completion of all observations, where (1) formal data entry and QC processes were outlined and (2) databases were designed for the capture of both summary figures and individual record-level data. Trained NSC staff members scanned the Scantron data collection sheets, noting any QC concerns.

Results

NHTSA Sites – Occupants

A total of 39,847 motor vehicles (i.e., passenger cars, sport utility vehicles (SUVs), and pick-up trucks) with 49,447 front seat occupants were observed within the 13 sampled jurisdictions (Figure 1). These totals represented decreases of 5.2% in the number of motor vehicles and 5.7% in the number of front seat occupants observed in the 2020 survey, mostly due to the observation of fewer lanes at several sites. Known seat belt use was ascertained for 46,717 (94.5%) of the occupants, of whom 37,261 (79.8%) were drivers and 9,456 (20.2%) were right front seat passengers.

*Figure 1 – Study Population
Flowchart of Vehicle and Occupant Observations*



Of the 46,717 drivers and right front seat passengers with known seat belt usage, 40,480 (86.6%) were occupants of passenger cars or SUVs and 6,237 (13.4%) were occupants of pick-up trucks. Most of the 46,717 occupants were observed on arterial Secondary roads (n=25,123, 53.8%) as opposed to Interstate/Primary roadways (n=18,907, 40.5%) or Local roads (n=2,687, 5.7%). This differential was expected, as 71 (55%) of the observed sites were located on Secondary roadways.

Data collection by jurisdiction (Table 4) indicated that the largest number of occupants were observed in Howard County (n=5,822) and the fewest were observed in Charles County (n=2,370). The average number of occupants observed per jurisdiction with known seat belt usage was 3,594.

Table 4 – Number of Front Seat Occupants Observed With Known Seat Belt Use by NHTSA-Surveyed Jurisdiction of Maryland

Jurisdiction	Number Observed
Howard	5,822
Montgomery	4,810
Harford	4,800
Anne Arundel	4,299
Baltimore Co	3,760
Washington	3,470
Frederick	3,319
Carroll	2,989
Wicomico	2,934
Cecil	2,800
Baltimore City	2,719
Prince George's	2,625
Charles	2,370

NHTSA Sites – Weighted Analysis

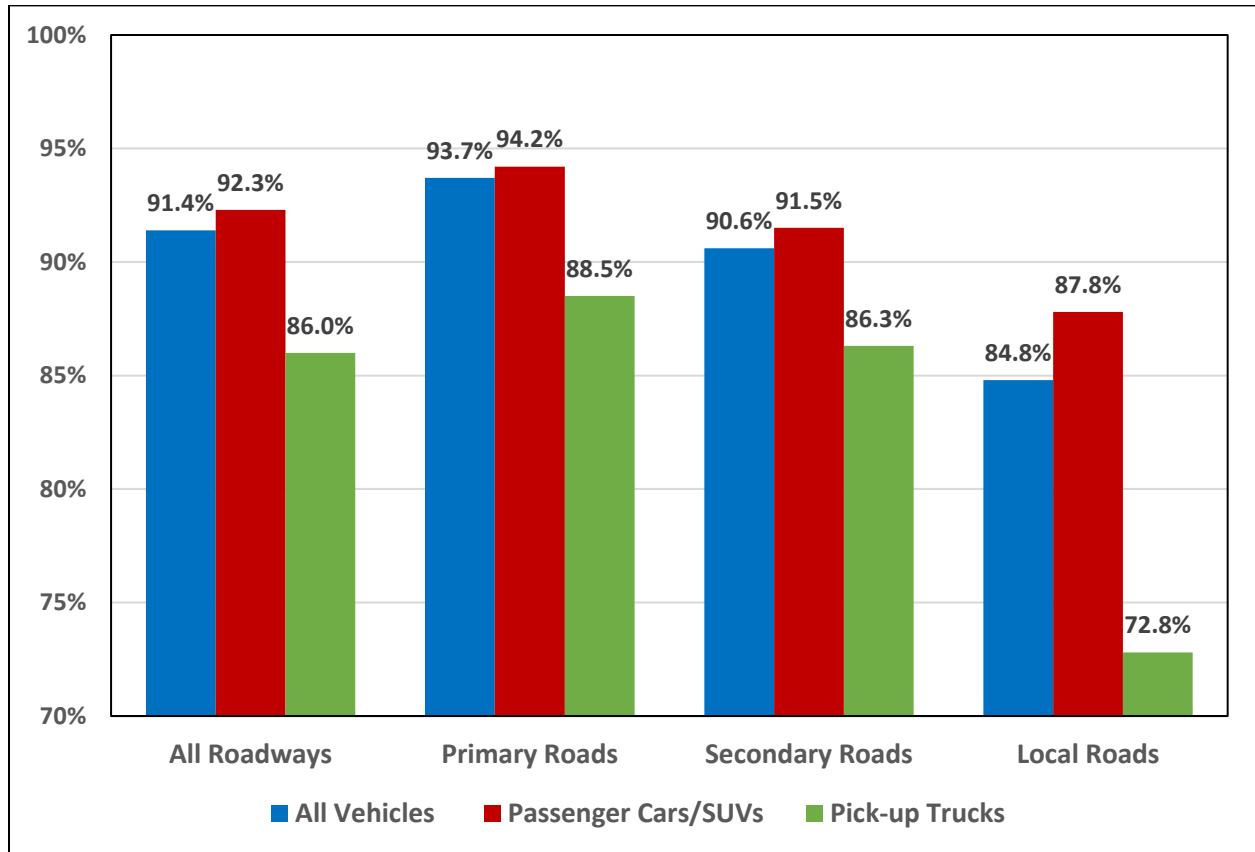
The overall seat belt usage rate among the 13 sampled jurisdictions for all drivers and right front seat passengers, weighted by probability of roadway selection and jurisdictional roadway specific VMT, was 91.4% (Table 5, Figure 2). Weighted usage rates were higher for occupants of passenger cars or SUVs (92.3%) than for occupants of pick-up trucks (86.0%). The overall weighted standard error rate of 0.6% was well below the 2.5% threshold required by NHTSA, yielding a 95% confidence interval of 90.2% to 92.6% for the combined usage rate. Relative to the data collected for passenger cars, the standard error rate for pick-up trucks was much higher (1.3% vs. 0.5%) but was still below the 2.5% NHTSA limit.

Vehicle occupants were more likely to use seat belts on Interstate/Primary roadways as opposed to Secondary roads and Local roads. Approximately 93.7% of drivers and passengers observed on Primary roadways were belted. This proportion fell to 90.6% on Secondary roads and 84.8% on Local roads. Front seat occupants of passenger cars or SUVs had higher rates than corresponding occupants of pick-up trucks on Primary roads (94.2% vs. 88.5%, respectively), Secondary roads (91.5% vs. 86.3%), and Local roads (87.8% vs. 72.8%).

