

# Occupant Restraint Problem Identification

## White Paper for the Florida Occupant Protection Coalition



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## I. Introduction

The objective of this report is to help inform the selection and implementation of effective countermeasures to reduce unrestrained fatalities and injuries among passenger vehicle occupants.

Problem Identification is a process that enables an understanding of a traffic safety problem in terms of its **magnitude**, **trend**, and **characteristics**. This process is intended to identify key factors associated with the problem, in this case **unrestrained occupants**.

The contents of this report are in response to Florida's Occupant Protection Coalition's *Occupant Protection Strategic Action Plan (Action Step 1.1.1d)*. *Action Step 1.1.1d*, which describes the development of a prioritized list of suggested target audiences for material development. The plan can be viewed in its entirety on the Florida Occupant Protection Coalition website, at:

[www.floccupantprotection.com](http://www.floccupantprotection.com)

The data used in this report comes largely from the Fatality Analysis Reporting System (FARS) database, maintained by the National Highway Traffic Safety Administration (NHTSA). The FARS database contains a census of motor vehicle-related fatalities on public roadways. These data are provided annually to NHTSA by each state. Additional data for this report comes from annual restraint use surveys administered by the State of Florida. Data from other sources (e.g., hospital data, injury data, other observational data, licensing data, vehicle miles traveled) are included when available and relevant.

## II. Background

### Magnitude and Trend in Passenger Vehicle Occupant Fatalities

Looking at fatal crash trends in Florida provides some perspective on the number of overall crashes. This helps with understanding who is in most need for occupant protection-related countermeasures.

This section provides a summary of crashes and fatalities involving *restrained* and *unrestrained* passenger vehicle occupants. The number of passenger vehicle occupants who were restrained and unrestrained in Florida (2007–2016), along with those whose restraint use was not known, is shown in Table 1.

**Table 1. Restraint Use Among Passenger Vehicle Occupant Fatalities in Florida: 2007–2016**

Year	Restraint Used		Not Used		Use Unknown		Totals		% of Known Use	
	#	%	#	%	#	%	All Fatalities	Known Use	Use	Non-Use
2007	735	39%	1,078	57%	66	3.5%	1,879	1,813	41%	59%
2008	686	40%	1,000	58%	42	2.4%	1,728	1,686	41%	59%
2009	626	41%	846	56%	44	2.9%	1,516	1,472	43%	57%
2010	660	47%	706	50%	37	2.6%	1,403	1,366	48%	52%
2011	568	46%	609	49%	65	5.2%	1,242	1,177	48%	52%
2012	610	48%	580	46%	69	6%	1,259	1,190	51%	49%
2013	600	49%	553	45%	64	5%	1,217	1,153	52%	48%
2014	640	53%	511	42%	56	5%	1,207	1,151	56%	44%
2015	780	53%	602	41%	80	6%	1,462	1,382	56%	44%
2016	890	52%	745	44%	65	4%	1,700	1,635	54%	46%

Source of data in this table and all tables that follow: Fatality Analysis Reporting System (FARS) 2007–2015 Final File and 2016 Annual Report File (ARF).

There were 3,174 traffic fatalities in the State of Florida in 2016, of which 1,700 (54%) were occupants of passenger vehicles. Among these 1,700 occupant fatalities, 52 percent were known to be restrained, 44 percent were known to be unrestrained, and restraint use was unknown for the remaining 4 percent. The restraint use was 54 percent for the 1,635 occupants whose restraint use was known and 46 percent unrestrained (shown in the bottom right two cells for year 2016 in Table 1).

The **number** of passenger occupant fatalities (where restraint use was known) declined by nearly 10 percent from 2007 to 2016 (from 1,813 to 1,635) and the **unrestrained percent** of these fatalities declined 13-percentage points (22% decrease in number), from 59 percent in 2007 to 46 percent in 2016.

The number and percent of restrained and unrestrained occupant fatalities from 2007 through 2016 (where restraint use was known), are displayed in Figures 1 and 2. Figure 1 shows a U-shaped trend for the number of unrestrained occupant fatalities, beginning with a decline of 567 fatalities from 2007 to 2014 (from 1,078 to 511 fatalities). This 53 percent decline in unrestrained fatalities was likely influenced by a combination of Florida’s primary safety belt law, implemented in 2009, and an economic recession, which began at the end of 2007 and officially ended in June 2009. The decline in the economy resulted in fewer vehicle miles traveled. Restrained occupant fatalities also declined modestly, from 735 in 2007 to 568 in 2011 (-167 fatalities; -23%). This decline in restrained fatalities was likely influenced primarily by the decline in the economy.

Figure 1 also shows that restrained fatalities declined from 2007 through 2009 (likely a function of the recession) and then remained stable from then until 2013 or 2014. The fact that unrestrained fatalities declined from 2007 to 2009 supports the notion that the overall decline was a function of the belt law. That is, if the causal factor for overall decline was more general (as would occur with an economic downturn) we might expect both restrained and unrestrained to decline. Both restrained and unrestrained fatalities increased substantially in 2015 and 2016, likely associated with the improving economy. Note that after 2014, the number of driver licenses and vehicle miles travelled both increased steadily in Florida (consistent with an improving economy). Data in the problem identification section below help to identify the factors (who, when, where) associated with the increased fatalities since 2014.

**Figure 1. Number of Restrained and Unrestrained Occupant Fatalities: 2007–2016**

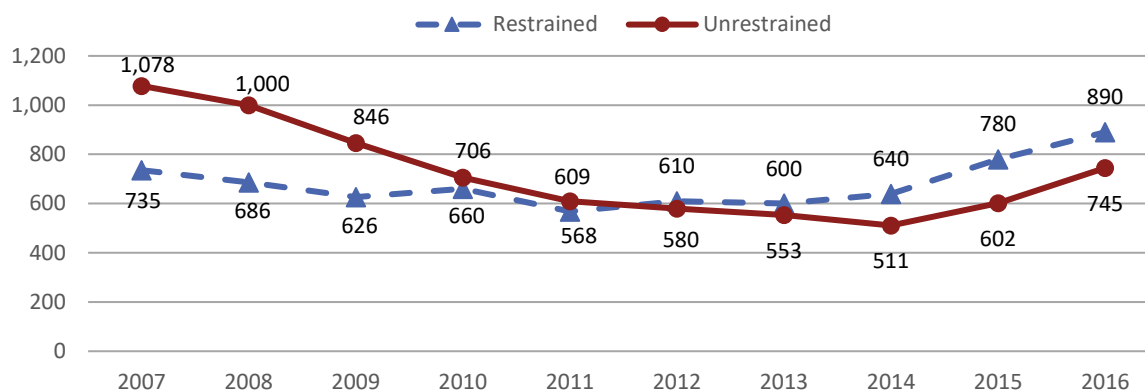
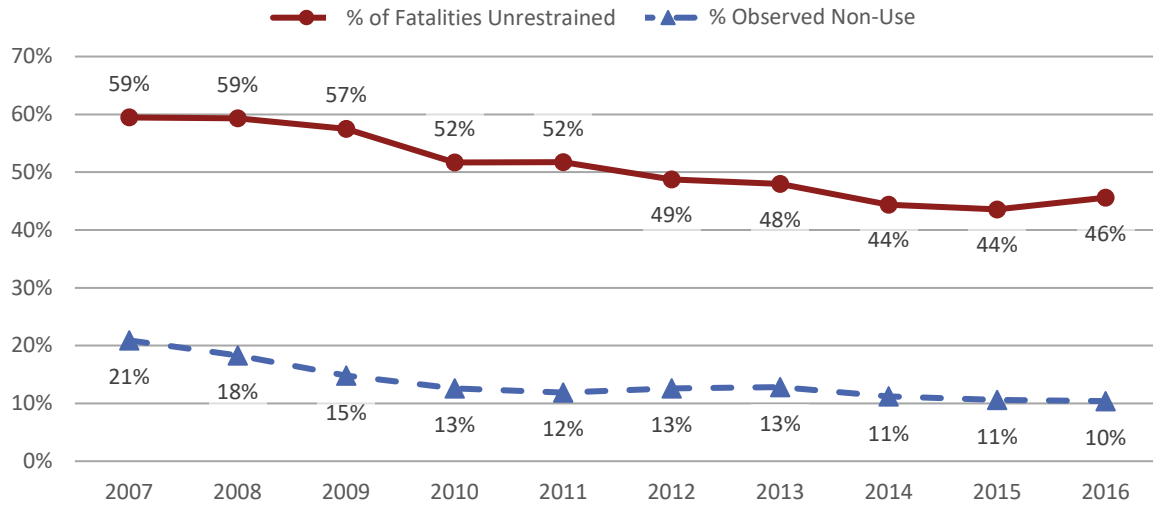


Figure 2 shows trends in terms of the unrestrained percentages of occupant fatalities (where restraint use was known). It also shows observed safety belt non-use among passenger vehicle occupants, from 2007 through 2016. There is a steady downward trend in the unrestrained percent of the occupant fatalities that paralleled the observed non-use rate.

