

# Puerto Rico Observational Survey of Seat Belt Use, 2017

Final Report

Submitted to: Traffic Safety Commission of Puerto Rico



September 29, 2017

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## INTRODUCTION

The Traffic Safety Commission of Puerto Rico (CST by its Spanish acronym), with the collaboration of Estudios Técnicos, Inc., conducted the Seat Belt Use Survey for 2017. The purpose of the study is to estimate seat belt use in Puerto Rico at a specific point in time.

The sample design is similar to the one approved by the National Highway Traffic Safety Administration (NHTSA) on November 9, 2011. For this year a new road selection was made following the Uniform Criteria for State Observational Surveys of Seat Belt Use, approved by NHTSA on May 30, 2017.

The fieldwork team was composed of eleven (11) members. All team members participated in a one day training session on August 15, 2017 that included all the different aspects for the observations and quality control. The training was organized in two sections. The first section addressed the objectives of the survey, operational definitions concerning field observations, and data gathering protocols. The second section consisted of examples and the recreation of the different situations and possible scenarios in the field. This second part also included role playing exercises for observers, counters and quality control monitors.

Observations were conducted from August 16 to September 14, 2017. Seventeen (17) counties were visited, for a total of 6,800 vehicle observations.

## METHODOLOGY

As mentioned in the introduction, the methodology used for the Seat Belt Survey (see Appendix 2) is similar to the one implemented in 2011 and approved by NHTS. For 2017 a new road selection was made following the Uniform Criteria for State Observational Surveys of Seat Belt Use, approved by NHTSA on May 30, 2017.

Two main units were considered in the sample design. The primary sample unit (PSU) is by counties, the second sample unit (SSU) by road segments, followed by: time segment, road direction, lane and vehicle selection. The PSU was stratified following a geographic distribution of the Island, composed of five regions. A sample of 17 counties was selected from a sample frame of 45 counties, after considering an exclusion of 15 percent of passenger vehicle occupant fatalities in the 78 counties that compose Puerto Rico. Counties were stratified by region. The selection was established according to the number of active driver's licenses by county.

The road sample was stratified in each county by three road types: (1) Primary, (2) Secondary and (3) Local. A total of four road segments were selected in each county,

including at least one road for every road type in each county. The selection was made using segment length as the measure of size (MOS). The four road segments by county represented one work day of data collection. Observations were scheduled ensuring that they were made during the seven days of the week. A universal period of observation of 45 minutes was used, with an estimation of 45 minutes of traveling time between segments. The starting time for each day was randomly chosen between 7:00 AM and 1:00 PM to warrant the observation probability between 7:00 AM and 6:00 PM.

Site locations for observations were selected deterministically by the first intersection or ramp encountered. Observations were conducted by three team members: two data collectors and one vehicle counter. The team recorded roadway directions of the selected segments and chose randomly roadway directions to be observed when there were more than two directions. Seven percent of the segments were visited without advance notice by an independent monitor for quality control purposes.

An observation protocol was used to guide field observations. The protocol established the roles for each team member, how to choose roadway directions, place to collect the information, how to identify the right vehicles to be observed, people to be observed inside the vehicles, and how to record the observations. A total of four protocols were developed to guide their actions in special situations. These included the following: (1) temporarily unavailable locations, (2) permanently unavailable locations, (3) nonresponse rates that exceed 10% and (4) process for non-usable data. The protocols warrant that sample units were represented and that standard error does not exceed 2.5 percentage points.

For data entry and processing, the following software programs were used: SPSS, Excel and SUDAAN. The belt use rate estimation was calculated through a ratio estimator and the standard error with SUDAAN software. Both procedures were included in the Sample Design submitted and approved by NHTSA.

## FINDINGS

### General Findings

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The five (5) regions of Puerto Rico were covered with the visits of the 17 counties (four road segments in each one selected for the sample). The number of observations per segment was 100 vehicles, for a total of 6,800 observed vehicles and 8,743 occupants (6,800 drivers and 1,943 front passengers).

Fifteen (15) of 68 road segments observed were classified as non-usable data due to non-vehicle flow. Most of them (13) were local roads. We think this happened because

of the new sample frame for road selection, which included more local roads, many of them with low car flow. For those fifteen road segments the protocol for locations permanently unavailable was applied.

**TABLE 1: ROAD SEGMENTS SUBSTITUTIONS**

Substituted segment					Substitution segment				
County	Type	Segment	Day	Hour	County	Type	Segment	Day	Hour
Arecibo	Local	Cll Cardona	Saturday	11:30	Arecibo	Local	Cll Municipal	Saturday	11:30
Caguas	Local	Cll Montreal	Sunday	12:00	Caguas	Local	Ave. Gautier Benitez	Sunday	12:00
Caguas	Local	Villas de Campo	Sunday	10:30	Caguas	Local	Ave Degetau	Sunday	10:30
Canovanas	Local	Cll 16	Tuesday	13:30	Canovanas	Local	Cll 12	Tuesday	13:30
Carolina	Local	Cll Via 24	Sunday	13:00	Carolina	Local	Carr. Boca Cangrejos	Sunday	13:00
Carolina	Local	Cll 615	Sunday	10:00	Carolina	Local	Ave Iturregui	Sunday	10:00
Cayey	Secondary	Pr-708	Monday	13:30	Cayey	Secondary	Pr- 1	Monday	13:30
Cayey	Local	Cll Evaristo Hernandez	Monday	15:00	Cayey	Local	Cll Nuñez Romeu	Monday	15:00
Fajardo	Local	Calle Buena Vis	Tuesday	12:00	Fajardo	Local	Pr- 3	Tuesday	12:00
Hatillo	Local	Cll Los Rodriguez	Thursday	16:30	Hatillo	Local	Marg.Cll Comercio	Thursday	16:30
Isabela	Local	Cll Italia	Wendsday	10:00	Isabela	Local	Cll Lamela	Wendsday	10:00
Juncos	Local	Cll Gardenia	Thursday	10:30	Juncos	Local	Cll Algarin	Thursday	10:30
Mayagüez	Local	Cll Pirineo	Thursday	11:00	Mayagüez	Local	Cll Nenadich E	Thursday	11:00
Ponce	Secondary	Pr- 139	Thursday	12:30	Ponce	Secondary	Pr- 2	Thursday	12:30
Salinas	Local	Cll Turpial	Friday	16:30	Salinas	Local	Cll Victoria Mateo Serrano	Friday	16:30

Quality control was conducted in seven percent of the observed segments. These segments, which are included in table two, were randomly selected.