**Table 5 – 2021 Weighted Usage Rates in NHTSA-Surveyed Jurisdictions of Maryland Overall,
by Vehicle Type and by Roadway
All Front Seat Occupants Combined With Known Seat Belt Use**

All Vehicles					
				95% CI	
	N	Usage Rate (%)	SE (%)	Lower Limit (%)	Upper Limit (%)
All Roadways	46,717	91.4	0.6	90.2	92.6
Primary Roads	18,907	93.7	0.6	92.5	94.9
Secondary Roads	25,123	90.6	0.6	89.4	91.8
Local Roads*	2,687	84.8	0	N/A	N/A
Passenger Cars/SUVs					
				95% CI	
	N	Usage Rate (%)	SE (%)	Lower Limit (%)	Upper Limit (%)
All Roadways	40,480	92.3	0.5	91.3	93.3
Primary Roads	16,858	94.2	0.5	93.2	95.2
Secondary Roads	21,293	91.5	0.6	90.3	92.7
Local Roads*	2,329	87.8	0.0	N/A	N/A
Pick-up Trucks					
				95% CI	
	N	Usage Rate (%)	SE (%)	Lower Limit (%)	Upper Limit (%)
All Roadways	6,237	86.0	1.3	83.5	88.5
Primary Roads	2,049	88.5	1.5	85.6	91.4
Secondary Roads	3,830	86.3	1.3	83.8	88.8
Local Roads*	358	72.8	0.0	N/A	N/A
*Standard Error = 0% because no more than 1 Local Road was observed per jurisdiction, thus no variability was measured.					

Figure 2 - Usage Rate by Vehicle Type and Roadway Following Adjustment for Probability of Road Segment Selection and Vehicle Miles Traveled (VMT)



The 2021 Maryland weighted seat belt usage rate increased by 1.5 percentage points over the previous year (Table 6 and Figures 3 and 4). Relevant to 2020, higher seat belt usage rates in 2021 were prevalent across the board, i.e., for passenger cars/SUVs (+1.4), pick-up trucks (+1.0), Primary roadways (+1.9), Secondary roadways (+1.0), and Local roadways (+4.2). An examination of usage rates over the most recent two-year period indicated that pick-up trucks experienced the largest increase (+2.4) and Local roadways experienced the only decrease (-3.0) since 2019.

Table 6- Change From 2019 to 2021 in Weighted Seat Belt Usage by Vehicle Type & Roadway

	2019	2020	2021	Change in Rate 2020-2021	Change in Rate 2019-2021
All Vehicles	90.4%	89.9%	91.4%	+1.5%	+1.0%
Cars/SUVs	91.3%	90.9%	92.3%	+1.4%	+1.0%
Trucks	83.6%	85.0%	86.0%	+1.0%	+2.4%
Primary Roads	91.6%	91.8%	93.7%	+1.9%	+2.1%
Secondary Roads	89.6%	89.6%	90.6%	+1.0%	+1.0%
Local Roads	87.8%	80.6%	84.8%	+4.2%	-3.0%

Figure 3 - Comparison from 2019 to 2021 of Weighted Seat Belt Usage Rates by Vehicle Type

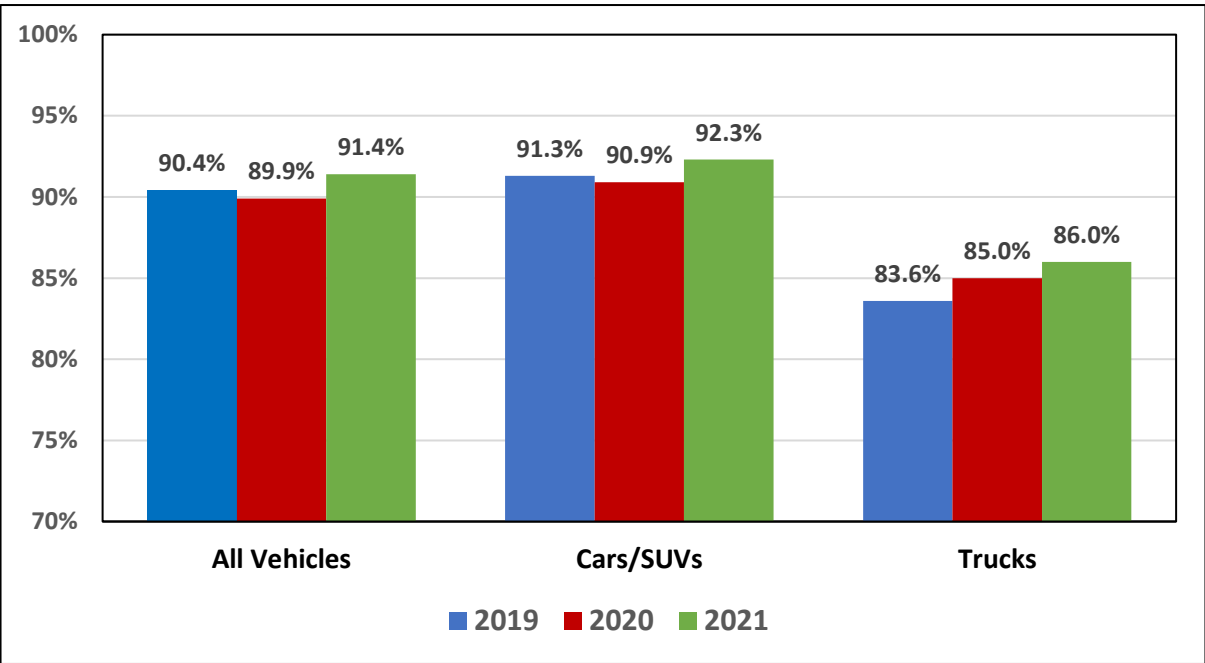
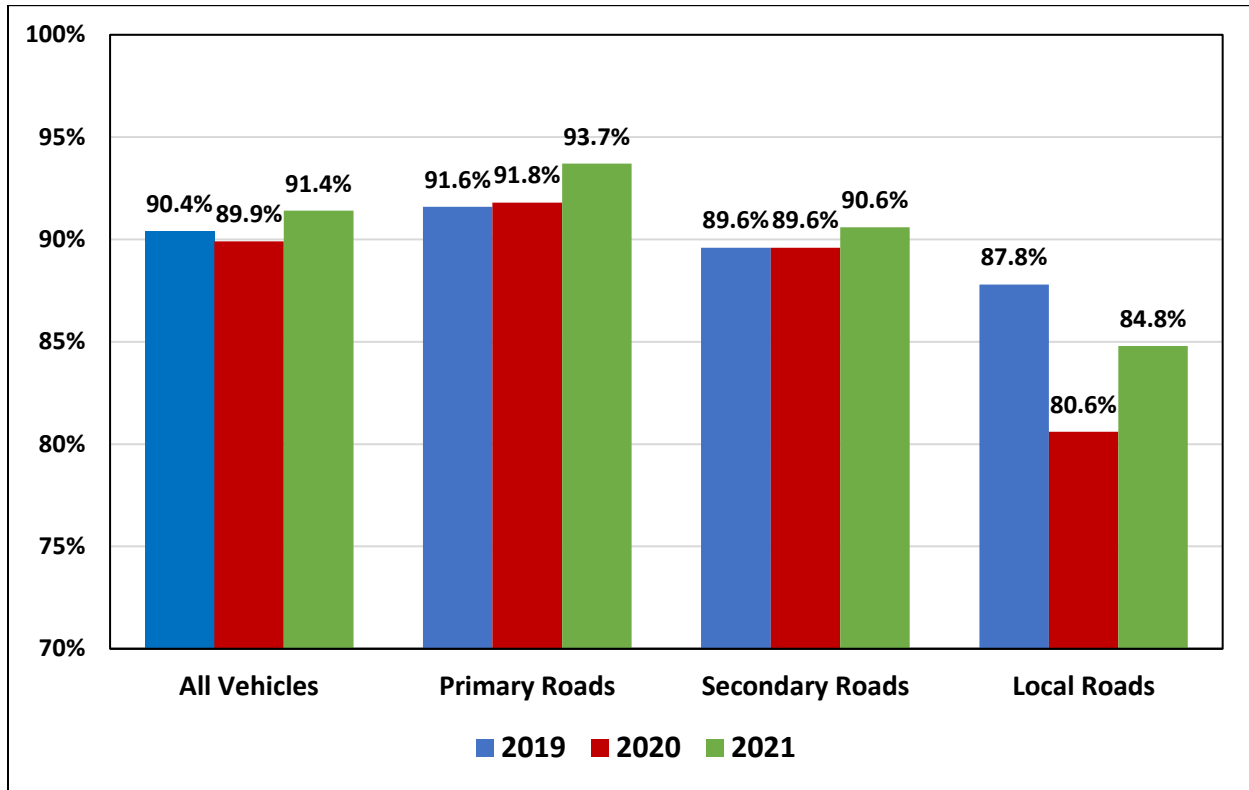