Observed safety belt non-use (Florida’s Annual Statewide Survey of Safety Belt Use) is much lower than usage among vehicle occupant fatalities. It also trended continuously downward throughout the ten-year period with a relatively large drop occurring after the primary law

upgrade. The percent of unrestrained occupant fatalities declined at the rate of more than one-percentage point per year, with the largest decline of five-percentage points from 2009 to 2010 after adopting a primary enforcement safety belt law (implemented June 30, 2009). In 2016, however, there was a two percentage-point increase in the unrestrained percent of total fatalities (this increase was not seen in the observational survey).

**Figure 2. Non-Use Among Occupant Fatalities and Observed Safety Belt Non-Use: 2007–2016**



### III. Problem Identification

The following examination of the characteristics of unrestrained occupant fatalities in Florida focuses on the most recent five years of FARS data (2012 through 2016), with emphasis on 2016, the most recent year for which data are available. These data represent a period following an economic recession which officially ended in 2009 and after a substantial decline in motor vehicle related fatalities. Data from other sources (e.g., hospital data, injury data, other observational data, licensing data, vehicle miles traveled) are included when available and relevant.

#### Age

Table 2 shows the number and percentage of occupant fatalities, by age and restraint use. The leftmost columns of percentages (C: restrained, E: unrestrained, and G: unknown) use the total number of occupant fatalities as the denominator (whether restraint use was known or not). The rightmost two columns, J and K, are derived using the number of fatalities (for which restraint use was known) as the denominator (i.e., fatalities with unknown use are omitted). These percentages (with unknown use omitted) are our focus as they demonstrate the likely use among all fatally injured occupants (if unknown status is not more likely to occur among either unrestrained or restrained occupants).

**Table 2. Passenger Vehicle Occupant Fatalities in 2016, by Age Group\***

A	B	C	D	E	F	G	H	I	J	K
Age Group	Restrained #	Restrained %	Unrestrained #	Unrestrained %	Unknown Use #	Unknown Use %	Total w/Unk.	Total Known	Restraint Known Used	Restraint Known Not Used
0-3	6	67%	2	22%	1	11%	9	8	75%	25%
4-7	11	52%	7	33%	3	14%	21	18	61%	39%
8-12	14	61%	8	35%	1	4%	23	22	64%	36%
13-15	4	20%	13	65%	3	15%	20	17	24%	76%
16-20	70	45%	80	51%	6	4%	156	150	47%	53%
21-24	79	40%	107	55%	10	5%	196	186	42%	58%
25-34	126	40%	167	54%	19	6%	312	293	43%	57%
35-44	93	47%	97	49%	6	3%	196	190	49%	51%
45-54	95	47%	107	53%	0	0%	202	202	47%	53%
55-64	100	60%	61	37%	5	3%	166	161	62%	38%
65-74	118	69%	44	26%	8	5%	170	162	73%	27%
75+	173	76%	52	23%	3	1%	228	225	77%	23%
Unk	1	100%	0	0%	0	0%	1	1	100%	0%
Total	890	52%	745	44%	65	4%	1,700	1,635	54%	46%

\* Totals shown in Column H include occupant fatalities with unknown restraint use (w/Unk.) and the Column I Totals exclude unknown cases of restraint use (Known).

The age group with the highest overall number of fatalities was 25-34-year-olds (N = 312) followed by those 75 and older (N = 228). The older group however, despite high numbers, had the lowest percentage of non-use (only 23% were unrestrained). As a group, the 25-34-year-old



occupants represent a group that could greatly benefit from an intervention. Not only do they represent the largest number of occupant fatalities (18%; disproportionately higher than their population representation of about 12%) but they have the third highest rate of being unrestrained in fatal crashes and only one-percentage point behind the second highest age group—21-24-year-old occupants. The 21-24-year-old occupants may be of greater concern considering that the category contains fewer years of age (4) compared to the 25-34-year-olds (10) and has the second highest unrestrained fatality rate. Thirteen to fifteen-year-old occupants represent a relatively small percentage of the total number of fatalities (1.2%) but have the highest proportion of unrestrained fatalities. That said, the small number of fatalities makes their percentage use questionable in terms of validity. Indeed, the number of unrestrained fatalities for this age in 2016 group was atypical compared to other years (Figure 3). Given the unusual spike in unrestrained fatalities, this age group should be monitored over time to ensure that it is not the beginning of a trend of non-use. Unrestrained serious injuries were also highest for 19-24-year-old occupants and 25-34-year-old occupants.<sup>1</sup> Unrestrained serious injuries for these two categories (individually) were nearly twice the number of fatalities of the next highest age group.

The numbers of fatalities among the **youngest age groups** are quite small relative to older age categories. However, Figure 3 shows that the number of unrestrained fatalities increased among all four of the youngest age groups, particularly among the 13-15-year-olds.

**Figure 3. Number of Unrestrained Fatalities for the Youngest Age Groups: 2012–2016**

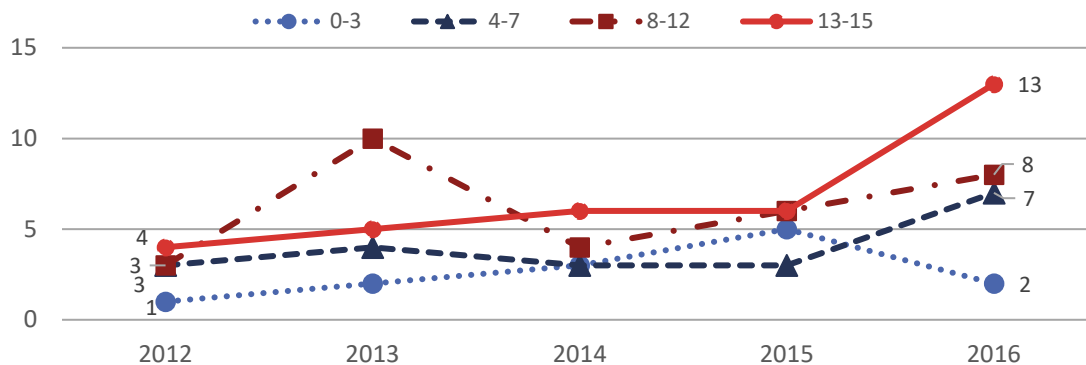


Figure 4 shows the number of unrestrained fatalities among the **young to middle-age groups**. The figure shows relative stability, if not a moderate decline, among these age groups from 2012 to 2014. In the last two years, particularly among the 25-34 group, there was an increase.

<sup>1</sup> Data from serious injuries comes from the Florida Occupant Protection Coalition’s Occupant Protection Fact Sheet. These results are from data spanning the years 2011 to 2016. Available: [http://www.floccupantprotection.com/pdf/FDOT\\_FOPC%20Fact%20Sheet\\_v7.pdf](http://www.floccupantprotection.com/pdf/FDOT_FOPC%20Fact%20Sheet_v7.pdf)

**Figure 4. Number of Unrestrained Fatalities for Young to Middle-Age Groups: 2012–2016**

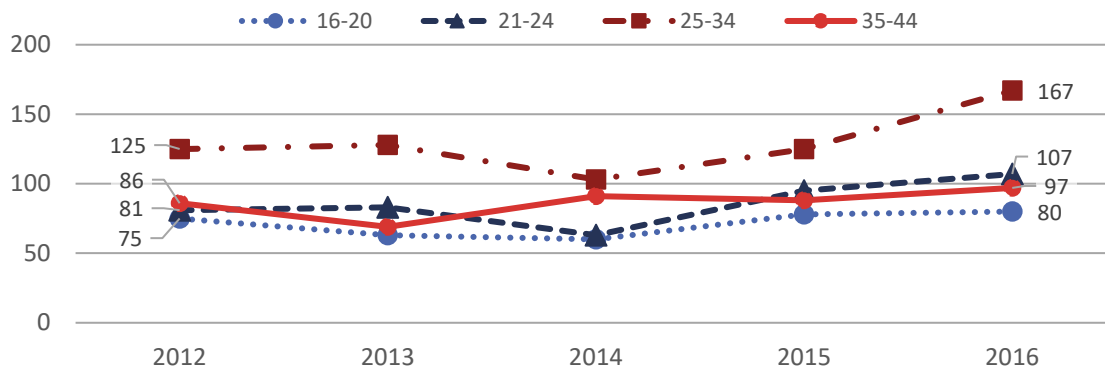
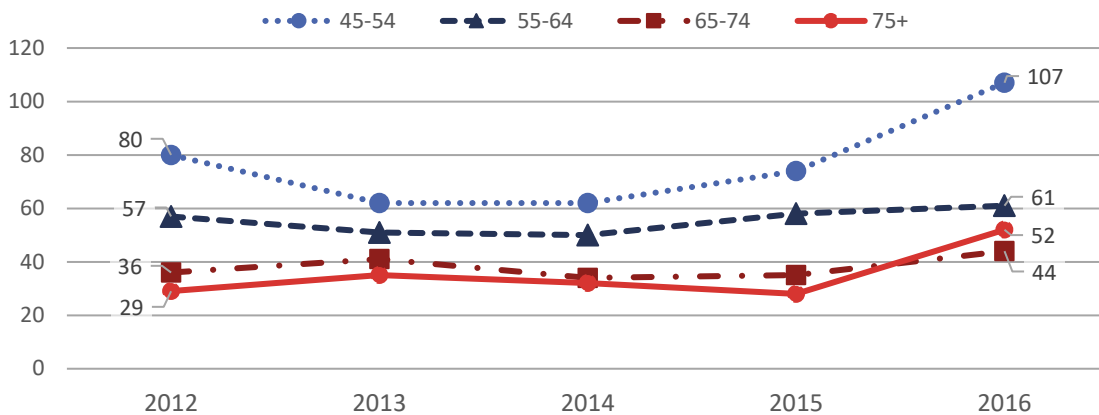


Figure 5 shows that the number of unrestrained fatalities among **the older age groups**. The pattern among the 45-54-year-old occupants and 55-64-year-old occupants tends to follow those of the young to middle-age groups where the increase starts in 2015 instead of 2016. The oldest age group (75+) experienced the largest percent increase (86%) in 2016.