**TABLE 2: QUALITY CONTROL BY ROAD SEGMENTS**

County	Type	Road Segment	Longitude	Longitude	Date	Hour
Cayey	Primary	Autopista Luis A Ferre	18.104720	-66.161588	August 21,2017	12:00
Fajardo	Local	Ave el Conquistador	18.339485	-65.656198	August 22,2017	10:30
San Juan	Local	Cll Hoare	18.450362	-66.081601	August 25,2017	11:30
Canovanas	Local	Cll 1	18.339961	-65.894689	August 29,2017	9:00

Observers recorded belt use information of 6,568 drivers and 1,895 front seat passengers. The number of occupants with unknown belt use was 280 (232 drivers and 48 front passengers) for a nonresponse rate of 3.2% (nonresponse rate = 280/8,743). Table three includes the number of observations of drivers and passengers per county and region.

**TABLE 3: NUMBERS OF VALID OBSERVATIONS OF FRONT SEAT OCCUPANTS PER COUNTY/REGION**

	<b>Drivers</b>	<b>Passengers</b>	<b>Total</b>
<b>North Region</b>	<b>1,158</b>	<b>394</b>	<b>1,552</b>
Arecibo	384	118	502
Hatillo	383	124	507
Toa Baja	391	152	543
<b>West Region</b>	<b>1,178</b>	<b>335</b>	<b>1,513</b>
Aguada	387	78	465
Isabela	394	132	526
Mayagüez	397	125	522
<b>South Region</b>	<b>1,537</b>	<b>416</b>	<b>1,953</b>
Ponce	387	101	488
Cayey	392	120	512
Juana Díaz	377	91	468
Salinas	381	104	485
<b>East Region</b>	<b>1,937</b>	<b>560</b>	<b>2,497</b>
Caguas	390	139	529
Canóvanas	382	112	494
Fajardo	391	107	498
Juncos	394	101	495
Naguabo	380	101	481
<b>Metropolitan Región</b>	<b>758</b>	<b>190</b>	<b>948</b>
Carolina	377	126	503
San Juan	381	64	445
<b>Total</b>	<b>6,568</b>	<b>1,895</b>	<b>8,463</b>

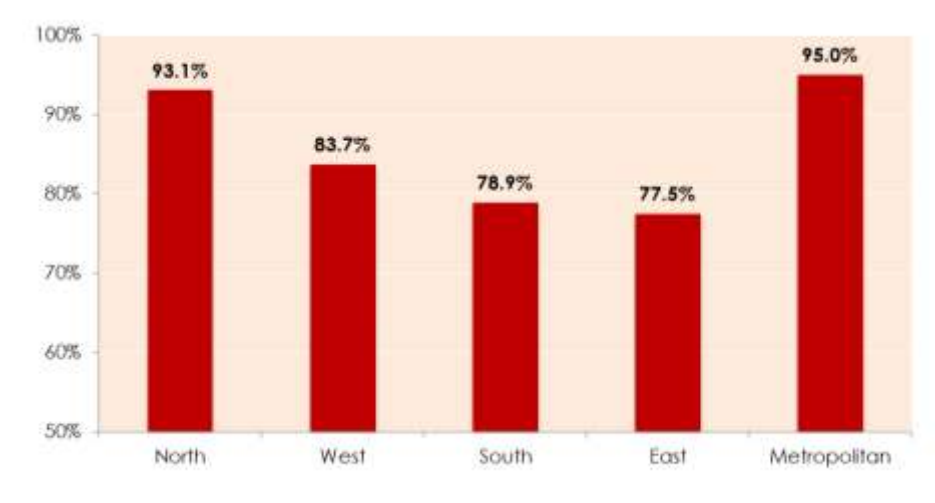
The overall belt use measured combining drivers and passengers (once weights were applied as indicated in the sample design) was 87.9 percent, with a standard error of 1.7%.

**TABLE 4: WEIGHTED SEAT BELT USE RATE FOR PUERTO RICO 2017**

<b>Rate of belt use</b>	<b>Standard Error</b>	<b>95 Percent Confidence Interval</b>	
<b>87.9%</b>	<b>1.7%</b>	<b>84.6%</b>	<b>91.2%</b>
<b>n = 8,463</b>			

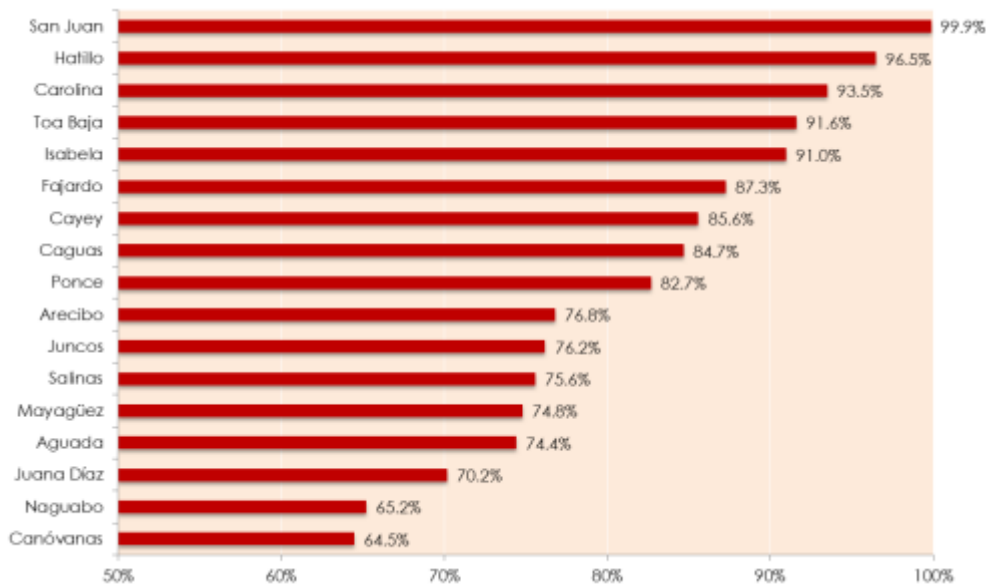
Significant<sup>1</sup> difference was found in belt use by region. In the Metropolitan Area (95%) and North (93.1%) regions belt use is more intense than the other regions, especially the East (77.5%) and South (78.9%).

**GRAPH 1: OBSERVED BELT USE BY REGION**



The belt use measurements by county showed that San Juan was the county with the highest belt use with 99.9%. Other counties that reached belt usage over 90 percent were: Hatillo, Carolina, Toa Baja and Isabela. In contrast, the lowest level of belt use was recorded in: Canóvanas (64.5%) and Naguabo (65.2%).

