Commonwealth of Puerto Rico

**Puerto Rico Traffic Safety Commission**

# PUERTO RICO HIGHWAY SAFETY PLAN
# FY 2015

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# INTRODUCTION

Puerto Rico is the smallest and the easternmost island of the Greater Antilles in the Caribbean, consisting of the main island of Puerto Rico and several smaller islands including Vieques and Culebra. The mainland measures 100 miles long and 35 miles wide (170km by 60km).

There are about 3.7 million citizens distributed over 78 municipalities, this is 1,000 people per square mile, a ratio higher than within any of the 50 states in the United States; it also ranks among the world's highest. The great majority of the population lives in the metropolitan area of San Juan, Caguas, Ponce and Mayagüez and are also highly populated municipalities. In addition, of the total population, approximately 85% are 64 years old and younger showing that Puerto Rico's population is relativy young with tendencies to live an active social life.

Puerto Rico's climate is tropical with an average year round temperature of 82°F. Average annual precipitation is 70 inches with less than 40 inches on the southern coastal plain to greater than 130 inches in the mountains and the north east coast. This precipitation has proven to be a problem to the driving public since roads get flooded very easily. Hurricane season runs from June to November and also has contributed to serious damages in state and municipal roads.

There are 16,694 roadway miles in Puerto Rico and in 2011 there were 3,619,499 licensed drivers and 3,084,543 registered vehicles.

# ALCOHOL

## Problem ID

According to NHTSA's 2012 Traffic Safety Facts Overview, 33,561 people died in traffic crashes in 2012 in the United States, District of Columbia and Puerto Rico. An estimate of 10,322 people died in alcohol impaired driving crashes.

Although alcohol impaired driving fatalities for 2013 are preliminary, data from years 2011, 2012 and 2013 will be analyzed. When analyzing impaired driving fatality data for calendar years 2011-2012 it is noted that total impaired driving fatalities were 104 in 2012 and 103 in 2011, indicating a .9% increase in the two years period. Still, impaired driving fatalities account for 28% of total traffic fatalities.

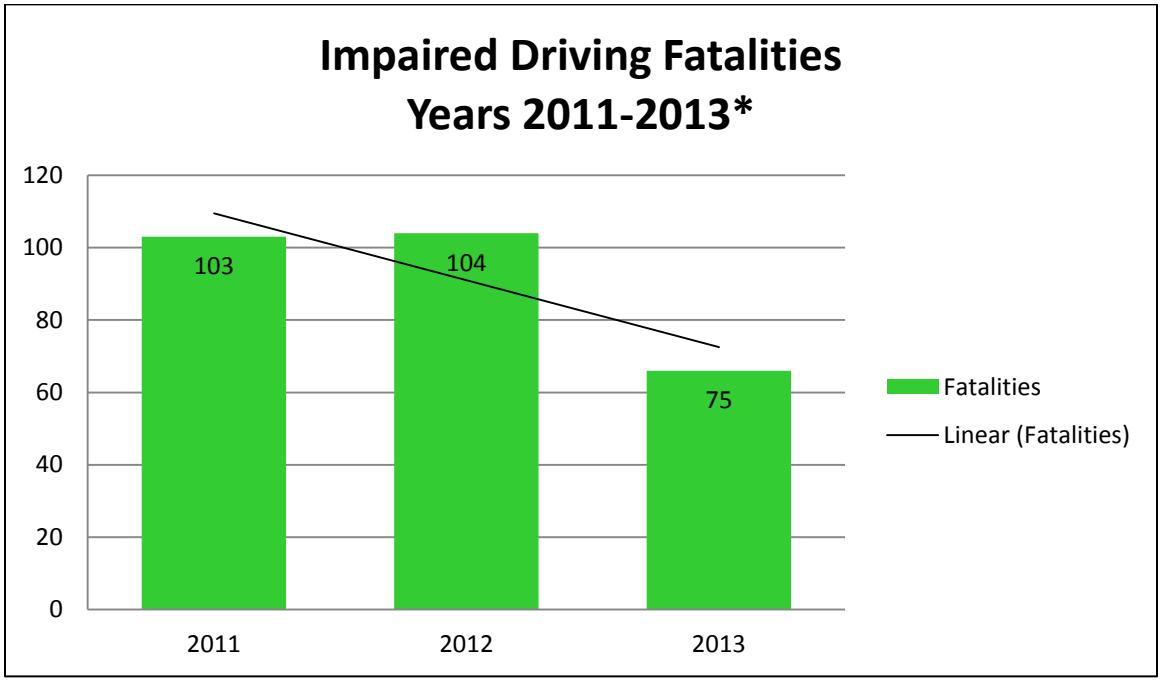



Figure 1: Impared Driving Fatalities Year 2011-2013

Gender data analysis for impaired driving fatalities for this three-year period reflects an average of 94% of male fatalities and 6% female fatalities. Analysis by age group shows that 54% of impaired driving fatalities are in the 25-49 years age group followed by 15-24 age group with 19%.