**Figure 5. Number of Unrestrained Fatalities for Older Age Groups: 2012–2016**



The Florida Department of Transportation conducted a child seat observational survey for the first time in 2017. Results from the survey indicate the youngest occupants (0-3) were unrestrained five percent of the time; those ages 4-5 were unrestrained 22 percent of the time and; those ages 6-12 were unrestrained 16 percent of the time.

*In summary, findings regarding **age of occupant** and restrained and unrestrained fatalities indicated:*

- Occupants **ages 21-34** represent a large portion of the overall fatalities and have among the highest rates of non-use.
- Special focus needs to be placed on **young teens** as their rate of non-use was the highest and there was a relatively large increase in unrestrained fatalities from 2015 to 2016. Given the national data suggesting high non-use rates this age group could

benefit from preventative focus (i.e. intervention ahead of a possible impending problem).

- Given the aging population of Florida, the increase in unrestrained fatalities among those **ages 75+** is likely a function of other factors (e.g., population growth among the age group) and not just non-use. That said, the relatively large increase in seen from 2015 to 2016 could indicate an emerging problem. Add to that the frailty of the oldest occupants, the impact of non-use is greater in terms of fatalities.
- Observational data and FARS data indicate that there is room for improvement among the youngest occupants particularly among those **ages 4-12**. Despite having non-use rates much lower than other groups, the vulnerability of children warrants intervention to prevent loss of life and injury among this age group. General injury increases (i.e., among all crash victims; not just unrestrained) among this age group on a per population basis (from the Bureau of Vital Statistics) support the need to direct some level of focus to this group.

### Gender

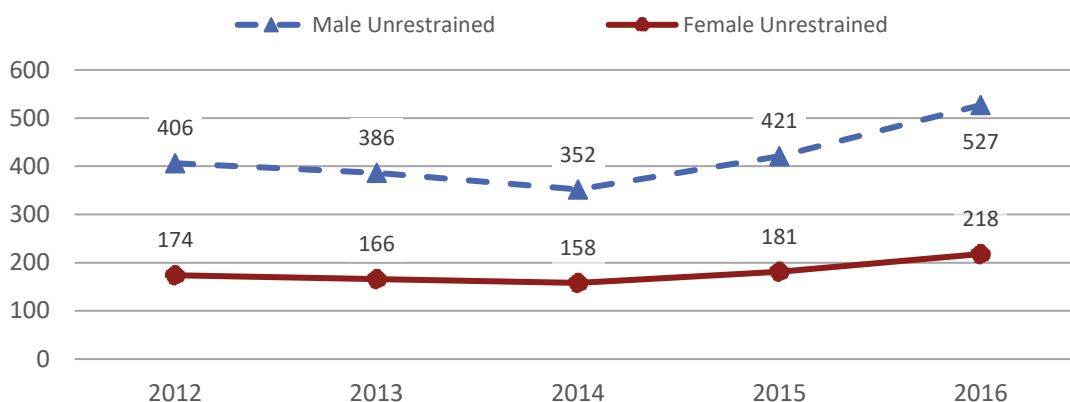
Table 3 provides a summary of restraint use among passenger vehicle occupant fatalities in 2016 by gender. Male occupants accounted for 2.4 times as many unrestrained fatalities as female occupants (527 and 218, respectively) but they only accounted for 1.4 times as many restrained fatalities as female occupants (521 and 369, respectively). Similar results are seen with serious injuries where 63 percent of the serious injuries in Florida were from male occupants. The percent of non-use for female occupant fatalities was 37 percent—much lower than the five percent non-use seen among male occupants.

**Table 3. Passenger Vehicle Occupant Fatalities in 2016, by Gender**

A	B	C	D	E	F	G	H	I	J	K
Gender	Restrained #	%	Unrestrained #	%	Unknown Use #	%	Total w/Unk.	Total Known	Restraint Known Used	Not Used
Male	521	48%	527	48%	46	4%	1,094	1,048	50%	50%
Female	369	61%	218	36%	19	3%	606	587	63%	37%
Total	890	52%	745	44%	65	4%	1,700	1,635	54%	46%

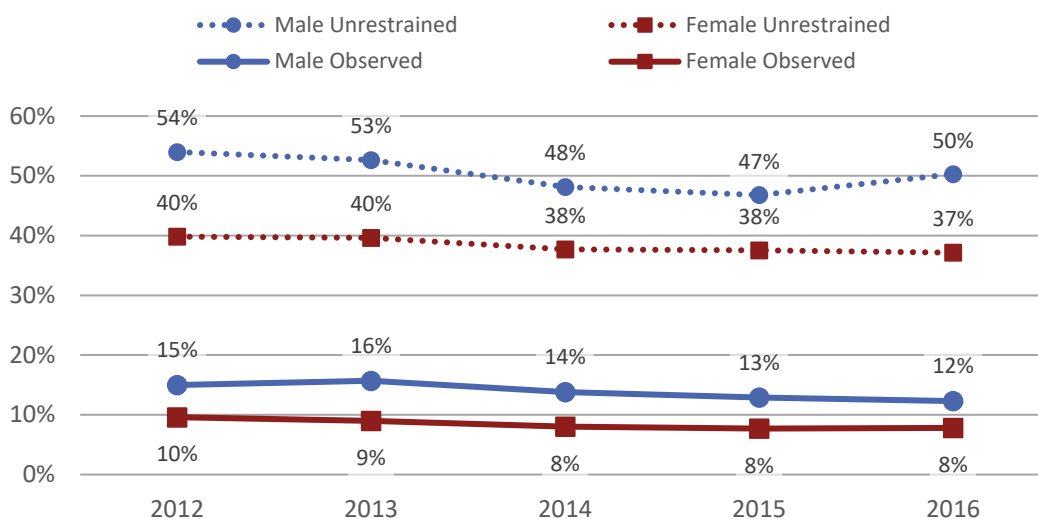
Figure 6 shows the number of unrestrained fatalities by gender of occupant over the five-year period ranging from 2012 to 2016. Both male and female unrestrained fatalities remained consistent, if not declining, from 2012 to 2014. Unrestrained fatalities increased for both male and female occupants starting in 2015. The increase among male occupants was of a greater magnitude than that of female occupants, with male occupants having 175 more fatalities in 2016 than 2014 (a 50% increase) compared to female occupants who had 60 more fatalities over the same time-period (a 38% increase).

**Figure 6. Number of Unrestrained Fatalities, by Gender: 2012–2016**



Florida’s statewide observational surveys, conducted in June of every year, were examined (note that these observations include front seat occupants only in passenger vehicles). Data from these surveys, like FARS, indicated higher rates of non-use with male occupants compared to female occupants. Data from these surveys indicated male occupants were unrestrained more often (12%) than female occupants (6%), consistent with the FARS data. Figure 7 shows percent of non-use among fatally injured occupants and observational results by occupant gender. The observational data and the FARS data tend to run parallel, indicating similar trends from both data sources. In 2016 however, there is a divergence between the observed non-use rate for males, which continued to improve, and an unrestrained fatality rate that increased.

**Figure 7. Percent of Fatalities, Unrestrained and Observed Non-Use, by Gender: 2012–2016**



*In summary, findings regarding gender of occupant and restrained and unrestrained fatalities indicated:*

- **Male occupants** accounted for almost 2.4 times as many fatalities compared to female occupants (71% vs. 29%). Males had greater increases in unrestrained fatalities than did female occupants over the last few years.

- A focus on strategies to increase use among male occupants could prove to be fruitful.

### Race & Ethnicity

Table 4 provides a summary of restraint use for race/ethnicity of passenger vehicle occupant fatalities in 2016. Omitting fatalities where restraint use was unknown, the data show that the percent restraint non-use was lowest for those identified as belonging to a race other than Black or White (Other: 38%). This group makes up only about four percent of the total occupant fatalities in the state (3% of the unrestrained fatalities). White occupants had the next lowest non-use rate (44%), and Black occupants had the highest rate of non-use (54%). Black occupants accounted for 20 percent of the unrestrained occupant fatalities in Florida yet make up an estimated 17 percent of the population thus making their unrestrained fatalities slightly higher than would be expected based on population.