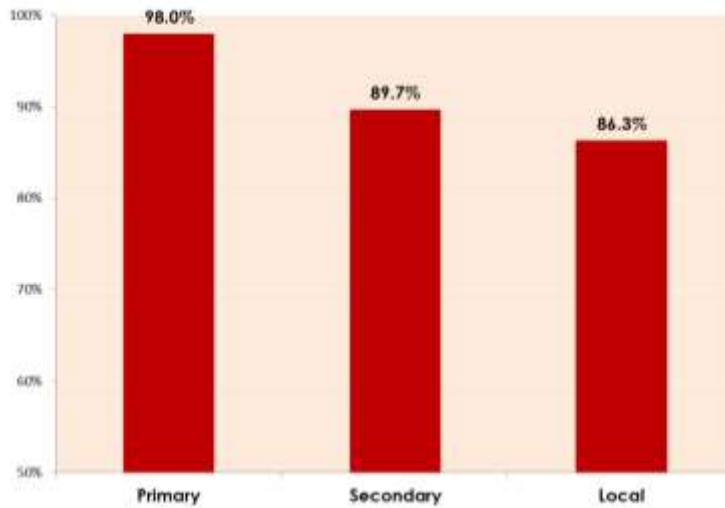
**GRAPH 2: OBSERVED BELT USE BY COUNTY**



<sup>1</sup> A Chi Square Test of Independence was calculated to identify relations between belt use and the rest of the observed variables.

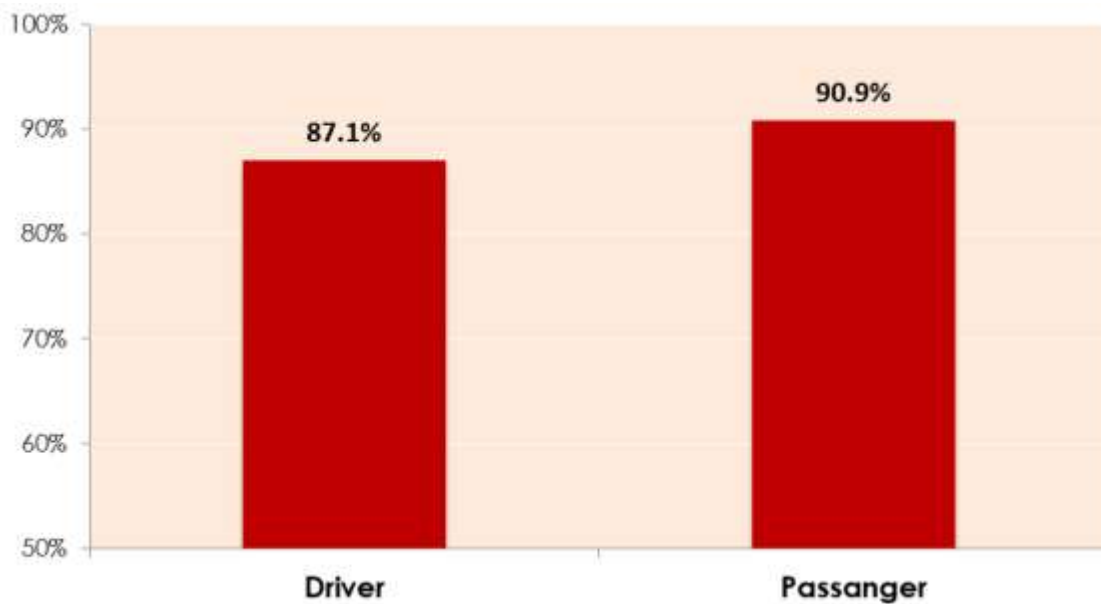
Differences were observed by road type. A significant difference of 11.7 percentage points of belt use separate the use in Primary Roads (98.0 percent) compared with local roads (86.3 percent).

**GRAPH 3: OBSERVED BELT USE BY ROAD TYPE**



A difference was observed between drivers and passengers. Belt use is higher by drivers (90.9%) than passengers (87.1%).

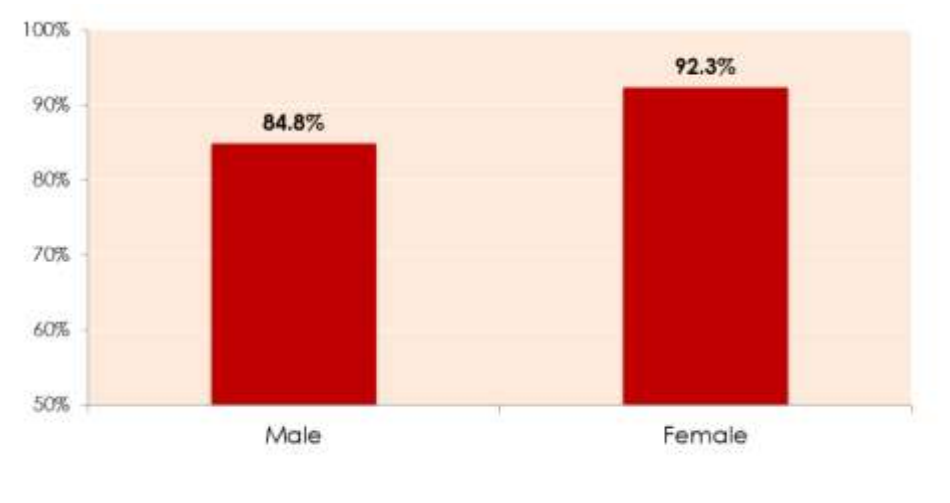
**GRAPH 4: OBSERVED BELT USE BY SEATING POSITION**





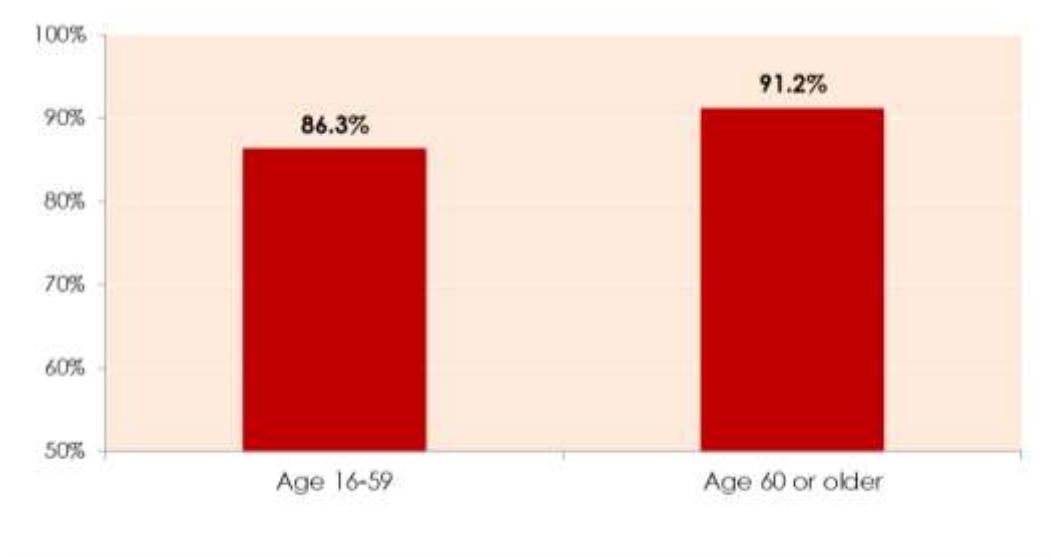
The survey results showed that female's belt use has a higher percentage compared to males (92.3 percent and 84.8 percent, respectively). This difference is statistically significant using a Chi Square Test of Independence.