Table 7 contains a list of weighted belt use and standard error rates by jurisdiction for all vehicles combined. Eight (61.5%) of the 13 jurisdictions had seat belt usage rates of at least 90%. The highest seat belt usage rates were found in Harford County (95.5%), Montgomery County (95.1%) and Baltimore City (94.7%), while Carroll (87.6%), Washington (87.4%) and Wicomico (83.0%) counties had the three lowest rates. Jurisdictional standard error rates ranged from a low of 0.1% in Harford County to a high of 1.1% in Wicomico County.

Figure 4 - Comparison from 2019 to 2021 of Weighted Seat Belt Usage Rates by Roadway Type



Jurisdictional usage rates of occupants observed in passenger cars or SUVs were at least 90% in 10 (76.9%) of the 13 jurisdictions (see Table 7). Harford County (96.1%), Montgomery County (96.0%) and Baltimore City (95.0%) had the highest usage rates among occupants of cars/SUVs, while Baltimore (89.5%), Prince George’s (89.5%) and Wicomico (87.6%) counties had the lowest rates. The lowest standard error rate of 0.1% occurred in Harford County; Baltimore County had the highest error rate (0.9%).

For occupants of pick-up trucks, two (15.4%) of the 13 jurisdictions had usage rates above 90%. The highest rates were found in Harford County (92.9%), Cecil County (90.6%) and Baltimore City (89.8%) (see Table 7). Overall, there were eight jurisdictions with rates between 80% and 90%, with Washington (76.1%), Carroll (72.2%) and Wicomico (69.2%) counties owning the only rates below 80%. The standard error rate for trucks ranged from a low of 0.4% in Harford County to a high of 2.3% in Wicomico County.

**Table 7 - 2021 Weighted Usage Rates in NHTSA-Surveyed Jurisdictions of Maryland by Jurisdiction and Vehicle Type
All Front Seat Occupants Combined With Known Seat Belt Use**

		All Vehicles			Passenger Cars/SUVs			Pick-up Trucks	
	VMT	Usage Rate*	SE		Usage Rate	SE		Usage Rate	SE
All 13 Jurisdictions	44,563	91.4%	0.6%		92.3%	0.5%		86.0%	1.3%
Harford	2,238	95.5%	0.1%		96.1%	0.1%		92.9%	0.4%
Montgomery	6,555	95.1%	0.5%		96.0%	0.4%		89.2%	1.2%
Baltimore City	2,971	94.7%	0.4%		95.0%	0.4%		89.8%	1.2%
Howard	3,640	93.3%	0.7%		93.6%	0.7%		87.8%	1.5%
Cecil	1,141	92.6%	0.3%		92.2%	0.2%		90.6%	1.4%
Anne Arundel	5,245	92.4%	0.5%		93.1%	0.4%		88.7%	1.1%
Frederick	2,781	91.7%	0.8%		92.9%	0.7%		87.0%	1.2%
Charles	1,103	90.6%	0.2%		92.5%	0.2%		83.3%	0.6%
Prince George's	7,990	89.1%	0.4%		89.5%	0.4%		86.2%	1.0%
Baltimore Co	7,233	88.7%	0.8%		89.5%	0.9%		82.1%	1.9%
Carroll	1,126	87.6%	0.6%		91.0%	0.4%		72.2%	1.7%
Washington	1,797	87.4%	0.5%		91.4%	0.4%		76.1%	1.4%
Wicomico	743	83.0%	1.1%		87.6%	0.8%		69.2%	2.3%

* Jurisdictional usage rates are sorted in descending order for all vehicles combined.