**Table 4. Passenger Vehicle Occupant Fatalities in 2016, by Race/Ethnicity**

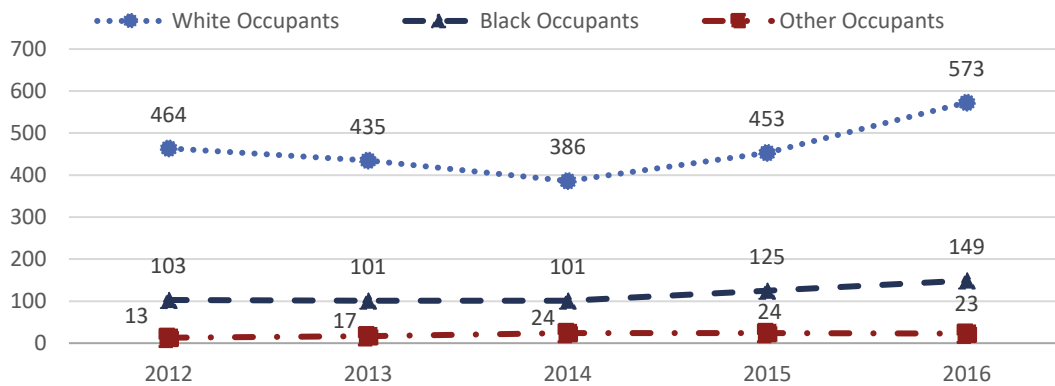
A	B	C	D	E	F	G	H	I	J	K
Race/Ethnicity	Restrained #	%	Unrestrained #	%	Unknown Use #	%	Total w/Unk.	Total Known	Restraint Known Used	Not Used
<b>Race</b>										
White	725	54%	573	43%	39	3%	1,337	1,298	56%	44%
Black	127	42%	149	50%	23	8%	299	276	46%	54%
Other	38	59%	23	36%	3	5%	64	61	62%	38%
<b>Ethnicity</b>										
Hispanic	192	49%	180	46%	17	4%	389	372	52%	48%
Not Hispanic	692	53%	562	43%	47	4%	1,301	1,254	55%	45%
<b>Unknown</b>	6	60%	3	30%	1	10%	10	9	67%	33%

Figure 8 shows the number of occupant unrestrained fatalities over time by race. Both Black and White occupants increased in 2015 and 2016. The increase among White occupants was relatively large; 187 more in 2016 than there was two years earlier in 2014. Black occupant fatalities increased by 48. While the magnitude of the recent increase was greater among the White occupants than Black occupants, the overall percentage change was the same for both groups (48%). It is interesting to note that from 2012 to 2014, decreases in unrestrained fatalities were driven almost exclusively by White occupants.

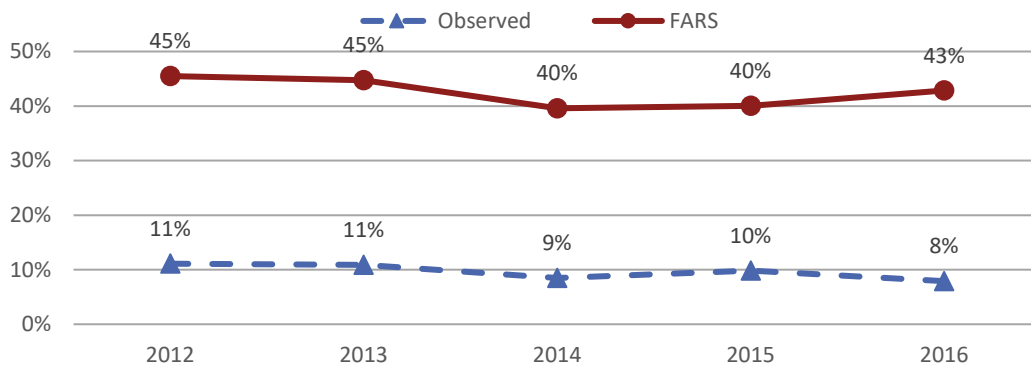
Race and non-usage trends were examined in both the observational survey data and FARS data. The observational survey coded race differently than FARS. For the observational study, observers identified race of individuals subjectively as being either Black, White, Hispanic and other/unknown. In FARS, race and ethnicity are coded individually such that an individual can be White and Hispanic or White and non-Hispanic etc. For the purposes of this report, we ignore those important differences in method. The differences in the methods are unlikely to change the results or recommendations stemming from those results.

Figures 9 and 10 show that non-usage rates among the FARS data and observation data tend to run mostly parallel over the years, with a slight divergence occurring in 2016 for White occupants (Figure 9) and divergence in 2014 and 2016 for Black occupants (Figure 10).

**Figure 8. Number of Unrestrained Fatalities in FARS, by Race: 2012–2016**



**Figure 9. Percent of Observed Non-Use and Percent of Fatalities for Unrestrained White Occupants: 2012–2016**



**Figure 10. Percent of Observed Non-Use and Percent of Fatalities for Unrestrained Black Occupants: 2012–2016**

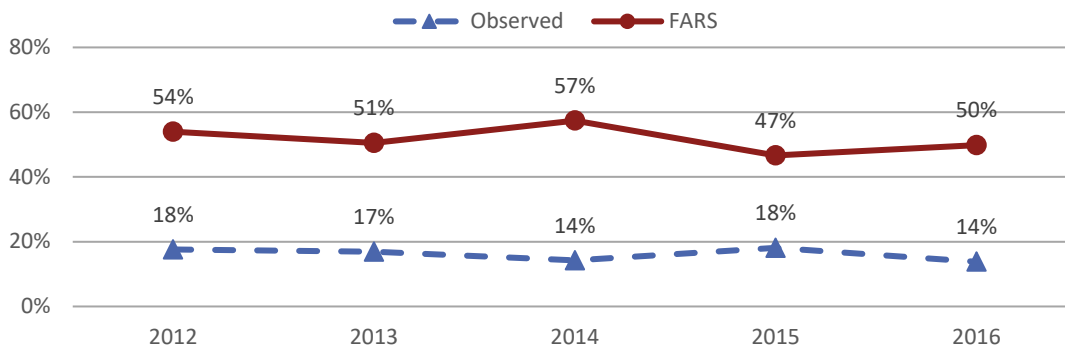
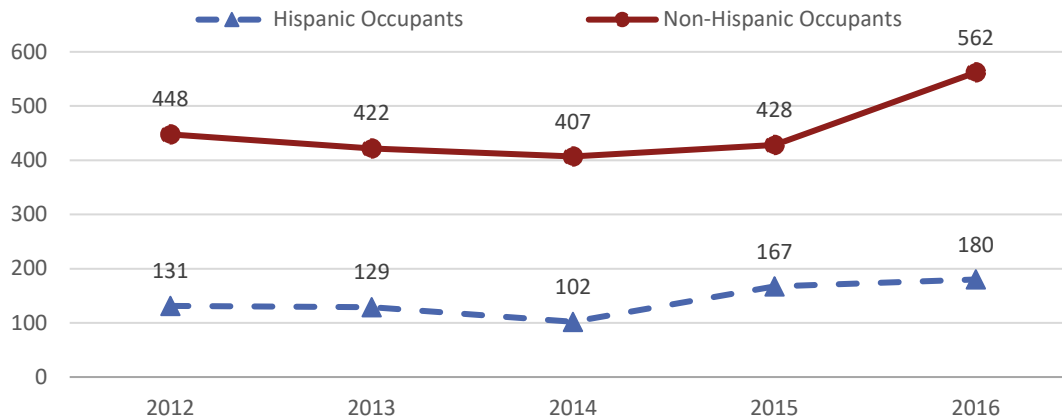


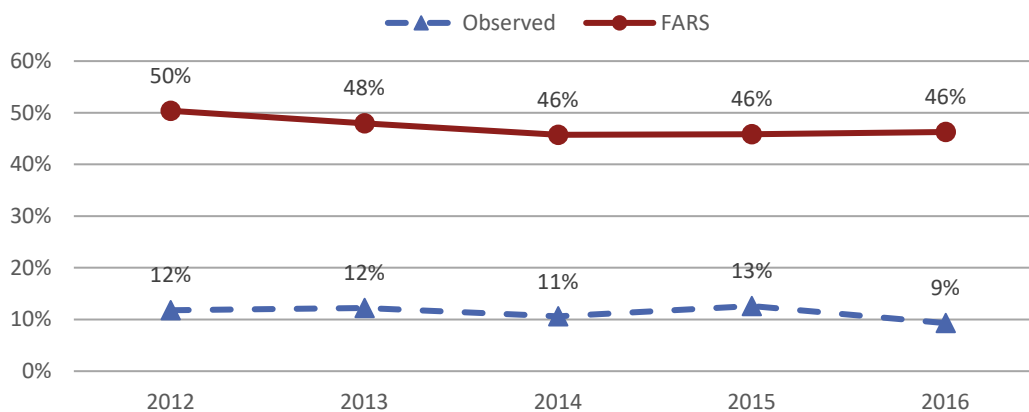
Figure 11 shows that Hispanic fatalities were unrestrained 48 percent of the time, only marginally more often than non-Hispanic Occupants (45%). Hispanics make up about 23 percent of the population in the state and accounted for about 24 percent of the unrestrained fatalities. Thus, they were within one-percentage point of the expected percentage.