**GRAPH 5: OBSERVED BELT USE BY GENDER**



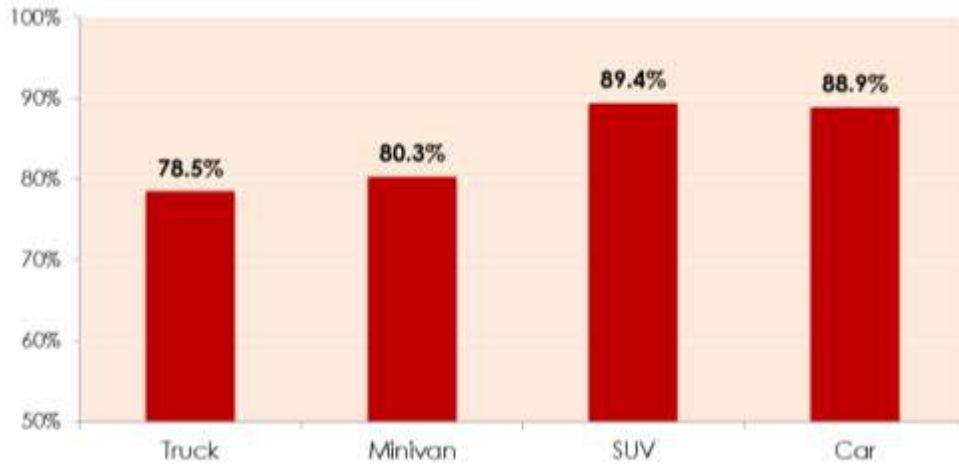
Those 60 years or older measured 4.4 percentage points higher belt use compared with persons between 16 and 59 years of age, that measured 89.2 percent, as showed in Graph 6.

**GRAPH 6: OBSERVED BELT USE BY AGE**



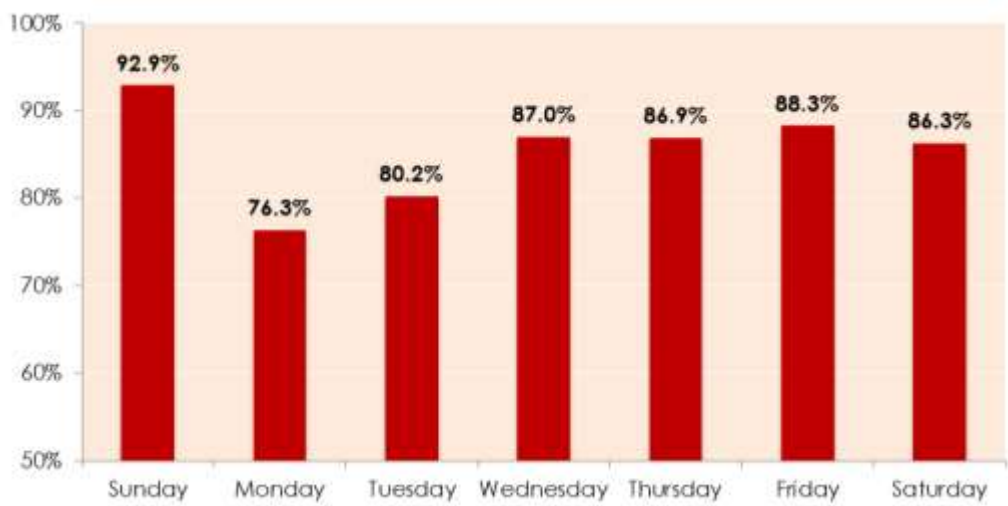
A significant difference of belt use was observed by vehicle type. As Graph 7 shows, 78.5 percent of belt use was registered on trucks, while 89.4 percent on SUVs. Minivans scored a belt use of 80.3 percent, which is 8.6 percentage points lower than cars and 9.1 percentage points lower than SUVs.

**GRAPH 7: OBSERVED BELT USE BY VEHICLE TYPE**



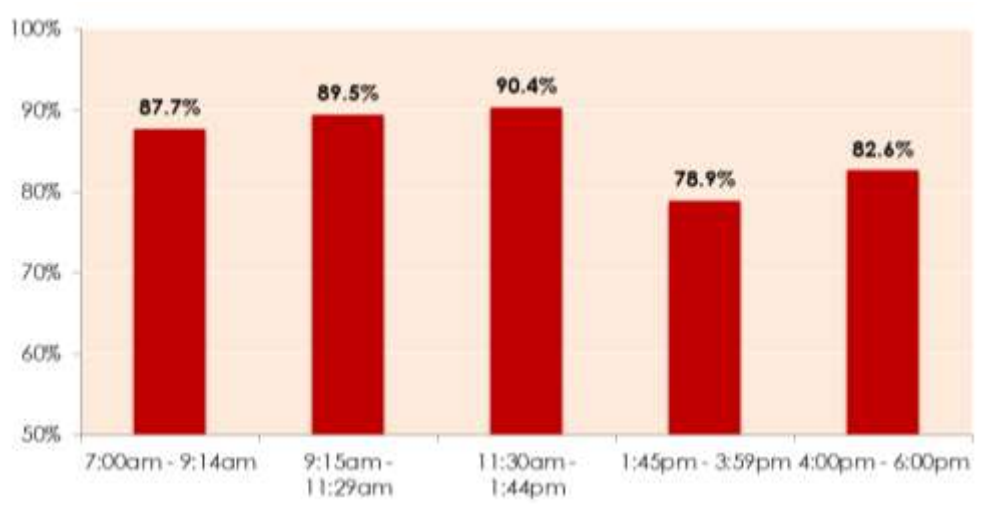
The days of the week that measured a higher belt use were Sunday and Friday with 92.9, and 88.3 percent, respectively. The days of the week that measured the lowest belt use were Monday and Tuesday, with 76.3 and 80.2 percent respectively. Those results are associated with the municipalities that were visited in those days.

**GRAPH 8: OBSERVED BELT USE BY DAY OF THE WEEK**



A lower belt use percentage was found after 1:45 PM. The time intervals corresponding from 1:45 PM to 3:59 PM (78.9%) and from 4:00 PM to 6:00 PM (82.6%) reflected lower belt use.