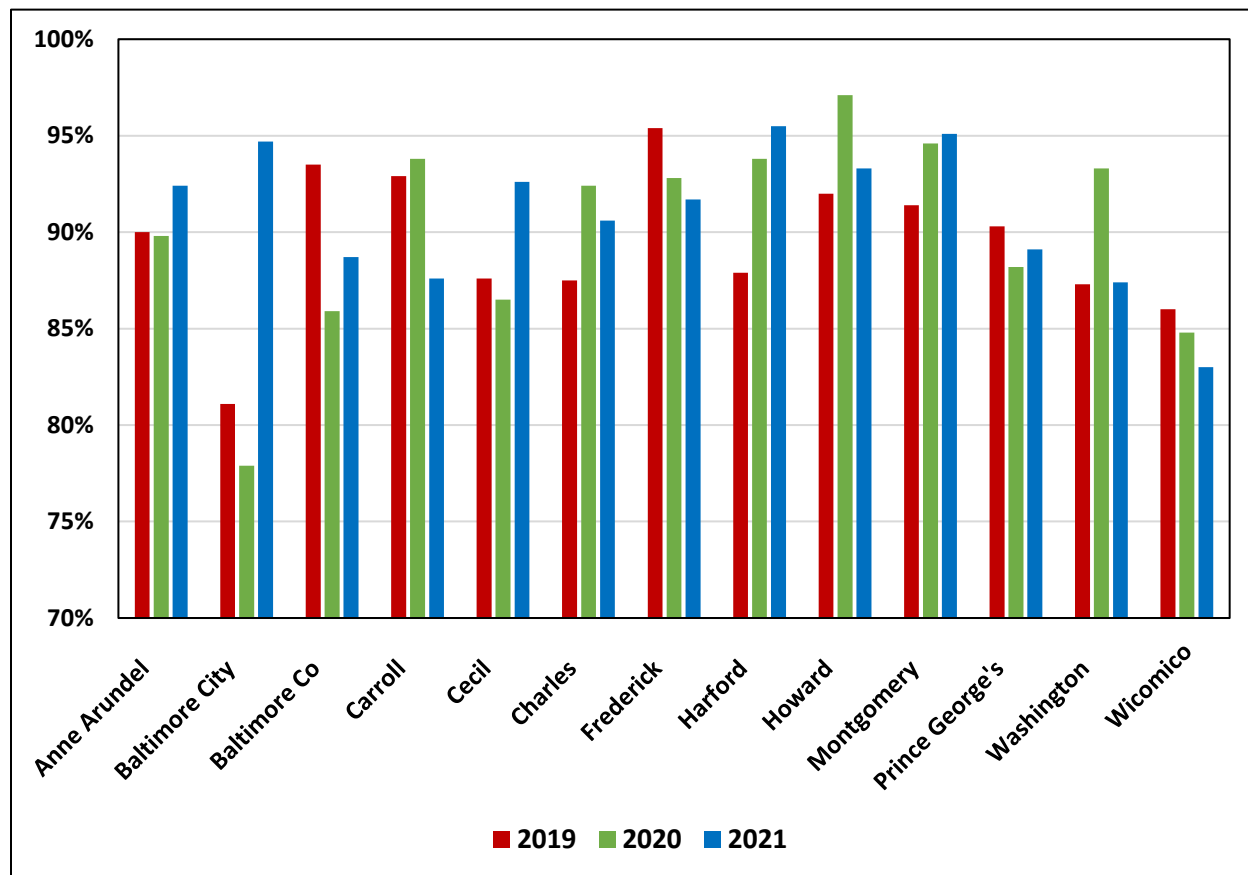
Jurisdictional changes in weighted rates over time are documented in Table 8 and Figure 5. Seven (53.8%) of the 13 jurisdictions experienced an increase in usage rate over the previous year, with Baltimore City (+16.8 percentage points) and Cecil County (+6.1) experiencing the biggest gains. The largest declines occurred in Carroll (-7.6) and Washington (-5.9) counties. Eight (61.5%) of the 13 jurisdictions experienced an increase in rates over the previous two years, led by Baltimore City (+13.6) and Harford (+7.6) County. Carroll (-5.3) and Baltimore (-4.8) counties experienced the largest decreases in rates since 2019. Overall, three jurisdictions had a rate that was consistently higher than the statewide rate each year since 2019 (Frederick, Howard, and Montgomery).

The large increase in rates for Baltimore City, which often exhibits some of the lowest rates in the state, may be partially due to the exchange of four originally sampled Secondary roadways with four reserve roads in 2021. The original roads were replaced in response to safety concerns, but the safer reserve road observation sites were located in more affluent areas with a different racial distribution than in the original sites, possibly affecting the observed usage rate. Census tract data indicated a 70% higher median income level and fewer than half as many African Americans for three reserve sites relative to their original roadways.

Table 8 - Changes Between 2019 and 2021 in Weighted Seat Belt Usage by Jurisdiction

Jurisdiction	2019	2020	2021	Change in Rate 2020-2021	Change in Rate 2019-2021
All 13 Jurisdictions	90.4%	89.9%	91.4%	+1.5%	+1.0%
Anne Arundel	90.0%	89.8%	92.4%	+2.6%	+2.4%
Baltimore City	81.1%	77.9%	94.7%	+16.8%	+13.6%
Baltimore Co	93.5%	85.9%	88.7%	+2.8%	-4.8%
Carroll	92.9%	93.8%	87.6%	-6.2%	-5.3%
Cecil	87.6%	86.5%	92.6%	+6.1%	+5.0%
Charles	87.5%	92.4%	90.6%	-1.8%	+3.1%
Frederick	95.4%	92.8%	91.7%	-1.1%	-3.7%
Harford	87.9%	93.8%	95.5%	+1.7%	+7.6%
Howard	92.0%	97.1%	93.3%	-3.8%	+1.3%
Montgomery	91.4%	94.6%	95.1%	+0.5%	+3.7%
Prince George's	90.3%	88.2%	89.1%	+0.9%	-1.2%
Washington	87.3%	93.3%	87.4%	-5.9%	+0.1%
Wicomico	86.0%	84.8%	83.0%	-1.8%	-3.0%

Figure 5 - Comparison from 2019 to 2021 of Weighted Seat Belt Usage Rates by Jurisdiction



NHTSA Sites - Unweighted Analysis

An unweighted analysis of seat belt rates was conducted for subgroups of the observed sample that were not examined by probability of selection and VMT weights. These subgroups included drivers only, passengers only, and jurisdiction-specific roadway types.

Approximately 92.8% of all drivers were belted (Table 9). Belt use among drivers was more likely to occur in passenger cars or SUVs (93.7%) than in pick-up trucks (86.7%). Drivers were more likely to be belted on Primary roads (94.2%) than on Secondary roads (91.7%) or Local roads (92.9%). Drivers in cars had the same usage rate on Primary and Local roads (94.7), but truck drivers were more likely to be belted on Primary roads (89.9%) than on Secondary roads (85.6%) or Local roads (81.1%).

A slightly higher proportion of passengers than drivers were belted overall (93.4%). As for drivers, passengers had a higher usage rate in passenger cars/SUVs (94.3%) than in trucks (87.4%). Passengers were more likely to be belted on Primary roads (95.0%) and Local roads (93.9%) than on Secondary (92.0%). This difference in roadway usage rates remained if the

passenger was in a car (95.4% vs. 95.0% vs. 93.2% for Primary vs. Local vs. Secondary) or in a truck (91.2% vs. 87.0% vs. 85.2%).

The data in Table 9 indicate that, with the exception of trucks on Secondary roadways, 2021 usage rates among passengers were higher than usage rates among drivers in every category.