**Figure 11. Number of Unrestrained Fatalities in FARS, by Ethnicity: 2012–2016**



Hispanic occupants showed a similar directional pattern over time (2012–2016) as did non-Hispanic occupants. However, from 2014 to 2016 there was a substantially greater increase among Hispanic occupants than non-Hispanic occupants (Hispanic: 76%; non-Hispanic: 38%) and their pattern of use over time for percentage of non-use was similar in terms of trend from both FARS and observations (Figure 12). Again, a slight divergence occurred in 2016.

**Figure 12. Percent of Observed Non-Use and Percent of Fatalities for Unrestrained Hispanic Occupants: 2012–2016**



*In summary, findings of occupant race/ethnicity and restrained and unrestrained fatalities indicated:*

- The observed results and the use rate among fatally injured unrestrained occupants by race are similar. Both measures indicate higher non-use rates among **Black occupants** than White occupants. Efforts to understand this difference and develop programs to address it are warranted.
- Hispanic occupants and non-Hispanic occupants demonstrated similar rates of non-use in both observational studies and using FARS. Of some interest is that fact that **Hispanic occupants** demonstrated a large percentage increase in unrestrained fatalities over the last few years. The state should maintain a focus on this group to determine the cause of the increase which does not seem to be driven by a change in non-use rates.

### Vehicle Type

Table 5 provides an overview of the distribution of occupant fatalities by vehicle type in 2016. Occupants in passenger cars accounted for the greatest numbers and proportions of all occupant fatalities (62% in 2016). Occupants in pickup trucks and sport utility vehicles (SUVs) accounted for 17 percent and 15 percent of occupant fatalities, respectively; and occupants of vans accounted for five percent of fatalities.

The data in Column J show that non-use among crash victims was highest in vans (34%) noting that van occupants made up five percent of all occupant fatalities (4% of unrestrained occupant fatalities). Occupants in passenger cars use was the next lowest (38%), followed by SUVs (57%), with the highest rate of non-use found among pickup truck occupants (63%).

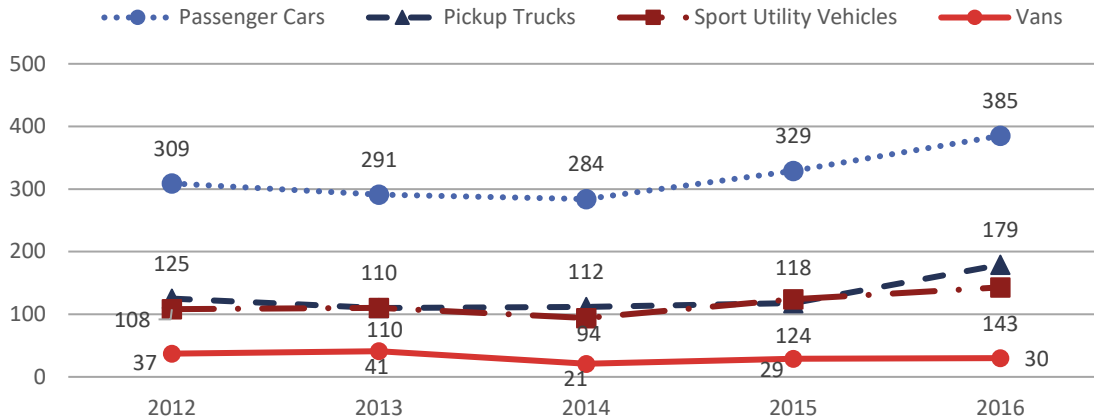
**Table 5. Occupant Fatalities in 2016, by Vehicle Type**

A Vehicle Type	B Restrained		C Unrestrained		D Unknown Use		E Total w/Unk.	F Total Known	G Restrained Known	
	#	%	#	%	#	%			Used	Not Used
Passenger Cars	618	59%	385	37%	45	4%	1,048	1,003	62%	38%
Pickups	107	37%	179	62%	3	1%	289	286	37%	63%
SUVs	107	41%	143	55%	12	5%	262	250	43%	57%
Vans	58	62%	30	32%	5	5%	93	88	66%	34%
Other	0	0%	8	100%	0	0%	8	8	0%	100%
Total	890	52%	745	44%	65	4%	1,700	1,635	54%	46%

The number of unrestrained fatalities increased among all vehicle types from 2014 to 2016 following a moderate decline from 2012 to 2014 in almost all groups (Figure 13). The greatest increase in number (N = 101) was among passenger cars, which again make up most of the passenger vehicles on the road, but the percentage increase was the lowest (36%). Vans, making up the smallest number of vehicles, had an increase of nine unrestrained fatalities over that time (43%) and SUVs had increase of 49 unrestrained fatalities (52%). Pickup truck occupants had the second highest increase in number (N = 67) but the highest percentage increase (60%) from 2014 to 2016.

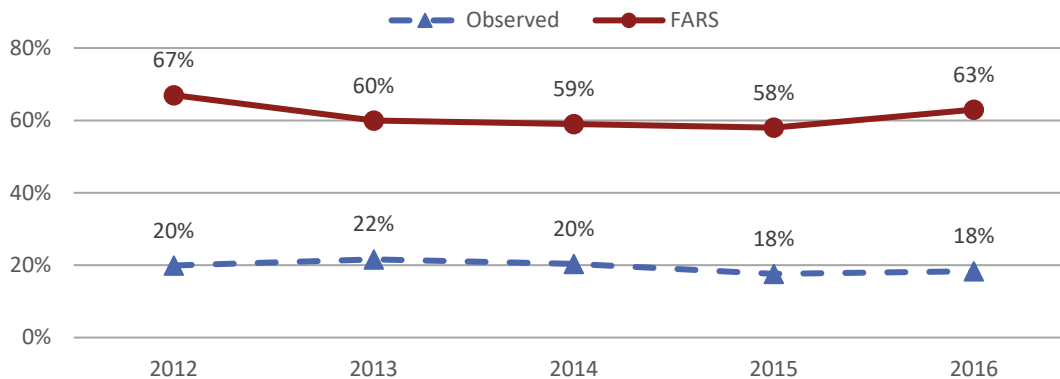


**Figure 13. Number of Unrestrained Occupants by Vehicle Type: 2012–2016**



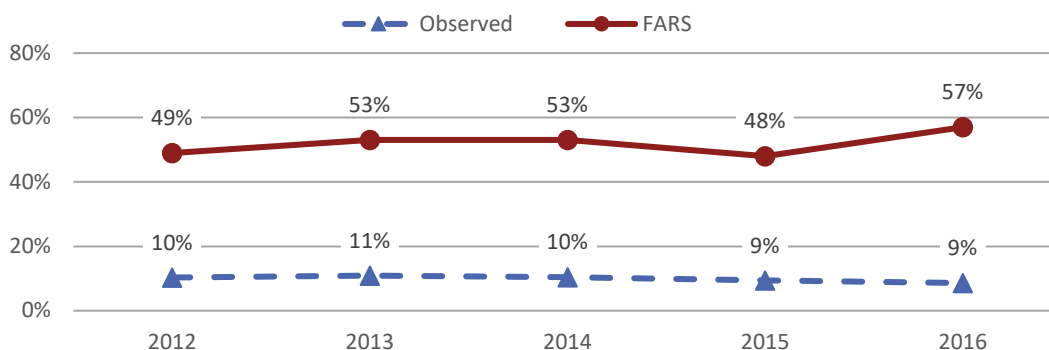
Vehicle type was also collected in the observational study. The figures below (Figures 14 and Figure 15) focus on pickup trucks and SUVs—both appear to be a problem area in Florida.

**Figure 14. Percentage of Observed Non-Use and Percent of Fatalities of Unrestrained Occupants in Pickup Trucks: 2012–2016**



Observation data indicate some fluctuation in the percent of non-use among occupants of pickups over time. Overall the non-use rate seems to be trending downward. FARS data suggests the same, until 2016 when the non-use rate showed a relatively large increase (Figure 14). A similar finding was evident for SUV occupants (Figure 15). It should be noted that the same increases from 2015 to 2016 were not present for cars (2015: 39% non-use; 2016: 38% non-use) and vans (2015: 41% non-use; 2016: 34% non-use).

**Figure 15. Percentage of Observed Non-Use and Percent of Fatalities of Unrestrained Occupants in SUVs: 2012–2016**



*In summary, findings regarding **passenger vehicle types** and fatalities involving restrained and unrestrained occupants indicated:*

- Passenger cars accounted for 61 percent of the total occupant fatalities but had among the lowest rate of non-use. The high proportion of occupants for this vehicle type is likely driven by the fact that a clear majority of vehicles on the road are passenger cars and their representation is likely not disproportionate.
- In 2016, occupant fatalities in **pickup trucks** were unrestrained far more often than any other vehicle type (63% of the time). It is clear however that a focus on individuals in pickup trucks and/or situations and locations more likely to have pickup truck occupants could reduce the number of unrestrained fatalities in the state. The large increase in the 2016 FARS data for percent unrestrained fatalities also indicates the potential for an increasing problem.
- Fatally injured **SUV occupants** in Florida had a relatively high rate of being unrestrained (57%) compared to passenger cars (34%) and vans (38%). In some states observed non-use in SUVs tended to be among the lowest. Observational data in Florida corroborate the FARS data. There exists, however, a divergence of findings between FARS data and observation data when it comes to SUVs. One potential explanation is that SUVs are carrying more (unrestrained) passengers than observation surveys see in the front seat. Another explanation is perhaps there is a subclass of SUV occupants that tend to be particularly risky. Further investigation and/or program intervention may be warranted to reduce non-use among high risk SUV occupants.