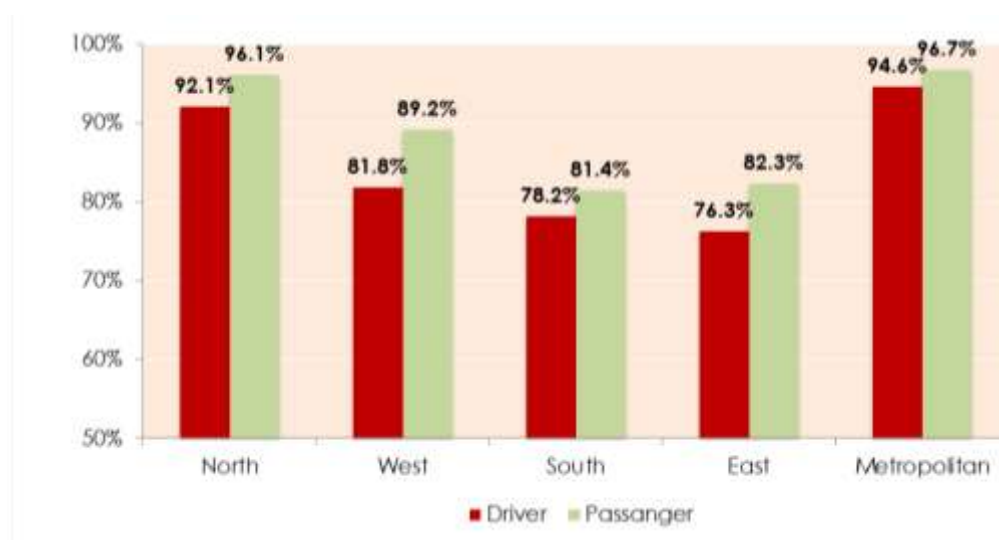
**GRAPH 9: OBSERVED BELT USE BY TIME INTERVALS**



**Information by Seating Position**

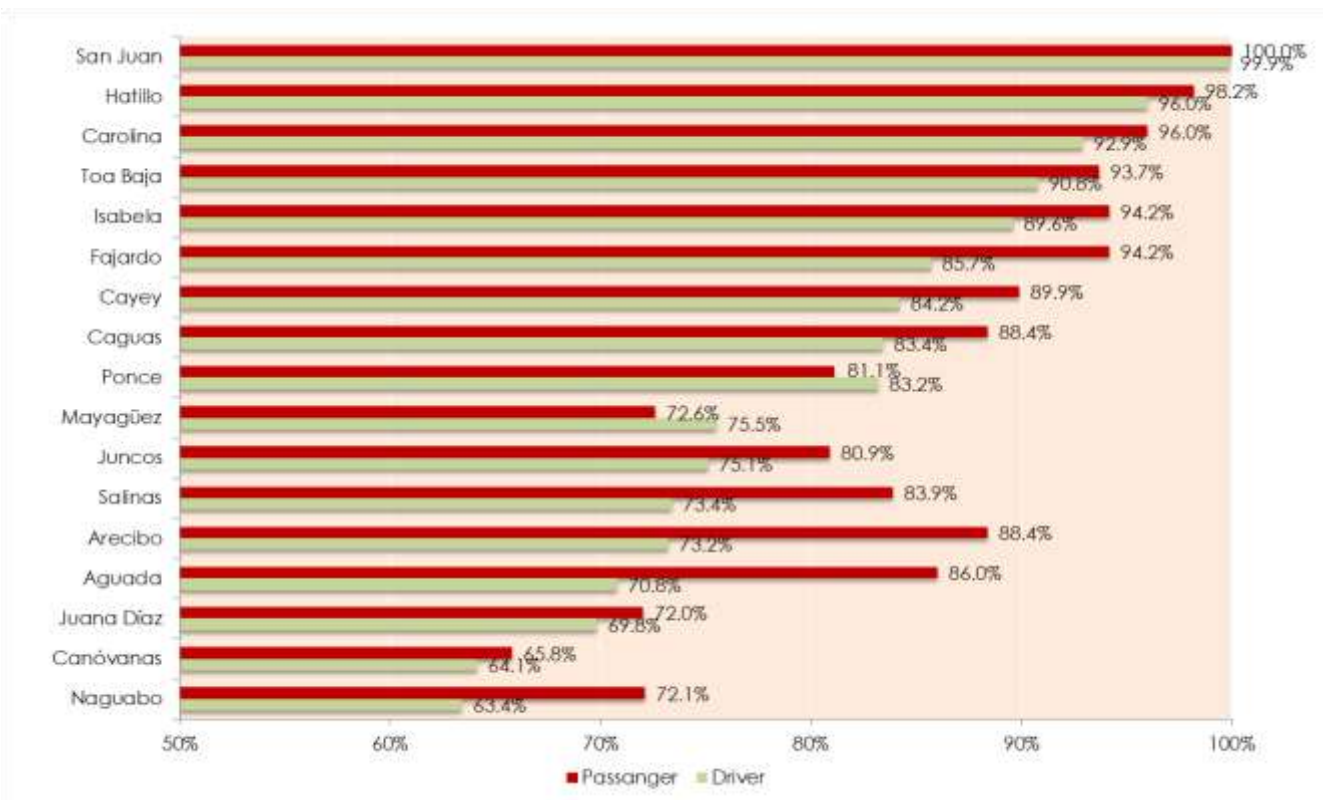
The measurements of belt use by seating position by region were similar to the ones by region in general. That is, the Metropolitan Region recorded the highest belt use, with no significant differences between drivers (94.5 percent) and passengers (96.7 percent), followed by the North Region. The East Region and South Regions recorded the lowest belt use.