**Table 9 - 2021 Unweighted Usage Rates in NHTSA-Surveyed Jurisdictions of Maryland Overall, by Vehicle Type and by Roadway Classification
Known Seat Belt Use by Front Seat Occupant Status**

	All Vehicles		Passenger Cars/SUVs		Pick-up Trucks	
	N	Usage Rate	N	Usage Rate	N	Usage Rate
DRIVERS Only						
All Roadways	37,261	92.8%	32,243	93.7%	5,018	86.7%
Primary Roads	14,861	94.2%	13,232	94.7%	1,629	89.9%
Secondary Roads	20,254	91.7%	17,146	92.8%	3,108	85.6%
Local Roads	2,146	92.9%	1,865	94.7%	281	81.1%
PASSENGERS Only						
All Roadways	9,456	93.4%	8,237	94.3%	1,219	87.4%
Primary Roads	4,046	95.0%	3,626	95.4%	420	91.2%
Secondary Roads	4,869	92.0%	4,147	93.2%	722	85.2%
Local Roads	541	93.9%	464	95.0%	77	87.0%

Analysis by jurisdiction indicated that seat belt usage rates for all occupants and all vehicle types combined were higher on Primary roads than on Secondary or Local roads in nine (81.8%) out of 11 jurisdictions having observations available on Primary roads (Table 10). Similarly, for cars or SUVs, seven (63.6%) of the 11 jurisdictions had higher usage rates on Primary roadways, and seven (63.6%) jurisdictions had higher rates on Primary roads for trucks. Though sample sizes were small, 100% belt use was observed among truck occupants on Local roads in three jurisdictions (Baltimore City, Montgomery County and Prince George’s County). However, the single truck occupant observed on a Local road in Baltimore County was not belted, yielding a 0% usage rate.

A color-coded map of weighted rates by NHTSA jurisdiction is displayed in Figure A1 of the Appendix.

**Table 10 – 2021 Unweighted Usage Rates in NHTSA-Surveyed Jurisdictions of Maryland by Vehicle Type and Roadway Classification Within Jurisdiction
All Front Seat Occupants Combined With Known Seat Belt Use**

Jurisdiction	# of Sites	Roadway Classification	Unweighted Seat Belt Usage Rates		
			All Vehicles	Passenger Cars/SUVs	Pick-up Trucks
Anne Arundel	5	Primary	95.1%	95.4%	93.3%
Anne Arundel	4	Secondary	92.2%	92.9%	88.4%
Anne Arundel	1	Local	89.2%	89.8%	86.7%
Baltimore City	3	Primary	99.2%	99.2%	98.4%
Baltimore City	6	Secondary	90.1%	90.8%	82.5%
Baltimore City	1	Local	99.0%	98.9%	100.0%
Baltimore Co	5	Primary	94.3%	94.6%	90.6%
Baltimore Co	4	Secondary	91.5%	92.3%	87.2%
Baltimore Co	1	Local	60.0%	66.7%	0.0%
Carroll	1	Primary	97.1%	99.1%	87.5%
Carroll	8	Secondary	92.2%	94.0%	83.6%
Carroll	1	Local	85.5%	86.6%	75.0%
Cecil	4	Primary	95.9%	95.9%	95.8%
Cecil	5	Secondary	95.3%	96.0%	90.8%
Cecil	1	Local	71.4%	66.7%	75.0%
Charles	9	Secondary	90.4%	91.9%	84.7%
Charles	1	Local	88.0%	93.2%	74.1%
Frederick	4	Primary	91.2%	91.4%	90.4%
Frederick	5	Secondary	90.5%	91.6%	85.0%
Frederick	1	Local	89.1%	97.2%	60.0%
Harford	4	Primary	98.5%	98.7%	96.4%
Harford	5	Secondary	94.6%	95.2%	91.3%
Harford	1	Local	90.1%	92.9%	83.6%
Howard	6	Primary	92.6%	93.2%	86.6%
Howard	3	Secondary	92.8%	93.3%	89.4%

Table 10 Continued
2021 Unweighted Usage Rates in NHTSA-Surveyed Jurisdictions of Maryland by
Vehicle Type and Roadway Classification Within Jurisdiction
All Front Seat Occupants Combined With Known Seat Belt Use

Jurisdiction	# of Sites	Roadway Classification	Unweighted Seat Belt Usage Rates		
			All Vehicles	Passenger Cars/SUVs	Pick-up Trucks
Howard	1	Local	94.4%	94.7%	90.0%
Montgomery	4	Primary	97.4%	97.8%	94.7%
Montgomery	5	Secondary	95.5%	96.4%	88.8%
Montgomery	1	Local	98.2%	98.1%	100.0%
Prince George's	5	Primary	90.5%	91.4%	83.8%
Prince George's	4	Secondary	87.2%	87.3%	86.5%
Prince George's	1	Local	87.5%	86.7%	100.0%
Washington	5	Primary	90.7%	92.1%	81.6%
Washington	4	Secondary	89.4%	91.7%	77.0%
Washington	1	Local	69.6%	90.0%	53.8%
Wicomico	9	Secondary	89.4%	91.5%	80.6%
Wicomico	1	Local	90.5%	93.9%	78.6%

NHTSA Sites - Unknown Observations

Seat belt usage could not be determined for 5.5% of all front-seat occupants, differing between drivers (6.5%) and passengers (1.5%). Unknown belt use was more prevalent in pick-up trucks (8.9%) than in passenger cars (5.0%) and slightly higher on Secondary roads (5.7%) than on Primary (5.6%) or Local roads (3.4%). Belt use was ascertained for every driver and passenger in eight (6.2%) of the 130 sites, while 15 sites (11.5%) had an unknown rate of at least 10%. Unknown observations were primarily attributed to glare (caused by bright sunny skies), extensive window tinting, and light rain. The overall proportion of unknown seat belt use in the 2021 survey was 1.4 percentage points lower than that computed in 2020.

Non-NHTSA Sites - Unweighted Analysis

Limited data collection was also conducted within the 11 remaining jurisdictions in Maryland to gain a rough estimate of the seat belt usage rate in those areas. Because these jurisdictions were not included in the sampling frame of the NHTSA Observational Survey of Seat Belt Use, the findings were not weighted. Only three randomly chosen sites were observed in each jurisdiction; hence, due to its potential instability, the standard error was not estimated. Unlike

the NHTSA survey plan, any roadway type could be selected for observation, as roadways were not chosen according to VMT proportion.

A total of 9,166 motor vehicles (i.e., passenger cars, SUVs, and pick-up trucks) with 11,399 front seat occupants were observed within the 11 non-NHTSA jurisdictions. Known seat belt use was ascertained for 10,653 (93.5%) of the occupants, of whom 8,528 (80.1%) were drivers and 2,125 (19.9%) were front seat passengers. Most (77.1%) were occupants of passenger cars or SUVs and the remainder 22.9% were occupants of pick-up trucks. Because of the rural setting of the 11 remaining jurisdictions, only 1,028 (9.7%) of the observations were made on Primary roads, as opposed to 7,035 (66.0%) on Secondary roads and 2,590 (24.3%) on Local roads. The average number of occupants observed per jurisdiction with known seat belt usage was 968.