### Occupant Type, Seating Row and Seating Position

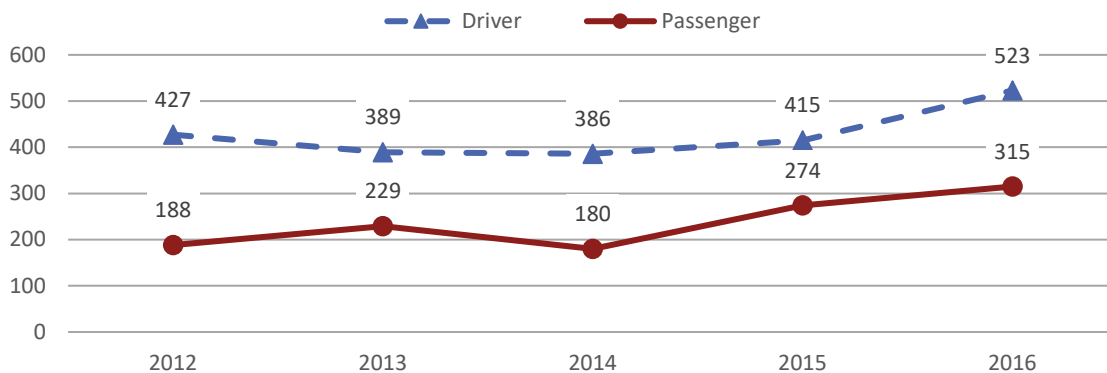
Table 6 provides a summary of restraint use and non-use data for occupant fatalities, by occupant role (i.e., driver or passenger). An overwhelming majority (72%) of occupant fatalities were drivers of vehicles. This is not surprising given the fact that every trip involves a driver but not necessarily a passenger. The rate of non-use among drivers and passengers were similar among fatally injured occupants (45% versus 47%, respectively).

**Table 6. Occupant Fatalities in 2016, by Occupant Type**

Occupant Type	B		C		D		E		F		G		H		I		J		K	
	Restrained #	%	Unrestrained #	%	Unknown Use #	%	Total w/Unk.	Total Known	Restraint Known Used	Not Used										
Driver	643	53%	528	44%	42	3%	1,213	1,171	55%	45%										
Passenger	247	51%	217	45%	23	5%	487	464	53%	47%										
Other	0	0%	8	100%	0	0%	8	8	0%	100%										
Total	890	52%	745	44%	65	4%	1,700	1,635	54%	46%										

Figure 16 shows that driver and passenger fatalities over time have moved somewhat consistently with each other (noting some greater year-to-year fluctuation in passenger numbers). Figure 17 shows the unrestrained driver and passenger fatality rates with observed rates over time. Observed data show little difference in the rate of non-use between drivers and passengers, with a steady decline over time. FARS data tended to fluctuate more among passengers compared to drivers.

**Figure 16. Number of Unrestrained Occupants, by Occupant Type: 2012–2016**



**Figure 17. Percent of Observed Non-Use and Percent of Fatalities of Unrestrained Occupants, by Role: 2012–2016**

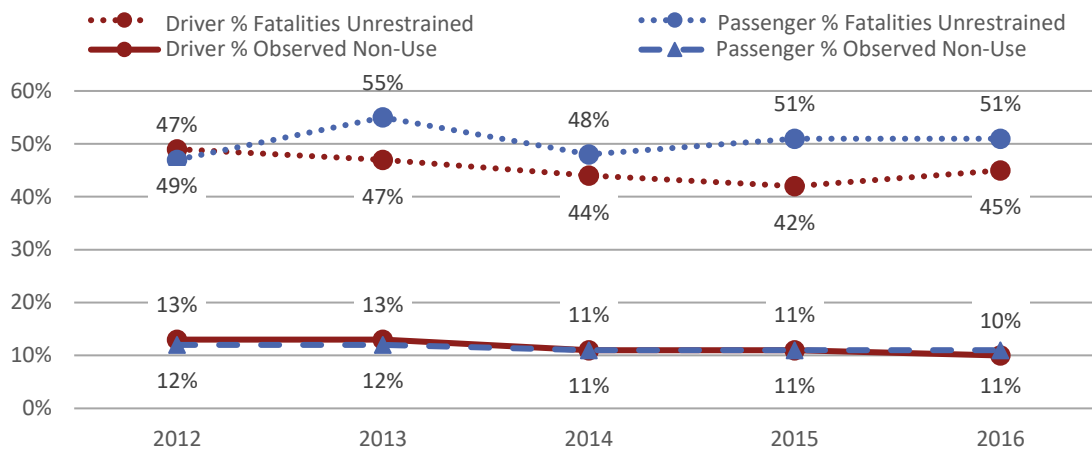


Table 7 looks at the **seating position** of occupants by front or rear seats. Restraint use is historically lower in rear seat (second row) positions. As a result, there has been increasing interest, nationally, in addressing rear seat usage. Table 7 summarizes 2016 FARS data for front row, second row, and other/unknown positions. In 2016, of which 1,513 (89%) were in the front seat; 149 (9%) were in the second row; and 38 (2%) were in some other or unknown seating position. The data indicate that rear seat occupants have a much higher rate of non-use (63%) than do front seat occupants (43%).

**Table 7. Occupant Fatalities in 2016, by Seating Row**

A	B	C	D	E	F	G	H	I	J	K
Row	Restrained		Unrestrained		Unknown Use		Total w/Unk.	Total Known	Restraint Known	
	#	%	#	%	#	%			Used	Not Used
Front	830	55%	627	41%	56	4%	1,513	1,457	57%	43%
2nd	53	36%	89	60%	7	5%	149	142	37%	63%
Other	7	19%	29	81%	2	0%	38	36	17%	83%
Total	890	52%	745	44%	65	4%	1,700	1,635	54%	46%

*In summary, findings regarding occupant type, seating row and seating position and fatalities involving restrained and unrestrained occupants indicated:*

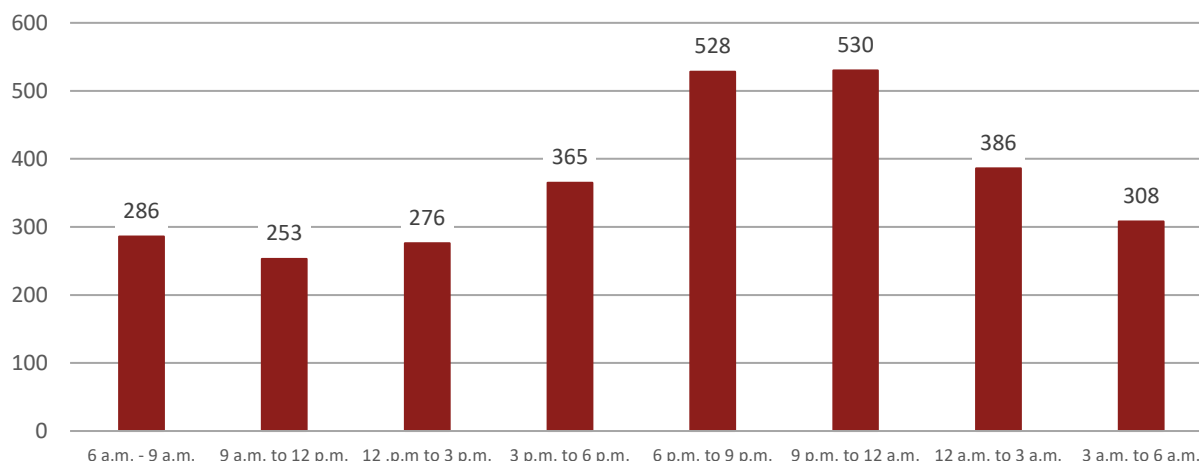
- **Rear seat occupants** make up a much smaller portion of Florida’s unrestrained fatalities (11% when considering all non-front positions). Non-use in the rear seat is a real problem. Usage in FARS indicates a 20-percentage point difference between front and rear positions.
- Interventions aimed at encouraging rear seat restraint use could contribute to efforts aimed at decreasing the unrestrained fatalities.

### Time of Day and Night

Figure 18 shows the number of all motor vehicle fatalities in Florida by time of day. Nighttime is defined as the 12-hour period from 6 p.m. to 6 a.m. The figure shows that the peak hours of fatal crashes are in the nighttime hours. The greatest numbers of fatalities are found between 6 p.m. and midnight. It is worth mentioning that the number of fatal crashes in the 3-hour period from 3 p.m. and 6 p.m. is similar to the number from the 3-hour period from 12 a.m. and 3 a.m. despite the fact that many fewer vehicles are traveling during nighttime. Particularly with data related to hour of day, it is important to consider the proportions of fatalities relative to traffic volume. That is, one could argue that the 530 fatalities from 9 p.m. to midnight are indicative of a greater problem—given lower traffic volume—than a similar number of fatalities occurring from 6 p.m. to 9 p.m.