**GRAPH 10: OBSERVED BELT USE BY REGION PER SEATING POSITION**



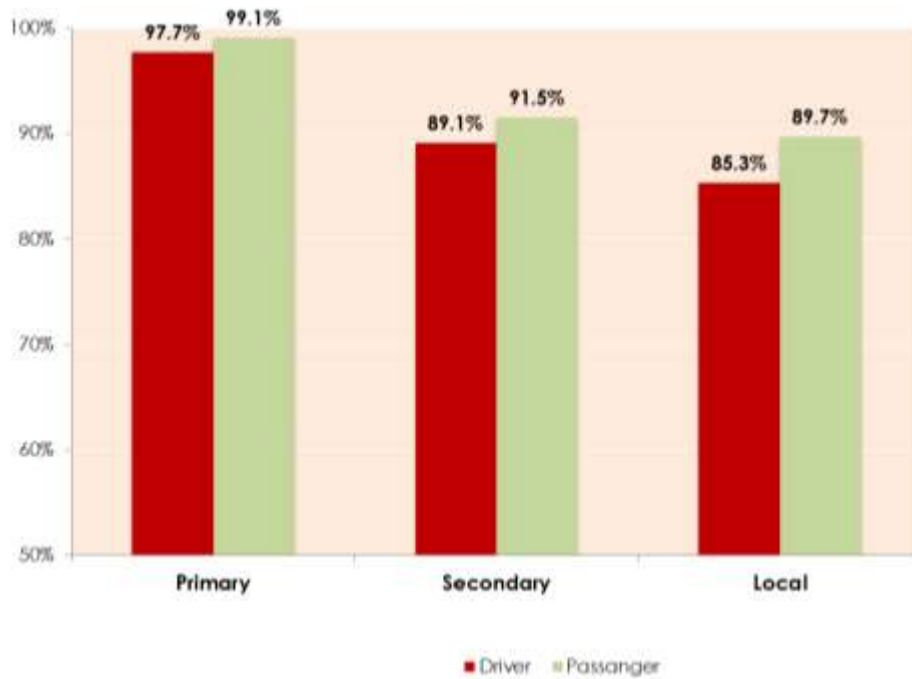
As Graph 11 shows, differences in belt use can be observed when counties are considered separately. The counties that measured the biggest differences between drivers and passengers were: Salinas, Arecibo and Aguada. Salinas measured a belt use of 73.4 percent for passengers, while drivers measured a belt use of 83.9 percent, for a difference of 10.5 percentage points. In the case of Arecibo, passengers measured 88.4 percent of belt use, while drivers recorded 73.2 percent, for a difference of 15.2 percentage points. In Aguada, the difference in belt use between drivers (70.8 percent) and passengers (86.0 percent) was of 15.2 percentage points.

**GRAPH 11: OBSERVED BELT USE BY COUNTY PER SEATING POSITION**



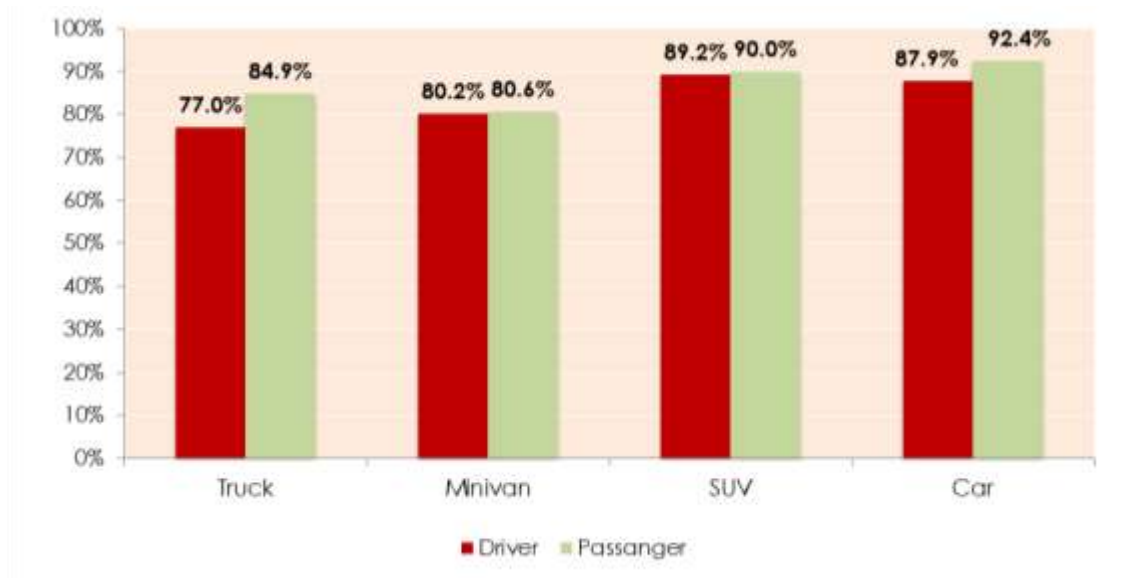
The biggest difference of belt use between drivers and passengers by road type was observed in local roads. Passengers measured 89.7 percent of belt use, while drivers measured 85.3 percent, for a difference of 4.4 percentage points. A smaller difference was measured in Primary roads, consisting of 1.4 percentage points between drivers (97.7 percent) and passengers (99.1 percent).

**GRAPH 12: OBSERVED BELT USE BY ROAD TYPE PER SEATING POSITION**



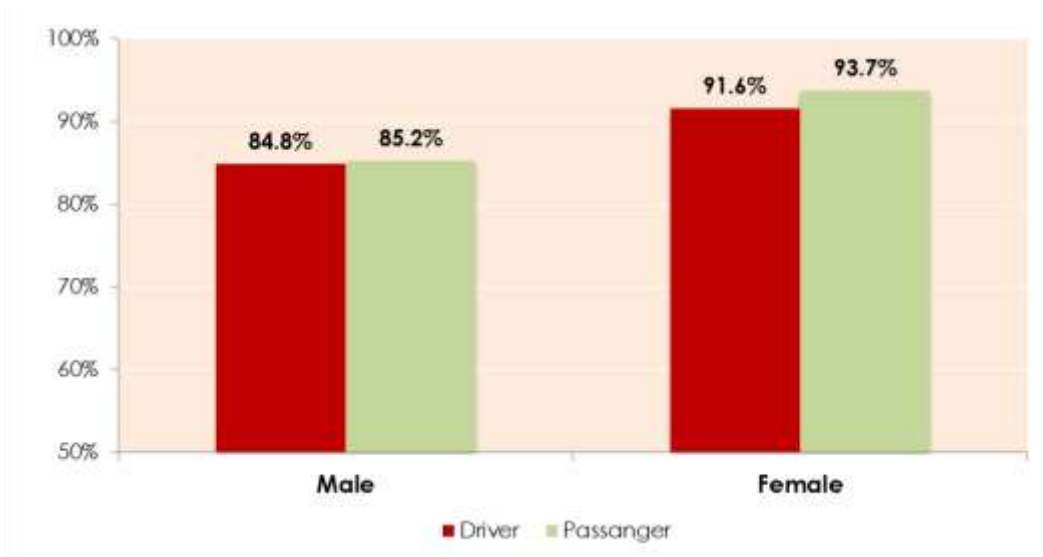
Related to belt use by type of vehicle, differences were found between drivers and passengers. Drivers recorded a higher belt use in SUVs (89.2%), while passengers have a higher use in cars (92.4%). Truck drivers recorded the lowest scores of belt use (77%), while minivans passengers have the lower scores of belt use (80.6%).