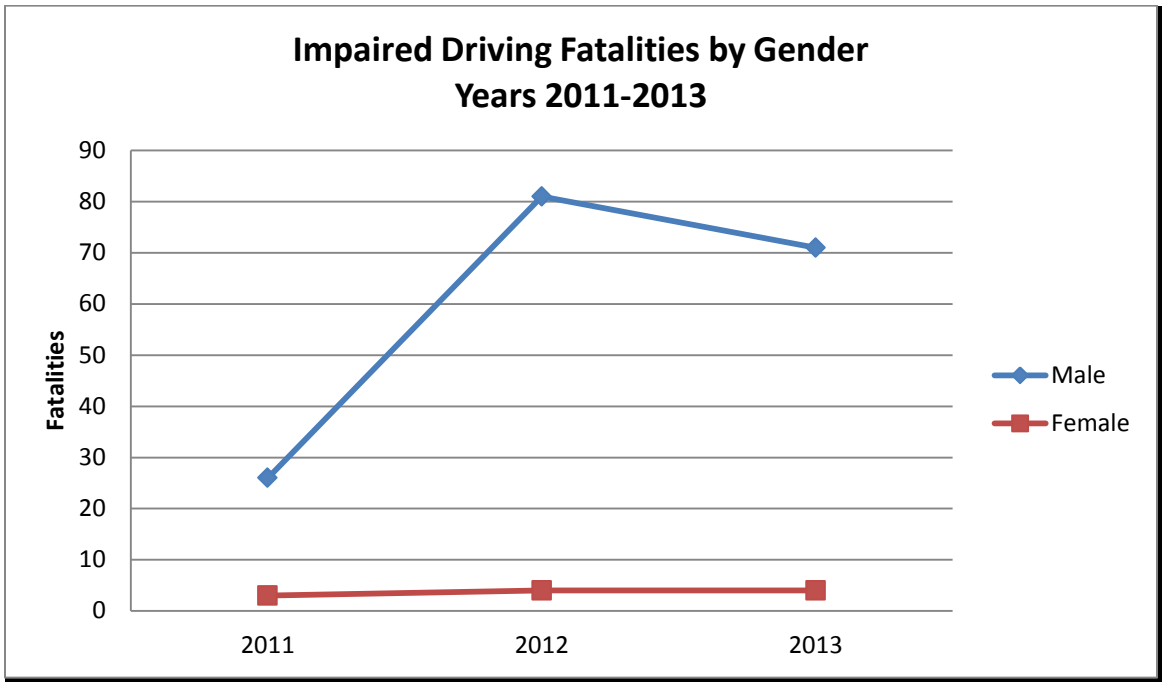



Figure 2: Impaired Driving Fatalities By Gender Years 20011-2013

When analyzing data of impaired driving fatalities by day of the week, it shows that Sunday reported the highest average of fatalities for the 3-year period with 33%, followed by Saturday and Friday, this demonstrates that alcohol and weekends are a lethal combination.