The data in Table 8 show the restrained and unrestrained numbers and percentages of occupant fatalities by time of day in 2016. Figures 21 and 22 display the distributions of these numbers and percentages graphically.

**Figure 18. All Motor Vehicle Fatalities (FARS) in 2016, by Time of Day**



**Table 8. Occupant Fatalities in 2016, by Time of Day**

A	B	C	D	E	F	G	H	I	J	K
Row	Restrained		Unrestrained		Unknown Use		Total w/Unk.	Total Known	Restraint Known	
	#	%	#	%	#	%			Used	Not Used
Day 6 a.m.-6 p.m.	469	61%	283	37%	23	3%	775	752	62%	38%
Night 6 p.m.- 6 a.m.	421	46%	461	50%	42	5%	924	882	48%	52%
Unknown	0	0%	1	100%	0	0%	1	0	0%	100%
Total	890	52%	745	44%	65	4%	1,700	1,635	54%	46%

The data in Table 8 also shows that the number of unrestrained fatalities increased substantially after 6 p.m. The percent non-use was also much higher at night (52%) than during the day (38%). FARS data were not broken down by individual hour, but it is likely that the percent non-use peaks between 1 a.m. and 3 a.m. Severe injury data from the Florida Department of Highway Safety and Motor Vehicle crash files show that the number of unrestrained fatalities (2011–2016) peaks between midnight and 3 a.m. Unrestrained serious injuries peak between the hours of midnight and 2 a.m.

*In summary, the findings regarding **time of day** and fatalities involving restrained and unrestrained occupants indicated:*

- **Nighttime travel**, as defined here, likely accounts for much less than half of the vehicle miles traveled (especially for passenger vehicles). Yet these 12 hours account for 62 percent of the unrestrained fatalities. Occupants, at this time of day, also demonstrate a

14-percentage point higher rate of non-use than daytime travelers. A focus on nighttime restraint use is clearly warranted.

### Designated Market Areas

The next topic addressed is where the unrestrained fatalities occur. This section of the problem identification process focuses on unrestrained occupant fatalities by Designated (Media) Market Area (DMA). There are 10 DMAs serving the State of Florida.

The objective was to identify areas with the greatest problem with unrestrained fatalities in terms of the number of unrestrained fatalities and the unrestrained percent of total fatalities. Because there can be large fluctuations in the number of unrestrained fatalities in most DMAs, the data was examined using five-year averages (from 2012 to 2016). This approach provides much more stability in numbers and percentages. However, since fatalities have been increasing over the past five years, the average annual numbers of unrestrained fatalities are slightly lower than the 2016 numbers. Conversely, because restrained fatalities have been increasing at a faster rate than unrestrained fatalities in the last few years, the (five-year average) unrestrained percentages of occupant fatalities will generally be slightly higher than the 2016 percentages.

Figure 19 displays the five-year averages for number and percent of unrestrained fatalities in each DMA. Regarding unrestrained fatalities, numbers are highest in DMAs dominated by large urban metropolitan areas, including Tampa (131), Orlando (109), Miami (91), Jacksonville (66) and West Palm Beach (55). These five DMAs average 50 or more unrestrained fatalities per year. The higher number is driven primarily by larger populations.

Percent of unrestrained fatally injured occupants ranged from a low of 43 percent (in both Orlando and West Palm Beach DMAs) to a high of 54 percent in the Mobile DMA. Two other DMAs surpassed the 50 percent mark—Tallahassee (53%) and Gainesville (51%).

**Figure 19. Average Number and Percent of Fatalities Unrestrained, by DMA: 2012–2016**

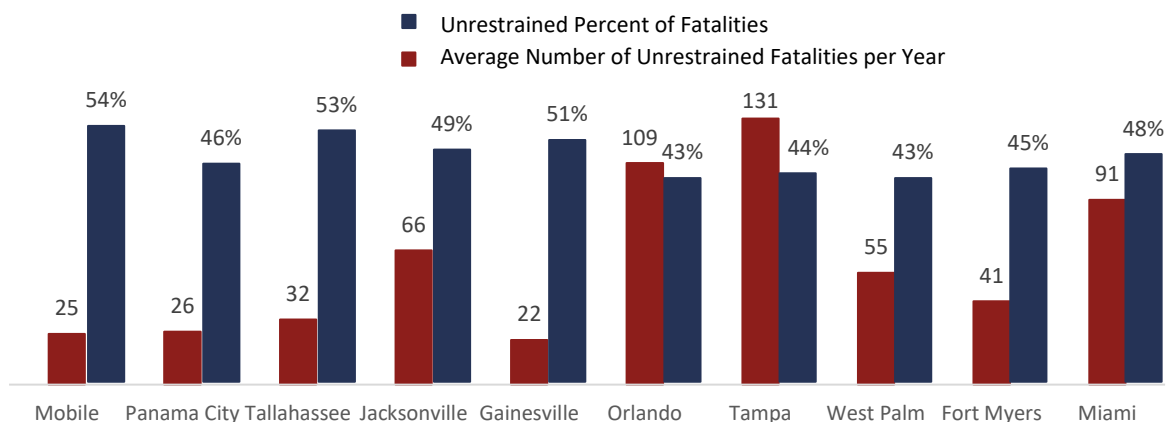
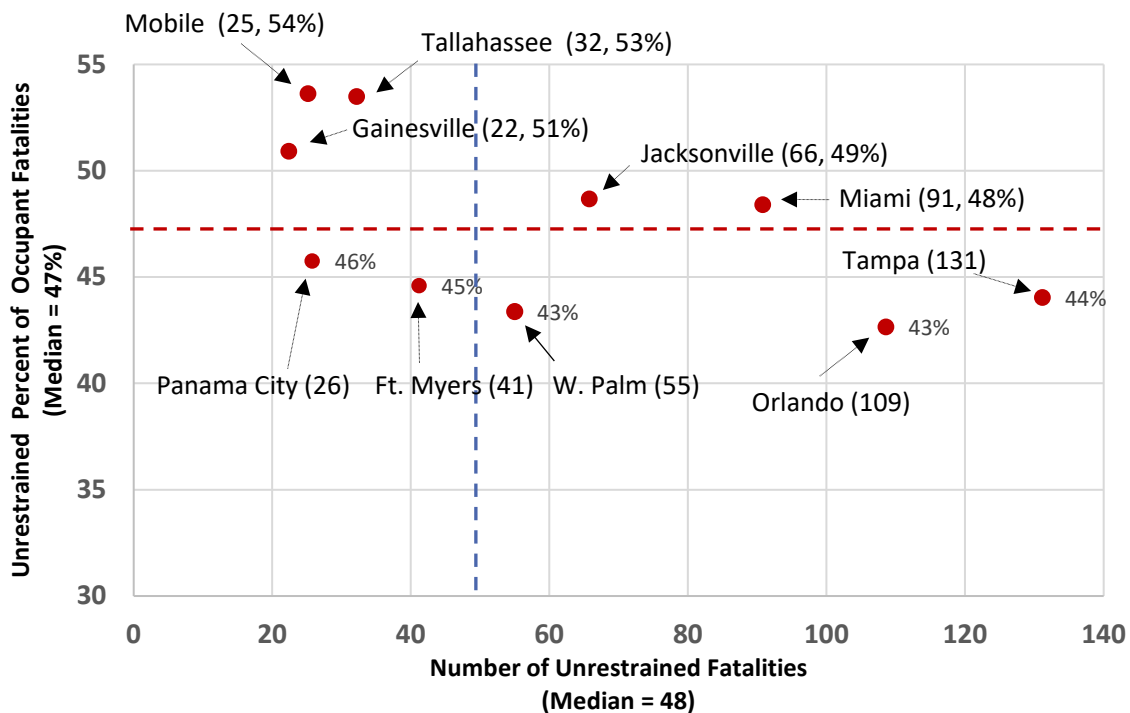


Figure 20 displays the 10 DMAs on two coordinates, the average annual number of unrestrained occupant fatalities, along the horizontal (x) axis; and the average unrestrained percent of occupant fatalities, along the vertical (y) axis.

The average number of unrestrained fatalities is the sum of all such fatalities across all counties within the DMA, divided by five (the number of years). The unrestrained percent is the sum of all unrestrained fatalities across all counties within the DMA divided by the sum of occupant fatalities for which restraint use was known.

Using these two coordinates for each DMA, Figure 20 provides an indication of the relative size of the unrestrained occupant problem in each DMA, in terms of both the number and the percent of occupant fatalities. The average values varied substantially between counties primarily due to urban/rural (population-related) characteristics. For this reason, median values of fatalities and percentages were used to form four quadrants. The median number of unrestrained fatalities was 48 per year; the median unrestrained percent of occupant fatalities was 47 percent.