**GRAPH 13: OBSERVED BELT USE BY VEHICLE TYPE PER SEATING POSITION**



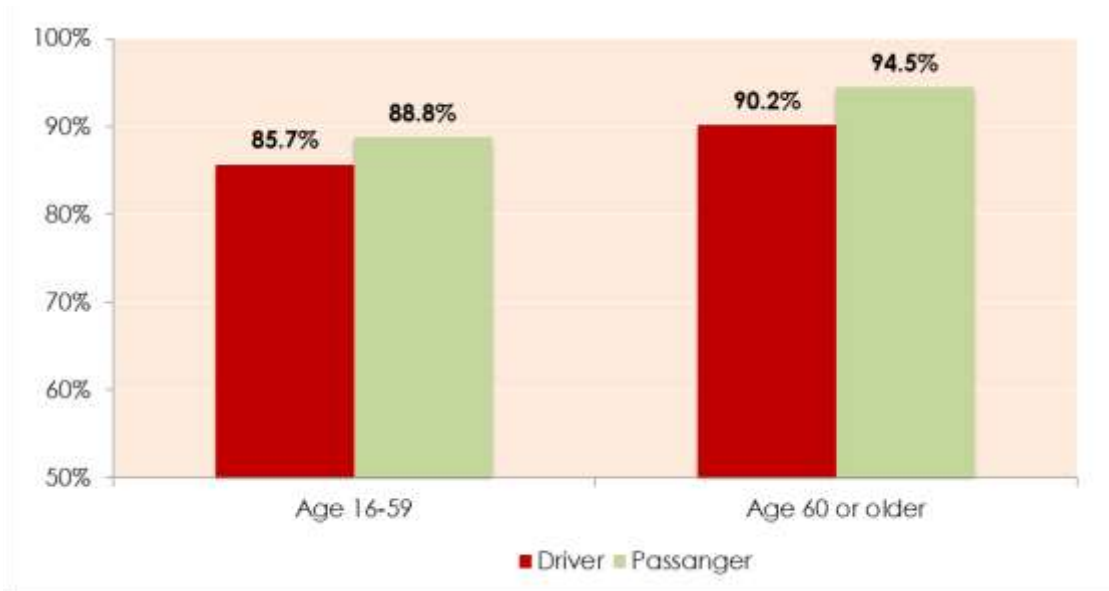
As Graph 5 showed, more females were observed using the belt than males. This tendency, as Graph 14 shows, is similar for drivers and passengers.

**GRAPH 14: OBSERVED BELT USE BY GENDER PER SEATING POSITION**



A 3.1 percentage point difference was registered in belt use between drivers (with 85.7 percent) and passengers (88.8 percent) regarding persons between 16 and 59 years old. For people of 60 years or older, drivers measured 90.2 percent, while passengers 94.5 percent, for a difference of 4.3 percentage points.

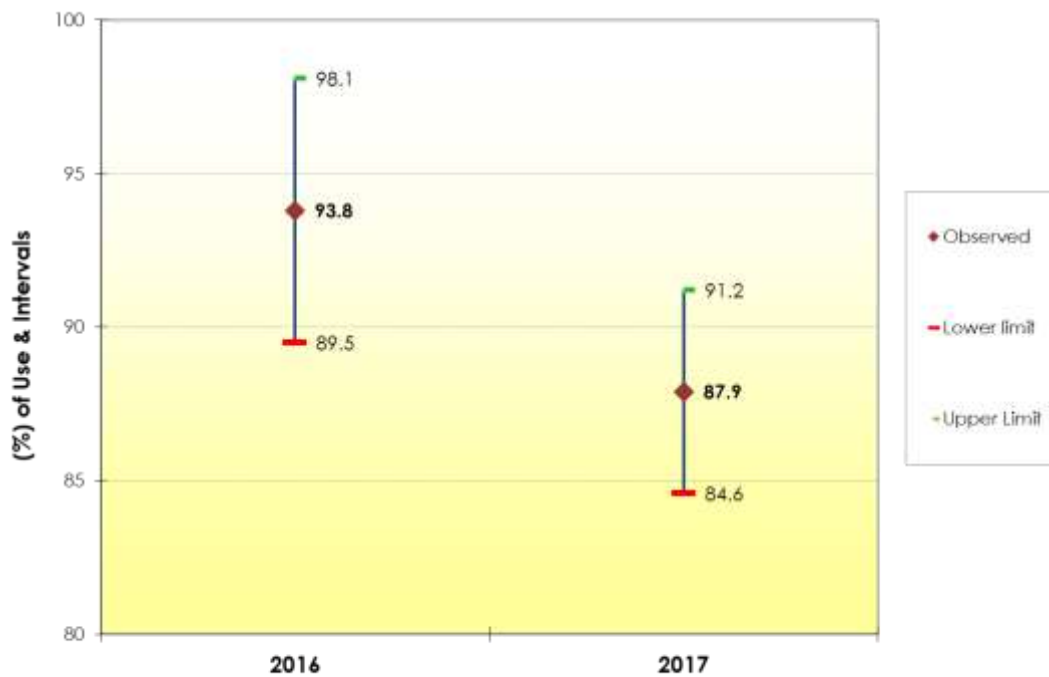
**GRAPH 15: OBSERVED BELT USE BY AGE PER SEATING POSITION**



## Conclusions

In Puerto Rico the belt use rate has been similar and consistent throughout recent studies. The last valid study was conducted in 2016 and the general belt use rate was 93.8%, being 93.4% for drivers and 94.7% for passengers. In the present study (2017), the belt use was measured at 87.9%; being 87.1% for drivers and 90.9% for passengers, and with a standard error of 1.7%. As shown in graph 16, at 95 percent confidence level, the belt use rate difference between 2016 and 2017 is not statistically significant.