Approximately 90.2% of all drivers and passengers in the non-NHTSA jurisdictions were belted (Table 11), representing an increase of 0.4 percentage points from the 2020 unweighted usage rate. A slightly higher proportion of passengers (90.7%) than drivers (90.0%) were belted (data not shown). Belt use among front seat occupants was more likely to occur in passenger cars or SUVs (92.1%) than in pick-up trucks (83.6%), and drivers and passengers in 2021 were more likely to be belted on Secondary roads (91.9%) than on Primary (90.1%) or Local roads (85.6%). This distribution according to roadway classification (i.e., Secondary higher than Primary higher than Local) was also found separately among front seat occupants in a car and in a truck.

Table 11 - 2021 Unweighted Usage Rates in Non-NHTSA Jurisdictions of Maryland Overall, by Vehicle Type and by Roadway, All Front Seat Occupants Combined With Known Seat Belt Use

2021 Unweighted Usage Rates in Non-NHTSA Jurisdictions of Maryland						
	All Vehicles		Passenger Cars/SUVs		Pick-up Trucks	
	N	Usage Rate	N	Usage Rate	N	Usage Rate
All Roadways	10,653	90.2%	8,213	92.1%	2,440	83.6%
Primary Roads	1,028	90.1%	837	92.0%	191	81.7%
Secondary Roads	7,035	91.9%	5,438	93.6%	1,597	86.0%
Local Roads	2,590	85.6%	1,938	88.1%	652	78.2%

A list of unweighted usage rates by jurisdiction is displayed in Table 12. Six (54.5%) of the non-NHTSA jurisdictions had unweighted rates above 90%, with Calvert (93.8%) and Caroline (93.0%) counties having the highest observed seat belt rates for all vehicles combined. Kent (86.9%) and Garrett (86.2%) counties were the only jurisdictions with a usage rate below 88%. Jurisdictional usage rates of occupants observed in passenger cars or SUVs were at least 90% in seven (63.6%) of the counties surveyed, with the usage rate ranging from a high of 95.7% in Queen Anne’s County to a low of 88.9% in Allegany County. Among occupants of pick-up

trucks, no jurisdiction had a usage rate greater than 90%. Calvert (89.5%) and St. Mary’s (89.3%) counties had the highest rates among truck occupants, while two jurisdictions had usage rates below 80% (Somerset and Garrett). See Figure A2 in the Appendix for a color-coded map of unweighted usage rates in non-NHTSA jurisdictions.

Table 12 - 2021 Unweighted Usage Rates in Non-NHTSA Counties of Maryland by Vehicle Type Within Jurisdiction, All Front Seat Occupants Combined With Known Seat Belt Use

	All Vehicles		Passenger Cars/SUVs		Pick-up Trucks
	Usage Rate*		Usage Rate		Usage Rate
11 Non-NHTSA Jurisdictions	90.2%		92.1%		83.6%
Calvert	93.8%		95.2%		89.5%
Caroline	93.0%		95.6%		84.2%
Queen Anne's	92.6%		95.7%		84.7%
Talbot	91.9%		93.2%		86.1%
St. Mary's	91.6%		92.4%		89.3%
Dorchester	91.3%		93.3%		84.9%
Somerset	89.1%		92.8%		78.7%
Worcester	88.7%		89.7%		84.7%
Allegany	88.0%		88.9%		85.6%
Kent	86.9%		89.1%		80.7%
Garrett	86.2%		89.5%		76.2%

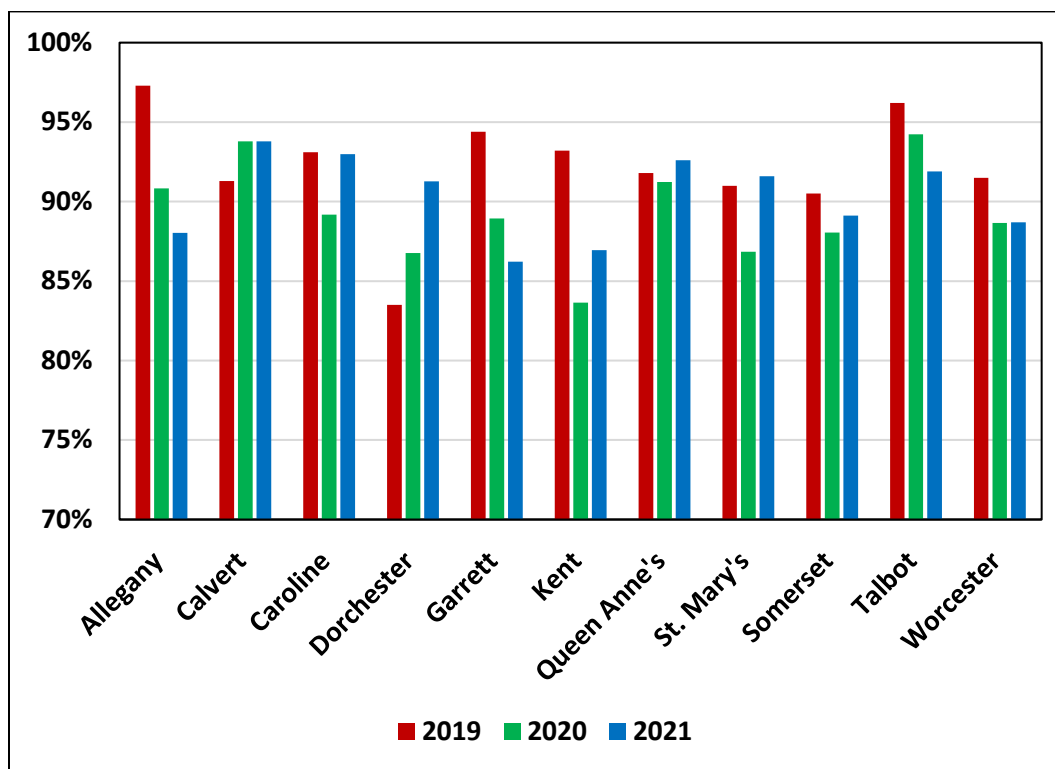
* Jurisdictional usage rates are sorted in descending order for all vehicles combined.

Jurisdictional changes in unweighted rates over time, for all vehicles combined, are documented for the non-NHTSA counties in Table 13 and Figure 6. The largest increases in usage rates over the past year were experienced by St. Mary’s (+4.8 percentage points) and Dorchester (+4.5) counties. Only three counties showed a decline in their usage rate since 2020: Talbot (-2.3), Garrett (-2.7) and Allegany (-2.8). Dorchester had by far the biggest increase over the past two years (+7.8), while Garrett (-8.2) and Allegany (-9.3) experienced large declines. Talbot County was the only jurisdiction that posted a higher rate than the overall non-NHTSA usage rate each year since 2019.