**Figure 20. Distribution of DMAs by Average Number of Unrestrained Fatalities and Percent of Non-Use Among Occupant Fatalities (Five-Year Averages from 2012 through 2016)**



The **upper left-hand quadrant** of Figure 20 includes three DMAs with fewer-than-median numbers of unrestrained occupant fatalities, but with higher-than-median unrestrained

percentages of such fatalities. This quadrant includes the Mobile, Tallahassee, and Gainesville DMAs. In the Tallahassee DMA, the numbers are heavily influenced by Leon County and in the Gainesville DMA, the numbers are heavily influenced by Alachua County.

The **upper right-hand quadrant** includes DMAs with higher-than-median numbers of unrestrained occupant fatalities and higher-than-median unrestrained proportions of occupant fatalities. The Jacksonville and Miami DMAs are included in this quadrant. The fact that these two DMAs have high percent non-use among occupant fatalities deserves further examination since these DMAs are very urban and this percentage is generally lower in urban areas than in more rural areas.

The **lower right-hand quadrant** identifies DMAs with higher-than-median numbers of unrestrained occupant fatalities, but with lower-than-median proportions of unrestrained occupant fatalities. This quadrant includes the Tampa, Orlando, and West Palm Beach DMAs. The high numbers of unrestrained fatalities are driven primarily by population (as they are in the Jacksonville and Miami DMAs above). The lower-than-median unrestrained percentages of occupant fatalities would be typical for urban areas such as this.

The **lower left-hand quadrant** shows the DMAs with lower-than-median numbers and percentages of unrestrained fatalities. It includes the Panama City-Pensacola and Fort Myers-Naples DMAs.

*In summary, findings regarding **Designated Market Area** and restrained and unrestrained fatalities indicated:*

- This analysis serves to rank order DMAs into at least 3 categories of problem. The upper right quadrant deserves the most attention. The **Jacksonville** and **Miami DMA's** have both high numbers of unrestrained fatalities and a higher percentage of non-use among fatally injured occupants.
- The top left and bottom right quadrants represent DMAs with either high numbers of unrestrained fatalities or high non-use rates but not both. It may be useful to focus on the lower right which has more overall unrestrained fatalities. Finally, the lower left quadrant, containing Panama City and Fort Myers represent areas where rates and numbers are lower.



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## IV. Conclusion

Ideally, this paper will guide the state towards a prioritization of focus points (*see priority table in section V*). Indeed, some subcategories rise to the top based on their magnitudes, and relative difference in non-use rates from other groups (e.g., **nighttime, pickups trucks**). Others stand out for being different in terms of magnitude alone (**white occupants, drivers, passenger cars**) but these tend to be issues related to sheer volume of motorists (i.e. the more of any given group, the more fatalities are expected). Others might deserve focus based on rate of non-use alone (e.g., **young teens, rear seat occupants**) but these may represent only a small portion of the unrestrained fatalities. Consideration needs to be given to both magnitude and rate but also feasibility of focusing on specific sub-groups, likely resistance to messaging, and ability to conduct enforcement.

This initial exploration of problems used FARS as a primary data source. More years of data could be added to allow more in-depth exploration of these initial findings but then the validity of such exploration could be questioned based on the age of the data. Other datasets might allow for further drilling down. That is, it might be interesting to explore the extent to which pick-up truck unrestrained fatalities are within a specific area/location or when unrestrained teen occupant fatalities are occurring. We were unable to discover whether any of the factors explored are explainable by some other factor(s). For example, could it be that the pickup truck problem is really a young-rural-male problem?

The trend data presented here are somewhat unique. They provide the Occupant Protection Coalition not only with a vision of which groups, places, times pose a problem, but how those problems are trending. **Hispanic occupants** would appear to be a group in need of little focus until one recognizes the large percentage increase that occurred over recent years. Similarly, increases in representation from **young teen occupants** and the **oldest occupants** suggest placing some focus to those groups in terms of watching and perhaps heading off impending problems.

Observation data and FARS data used for the white paper have some notable differences. The observation data are a random sample of roadway occupants. The FARS data are census of fatally injured occupants which likely contains a high portion of risky drivers. Despite these differences, they typically show similar results (noting the divergence in 2016). That said, cases where the two are different, as is the case with **SUV occupants**, are of interest because it could indicate some deeper puzzle. As suggested above, it may be that there are different classes of SUV drivers that represent very different risks. The soccer mom in an SUV may make-up a relatively large portion of the SUV occupants observed during a daytime observation but may not be the make-up of those crashing. Furthermore, the observation data are front seat observations done in a single month during the daytime. They fail to address the problem of nighttime and rear seat occupants. Indeed, further drilling down may indicate that SUV's are

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more likely to have unrestrained rear seat occupants (not observed during the statewide survey).

Overall, the data here serve to identify several problem areas that could benefit with additional focus from the state to reduce unrestrained fatalities and likely impact injuries as well.

## V. Unrestrained Occupant Priority Table<sup>2</sup>

Category	High Number Unrestrained Fatalities	High-Percent Unrestrained Fatalities	Recommended Enhanced Efforts	Notes
<b>AGE</b>				
0-3				
4-7			Possible	Data from (Bureau of Vital Statistics) suggest injuries and fatalities are increasing among this group, but this may or may not be a function of non-restraint use.
13-15		●	Somewhat	Data suggest the possibility of an emerging upward trend in unrestrained fatalities.
16-20				
21-34	●	●	Strongly	This age group has high numbers of unrestrained fatalities and high rates of non-use. The magnitude of both measures suggests the need for enhanced intervention.
35-74				
75+			Possible	Data suggest the possibility of an emerging upward trend in unrestrained fatalities, but this may not be a function of non-restraint use.
<b>Gender</b>				
Male	●	●	Somewhat	Male occupants have high numbers of unrestrained fatalities and high rates of non-use, but the numbers are somewhat a function of population size. It is likely that other interventions targeting specific ages, nighttime, and pickup truck occupants (for example) will address the non-use rate among male occupants more so than female occupants.
Female	●			Female occupants have high unrestrained numbers, but this is likely to be a function of overall population.

<sup>2</sup> A lack of a recommendation does not imply that any existing programing should be removed. Existing programs may have positive impacts that lead us to not identify them as problem areas.

Category	High Number Unrestrained Fatalities	High-Percent Unrestrained Fatalities	Recommended Enhanced Efforts	Notes
<b>Race &amp; Ethnicity</b>				
White Occupants	●			White occupants have high numbers of unrestrained fatalities, but this is likely influence by population.
Black Occupants	●	●	Somewhat	Black occupants have relatively high numbers of unrestrained fatalities and high rates of non-use. While making up a considerable portion of the unrestrained fatalities, this group is not as large as some other categories. And while there is lower use among Black occupants than White occupants, the extent of that difference is not as pronounced as in other areas.
Other				
Hispanic Occupants	●		Possible	Data suggest the possibility of an emerging upward trend in unrestrained fatalities, but this may not be a function of non-restraint use.
<b>Vehicle Type</b>				
Passenger Cars	●			Passenger car occupants have a high number of unrestrained fatalities, but this is likely a function of overall population.
Pickup Trucks	●	●	Strongly	Pickup occupants have a high number of unrestrained fatalities and a high rate of non-use. The magnitude of both measures suggests the need for enhanced intervention.
SUVs	●	●	Possible	SUV occupants have a high unrestrained fatality rate according to FARS data. Observed rates did not show these high rates. Recommend that some focus be put towards exploring this category for the possibility of emerging problems.
Vans				

Category	High Number Unrestrained Fatalities	High-Percent Unrestrained Fatalities	Recommended Enhanced Efforts*	Notes
<b>Person Type &amp; Seat Position</b>				
Driver	●			Drivers have a high unrestrained number of fatalities, but this is likely to be a function of overall population.
Passengers	●			Passengers have a high number of unrestrained fatalities, but this is likely to be a function of overall population.
Front Seat	●			Front seat occupants have a high number of unrestrained fatalities, but this is likely to be a function every trip having a driver.
Rear Seats		●	Strongly	Rear seat occupants make up a relatively small portion of the unrestrained fatalities, but the magnitude of the difference in non-use between front and rear seat occupants suggests the need for enhanced intervention.
<b>Time of Day</b>				
Day	●			Occupants in vehicles during the day have high unrestrained numbers, but this is likely to be a function of overall traffic volume.
Night	●	●	Strongly	Occupants in vehicles at night have high numbers of unrestrained fatalities and high rates of non-use. The magnitude of both measures suggests the need for enhanced intervention.

Category	High Number Unrestrained Fatalities	High-Percent Unrestrained Fatalities	Recommended Enhanced Efforts*	Notes
<b>DMA</b>				
Jacksonville, Miami	●	●	Strongly	These DMAs have high numbers of unrestrained fatalities and high rates of non-use. The magnitude of both measures suggests the need for enhanced intervention.
Tampa, Orlando, West Palm	●		Possible	These DMAs have high numbers of unrestrained fatalities, but this may not be a function of non-use.
Mobile, Tallahassee, Gainesville		●	Possible	These DMAs have high rates of non-use but relatively low numbers of unrestrained fatalities.
Panama City, Ft. Myers				Number of unrestrained fatalities are low and current intervention approach appears effective.