**GRAPH 16: 2011-2012 RATE OF BELT USE AND 95 PERCENT CONFIDENCE LEVEL.**





## APPENDIX 1: LIST AND MAP OF SAMPLED ROAD SEGMENTS

Region	County	Type	Road Segment	X Coordinate	Y Coordinate	Day	Time	Belt use percentage
West	Aguada	Secondary	Pr- 417	18.360792	-67.141408	Wednesday	12:30	70.7%
West	Aguada	Local	Pr- 419	18.326512	-67.152832	Wednesday	11:00	63.8%
West	Aguada	Local	Marginal 2	18.356027	-67.162926	Wednesday	8:00	60.7%
West	Aguada	Local	PR-4416	18.354545	-67.166826	Wednesday	9:30	78.4%
North	Arecibo	Primary	Expreso Jose de Diego	18.436628	-66.586889	Saturday	14:30	91.8%
North	Arecibo	Secondary	Pr- 656	18.420692	-66.684354	Saturday	10:00	69.0%
North	Arecibo	Local	Cll Las Carolinas	18.403766	-66.595401	Saturday	13:00	80.7%
North	Arecibo	Local	Cll Municipal	18.459663	-66.590922	Saturday	11:30	73.6%
East	Caguas	Primary	Autopista Luis A Ferre	18.297559	-66.044480	Sunday	13:30	99.2%
East	Caguas	Secondary	Pr- 789	18.222181	-66.022902	Sunday	9:00	87.1%
East	Caguas	Local	Ave. Gautier Benitez	18.212775	-66.045942	Sunday	12:00	92.8%
East	Caguas	Local	Ave Degetau	18.222341	-66.039008	Sunday	10:30	81.1%
East	Canovanas	Primary	Pr- 66	18.367641	-65.886149	Tuesday	12:00	94.9%
East	Canovanas	Secondary	Pr- 185	18.313359	-65.891835	Tuesday	10:30	80.5%
East	Canovanas	Local	Cll 12	18.394256	-65.888067	Tuesday	13:30	63.6%
East	Canovanas	Local	Cll 1	18.339961	-65.894689	Tuesday	9:00	59.7%
Metropolitan	Carolina	Primary	Pr- 26	18.400937	-65.981510	Sunday	14:30	92.7%
Metropolitan	Carolina	Secondary	Pr- 874	18.395630	-65.934822	Sunday	11:30	90.7%
Metropolitan	Carolina	Local	Carr. Boca Cangrejos	18.443467	-66.006781	Sunday	13:00	92.0%
Metropolitan	Carolina	Local	Ave Iturregui	18.417931	-66.000311	Sunday	10:00	93.6%
South	Cayey	Primary	Autopista Luis A Ferre	18.104720	-66.161588	Monday	12:00	95.9%
South	Cayey	Secondary	Pr- 1	18.132996	-66.128660	Monday	13:30	88.7%
South	Cayey	Local	Cll Nuñez Romeu	18.113004	-66.164986	Monday	15:00	78.7%
South	Cayey	Local	Pr- 7722	18.108191	-66.209815	Monday	16:30	90.9%
East	Fajardo	Primary	Pr- 53	18.285711	-65.649759	Tuesday	13:30	93.0%

Region	County	Type	Road Segment	X Coordinate	Y Coordinate	Day	Time	Belt use percentage
East	Fajardo	Secondary	P R- 195	18.332613	-65.632474	Tuesday	9:00	77.5%
East	Fajardo	Local	Pr- 3	18.296082	-65.642378	Tuesday	12:00	87.9%
East	Fajardo	Local	Ave el Conquistador	18.339485	-65.656198	Tuesday	10:30	87.1%
North	Hatillo	Primary	Pr- 2	18.488131	-66.799438	Thursday	13:30	99.2%
North	Hatillo	Secondary	Ave Dr Susoni	18.487730	-66.824029	Thursday	12:00	85.4%
North	Hatillo	Local	Calle E	18.487776	-66.789458	Thursday	15:00	99.2%
North	Hatillo	Local	Marg.Cll Comercio	18.485504	-66.818322	Thursday	16:30	86.9%
West	Isabela	Secondary	Pr- 2	18.468321	-67.031808	Wednesday	11:30	93.8%
West	Isabela	Local	Cll Dr Gonzalez	18.501772	-67.020247	Wednesday	14:30	88.8%
West	Isabela	Local	Cll Lamela	18.500950	-67.026652	Wednesday	10:00	82.5%
West	Isabela	Local	Cll la Sierra	18.504912	-67.061166	Wednesday	13:00	72.1%
South	Juana Díaz	Primary	Autopista Luis A Ferre	18.032402	-66.434595	Monday	15:30	94.3%
South	Juana Díaz	Secondary	Pr- 14	18.052872	-66.521361	Monday	12:30	91.0%
South	Juana Díaz	Local	Cll Ext Munoz Rivera	18.053821	-66.504846	Monday	11:00	71.0%
South	Juana Díaz	Local	Avecamino Real	18.011116	-66.493727	Monday	14:00	64.3%
East	Juncos	Primary	Expreso Cruz Ortíz Stella	18.244460	-65.940350	Thursday	13:30	91.3%
East	Juncos	Secondary	Pr- 189	18.240805	-65.932685	Thursday	12:00	89.4%
East	Juncos	Local	Cll Martinez	18.228180	-65.921854	Thursday	9:00	80.7%
East	Juncos	Local	Cll Algarin	18.227368	-65.927396	Thursday	10:30	70.1%
West	Mayagüez	Secondary	P R - 105	18.203182	-67.145643	Thursday	12:30	81.6%
West	Mayagüez	Local	Cll Simon Carlos	18.202173	-67.149470	Thursday	14:00	64.3%
West	Mayagüez	Local	Calle M Columbus Lndg	18.198214	-67.150428	Thursday	15:30	53.3%
West	Mayagüez	Local	Cll Nenadich E	18.197356	-67.143562	Thursday	11:00	89.3%
East	Naguabo	Primary	Pr- 53	18.214525	-65.718318	Friday	8:00	87.5%
East	Naguabo	Secondary	Pr- 3	18.201024	-65.711556	Friday	9:30	69.9%

Region	County	Type	Road Segment	X Coordinate	Y Coordinate	Day	Time	Belt use percentage
East	Naguabo	Local	Cll Goyco	18.212429	-65.734183	Friday	12:30	60.2%
East	Naguabo	Local	Cll 7	18.206030	-65.737460	Friday	11:00	60.0%
South	Ponce	Primary	Autopista Luis A Ferré	18.002135	-66.583322	Thursday	14:00	96.6%
South	Ponce	Secondary	Pr- 2	17.974190	-66.680717	Thursday	12:30	88.9%
South	Ponce	Local	Ave Padre Noel	17.982400	-66.622295	Thursday	15:30	81.2%
South	Ponce	Local	Cll 2	18.018618	-66.604890	Thursday	11:00	59.5%
South	Salinas	Primary	Autopista Luis A Ferre	17.993180	-66.261345	Friday	13:30	96.7%
South	Salinas	Secondary	Pr- 1	18.039239	-66.240620	Friday	12:00	87.7%
South	Salinas	Local	Cll Miguel Ten	17.976603	-66.297964	Friday	15:00	78.4%
South	Salinas	Local	Cll Victoria Mateo Serrano	17.977954	-66.296859	Friday	16:30	70.3%
Metropolitan	San Juan	Primary	Expreso Las Americas	18.389778	-66.071626	Friday	10:00	100.0%
Metropolitan	San Juan	Secondary	Ave John F Kennedy	18.431885	-66.089463	Friday	7:00	100.0%
Metropolitan	San Juan	Local	Cll Hoare	18.450362	-66.081601	Friday	11:30	99.1%
Metropolitan	San Juan	Local	Cll 7 S	18.401591	-66.090262	Friday	8:30	100.0%
North	Toa Baja	Primary	Pr- 22	18.415249	-66.207233	Saturday	16:00	96.5%
North	Toa Baja	Secondary	Pr- 2	18.403435	-66.216572	Saturday	17:30	97.2%
North	Toa Baja	Local	Pr- 866	18.416051	-66.200846	Saturday	13:00	93.9%
North	Toa Baja	Local	Cll Canarios	18.425498	-66.172550	Saturday	14:30	64.6%