**Table 13 - Change Between 2019 and 2021 in Combined Unweighted Seat Belt Usage
by Non-NHTSA Jurisdiction**

Jurisdiction	2019	2020	2021	Change in Rate 2020- 2021	Change in Rate 2019- 2021
All 11 Jurisdictions	92.4%	89.8%	90.2%	+0.4%	-2.2%
Allegany	97.3%	90.8%	88.0%	-2.8%	-9.3%
Calvert	91.3%	93.8%	93.8%	0.0%	+2.5%
Caroline	93.1%	89.2%	93.0%	+3.8%	-0.1%
Dorchester	83.5%	86.8%	91.3%	+4.5%	+7.8%
Garrett	94.4%	88.9%	86.2%	-2.7%	-8.2%
Kent	93.2%	83.6%	86.9%	+3.3%	-6.3%
Queen Anne's	91.8%	91.2%	92.6%	+1.4%	+0.8%
St. Mary's	91.0%	86.8%	91.6%	+4.8%	+0.6%
Somerset	90.5%	88.0%	89.1%	+1.1%	-1.4%
Talbot	96.2%	94.2%	91.9%	-2.3%	-4.3%
Worcester	91.5%	88.7%	88.7%	0.0%	-2.8%

Figure 6 - Comparison from 2019 to 2021 of Combined Unweighted Seat Belt Usage Rates by Non-NHTSA Jurisdiction



Non-NHTSA Sites - Unknown Observations

Seat belt usage could not be ascertained for 6.5% of all front-seat occupants surveyed in the non-NHTSA jurisdictions; 7.0% of driver belt use was unknown and 4.8% of passenger belt use was unknown. Occupants of passenger cars or SUVs had an unknown rate of 6.0% and truck occupants had an unknown rate of 8.3%.

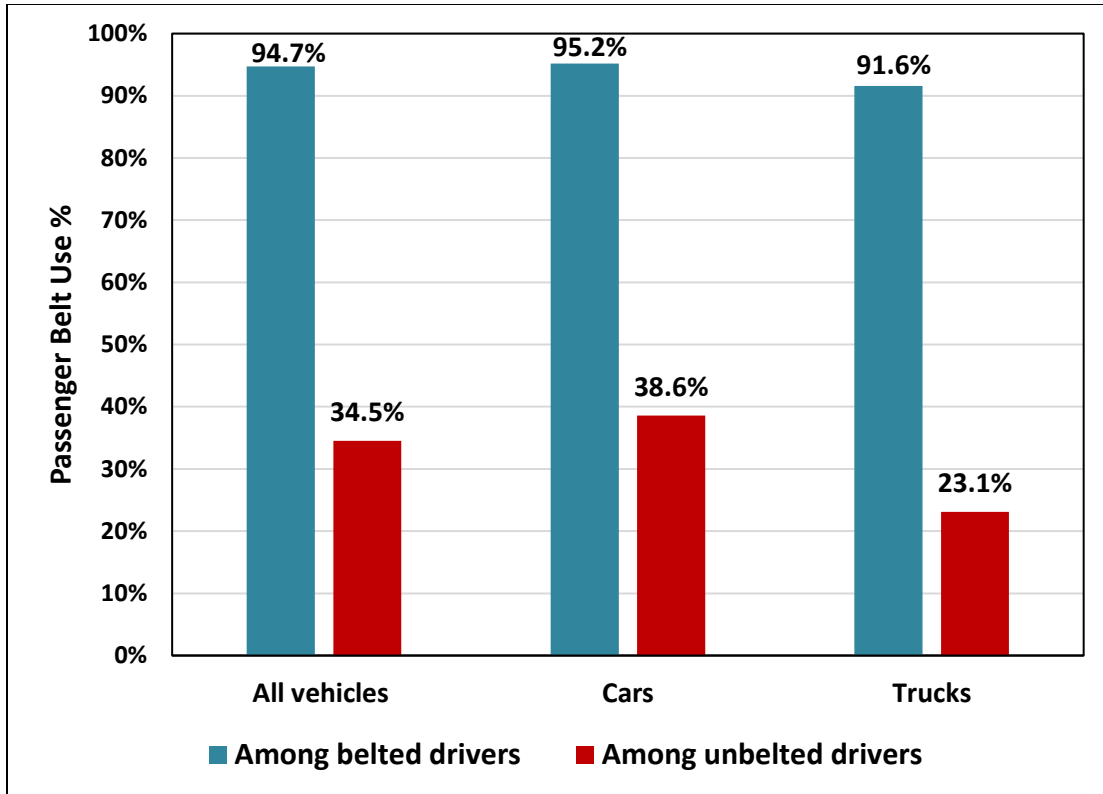
Analysis of Individual Record-Level Data

In addition to the analysis of summary data to calculate overall usage rates, individual record-level data were analyzed for more in-depth study of occupant behavior within NHTSA jurisdictions. Specific analyses focused on the unweighted belt use of the right front passenger and their association with the driver's unweighted belt use, as well as any connection between driver belt use and observed hand-held cell phone use. However, because this project is primarily a study of seat belt usage, the cell phone results should not be viewed as being conclusive. Less than ideal observation angles (e.g., from an overpass), glare, and concentration on determining seat belt usage, may have contributed to an underestimate of cell phone usage.

Of the 37,261 belted and unbelted drivers observed in NHTSA jurisdictions, approximately 25.6% (n=9,522) also had a passenger observed in the right front seating position. Approximately 95.9% of those drivers were belted and the majority was riding in cars (87.1%).

Of the drivers that were belted with passengers in the vehicle, 94.7% of those passengers were also belted. However, among the cases of unbelted drivers with passengers, only 34.5% of the passengers were belted. This large difference was also prevalent when the data were stratified by vehicle type: 95.2% vs. 38.6% of passengers wore their seat belt in cars with belted and unbelted drivers, respectively, while 91.6% vs. 23.1% of passengers were belted in pick-up trucks with belted and unbelted drivers (Figure 7).

Figure 7 – 2021 Right Front Passenger Seat Belt Use is Associated With Driver Use by Vehicle Type



The associations of lower passenger belt use with unbelted drivers, and the larger difference among those in pickup trucks as compared to cars, were also present when examining the data by roadway classification. The overall difference in passenger belt use between cases of belted and unbelted drivers was 94.7% vs. 53.5% on Primary roads, 94.7% vs. 28.7% on Secondary roads, and 95.6% vs. 19.0% on Local roads. Thus, the large difference in passenger restraint by driver restraint use that was observed on Primary roads was even wider on Secondary and Local roadways.

The data were further analyzed with regard to observed hand-held cell phone use. The proportion of belted drivers observed on a cell phone was lower than the proportion of unbelted drivers on a cell phone (2.2% of belted and 3.8% of unbelted drivers). This discrepancy in cell phone use mirrored that found between belted and unbelted car drivers (2.2% vs. 3.7%) and was slightly smaller than the discrepancy between belted and unbelted truck drivers (1.9% vs. 3.9%),

respectively). Analyzing the data from a different perspective, among all drivers on a cell phone with known belt use, 88.3% were belted, with car drivers being restrained much more often than truck drivers (90.0% in cars vs. 76.1% in trucks). As might be expected, these belt usage rates were lower than the corresponding belt use rates found among drivers with known belt use who were not using a cell phone (cars and trucks 92.9%, cars 93.8%, trucks 87.0%).

Summary

The overall observed seat belt usage rate for drivers and right front seat passengers in the State of Maryland in 2021, after weighting by probability of roadway selection and jurisdictional roadway-specific VMT, was 91.4%, representing a 1.5 percentage point increase over the previous year. The Statewide standard error of 0.6% was well below the NHTSA threshold of 2.5%, yielding a 95% confidence interval of 90.2% to 92.6% for the combined usage rate. These rates were based on observation of 39,847 vehicles and 49,447 occupants, representing decreases of 5.2% and 5.7% in the number of vehicles and occupants observed, respectively, in the 2020 survey.

Belt use was highest among passenger cars and SUVs relative to pick-up trucks (92.3% vs. 86.0%, respectively). Seat belt usage was also highest among all front seat occupants traveling on Primary roads relative to Secondary and Local roads (93.7% vs. 90.6% and 84.8%). Since 2020, the rates represented increases across the board for passenger cars/SUVs, pick-up trucks, and all three types of roadways.

Harford County (95.5%) had the highest usage rate among Maryland's 13 NHTSA jurisdictions, followed by Montgomery County (95.1%), and Baltimore City (94.7%) Counties. There were eight jurisdictions with combined rates of at least 90%; Carroll (87.6%), Washington (87.4%), and Wicomico (83.0%) counties experienced the lowest rates. Overall, seven of the 13 jurisdictions experienced an increase in combined usage rates over the past year. The replacement due to safety concerns of four original observation sites with four reserve sites may have accounted for the increase in belt usage rates in Baltimore City. For occupants of passenger cars or SUVs, ten jurisdictions had usage rates of at least 90%. Among occupants of pick-up trucks, two jurisdictions had a usage rate above 90% (Harford and Cecil counties), and three jurisdictions (Washington, Carroll and Wicomico counties) experienced rates below 80%. Unweighted analysis indicated that drivers had a slightly lower Statewide usage rate (92.8%) than front seat passengers (93.4%).

Seat belt usage could not be ascertained for 5.5% of all drivers and passengers. Unknown belt use was more prevalent in pick-up trucks (8.9%) than in passenger cars (5.0%), higher for drivers (6.5%) than for passengers (1.5%), and slightly higher on Secondary roads (5.7%) compared to Primary roads (5.6%) and Local roads (3.4%).

Approximately 90.2% of all drivers and right front-seat passengers traveling in the 11 non-NHTSA jurisdictions were belted, representing a 0.4 percentage point increase over the past year (unweighted analysis). A slightly lower proportion of drivers (90.0%) than passengers (90.7%) were observed to be belted. In addition, higher usage rates were found in passenger cars or SUVs

(92.1%) than in pick-up trucks (83.6%), and on Secondary as opposed to Primary or Local roadways. Six of the non-NHTSA jurisdictions had a usage rate above 90%. For passenger cars or SUVs, usage rates were also at least 90% in seven jurisdictions, while usage rates among occupants of trucks were below 90% in all non-NHTSA jurisdictions. Garrett County experienced the lowest rate among all vehicles. Seat belt usage could not be ascertained for 6.5% of all front-seat occupants.

Examination of individual record-level data, for the instance in which both a driver and passenger were observed in the front seat, indicated that 94.7% of passengers were belted when the driver was belted. However, if the driver was unbelted, only 34.5% of passengers were observed to wear their belt. This large difference in passenger belt use occurred in cars and SUVs (95.2% for belted drivers vs. 38.6% for unbelted drivers) as well as in trucks (91.6% for belted drivers vs. 23.1% for unbelted drivers). There was also an association with roadway classification, with the Secondary or Local roadways corresponding to a larger difference in passenger belt use between belted and unbelted drivers than the discrepancy seen on Primary roads. Finally, cell phone usage was ascertained when possible, indicating that belted drivers were less likely than unbelted drivers to use a hand-held cell phone while driving (2.2% vs. 3.8%, respectively). Drivers on a hand-held cell phone had a lower seat belt usage rate (88.3%) than drivers who were not observed using a cell phone (92.9%).

Appendix

Figure A1

Maryland Seat Belt Usage Rates For NHTSA Jurisdictions
2021

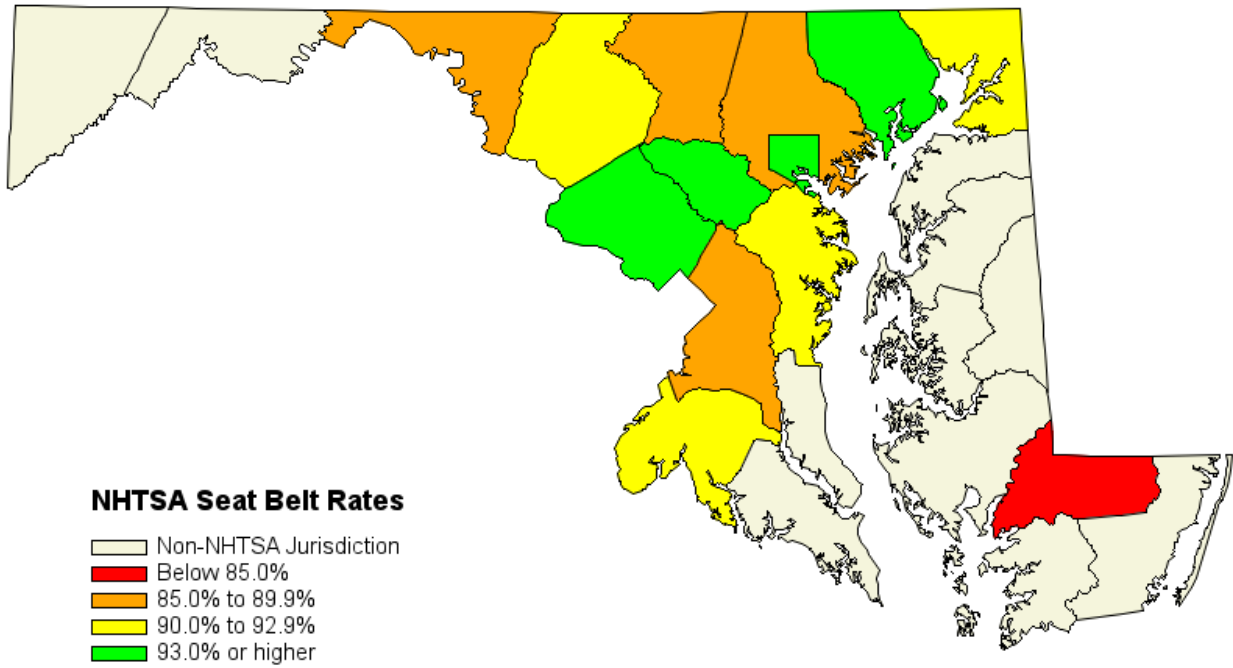


Figure A2

**Maryland Seat Belt Usage Rates For Non-NHTSA Jurisdictions
2021**