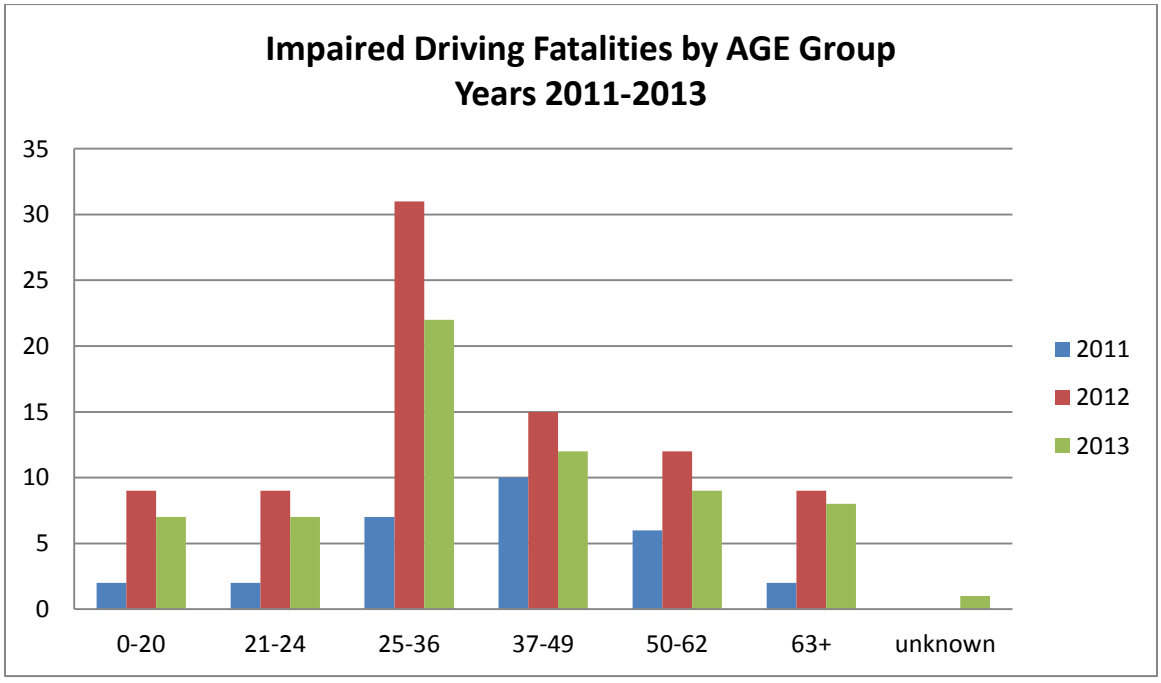



Figure 3: Impared Driving Fatalities by Age Group Years 2011-2013

The following graph shows that 43% of alcohol impaired driving fatalities occurred during 12:00mn- 5:59am followed by 37% during 6:00pm- 11:59pm, nighttime is still the riskiest period for drunk drivers and their possible victims.

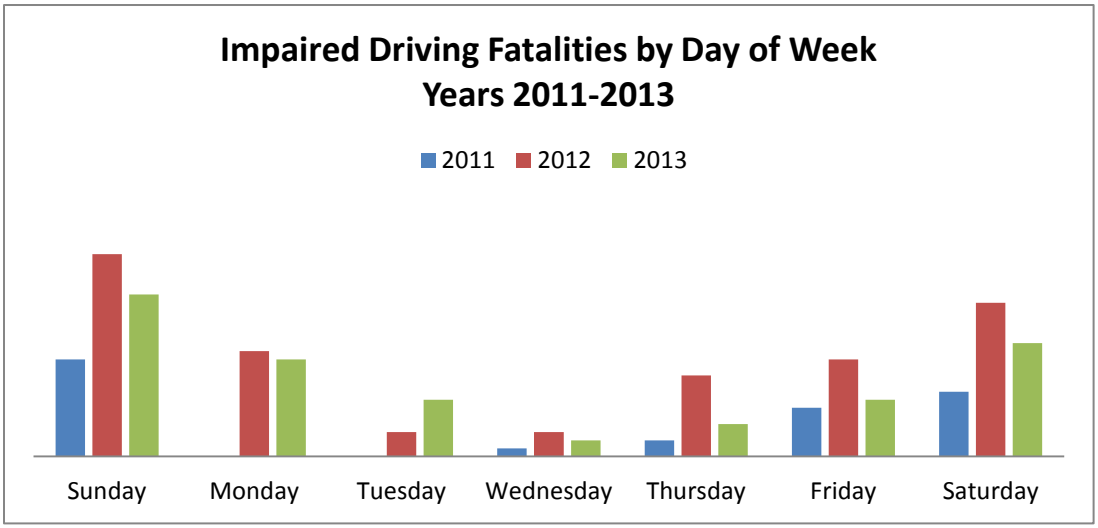



Figure 4: Imapaired Driving fatalities By Day of Week Years 2011-2013

| RANKING | MUNICIPALITY |
|---|---|
| 1 | San Juan |
| 2 | Río Grande |
| 3 | Caguas |
| 4 | Aguadilla |
| 5 | Juana Díaz |
| 6 | Cayey |

Figure 5:Top Six Impared Driving Fatalities by Municipality Years 2011-2013

Data shows that almost all municipalities have dealt with fatalities related to alcohol impaired driving. However, when analyzing alcohol impaired driving fatalities by municipality during the three-year period of 2011-2013, San Juan and Caguas in the metropolitian area, Río Grande in the northeast, Cayey in the center, Juana Díaz in the south, and Aguadilla in the northwest of the island, are among the top six. Most impaired driving fatalities have occurred on primary roads.

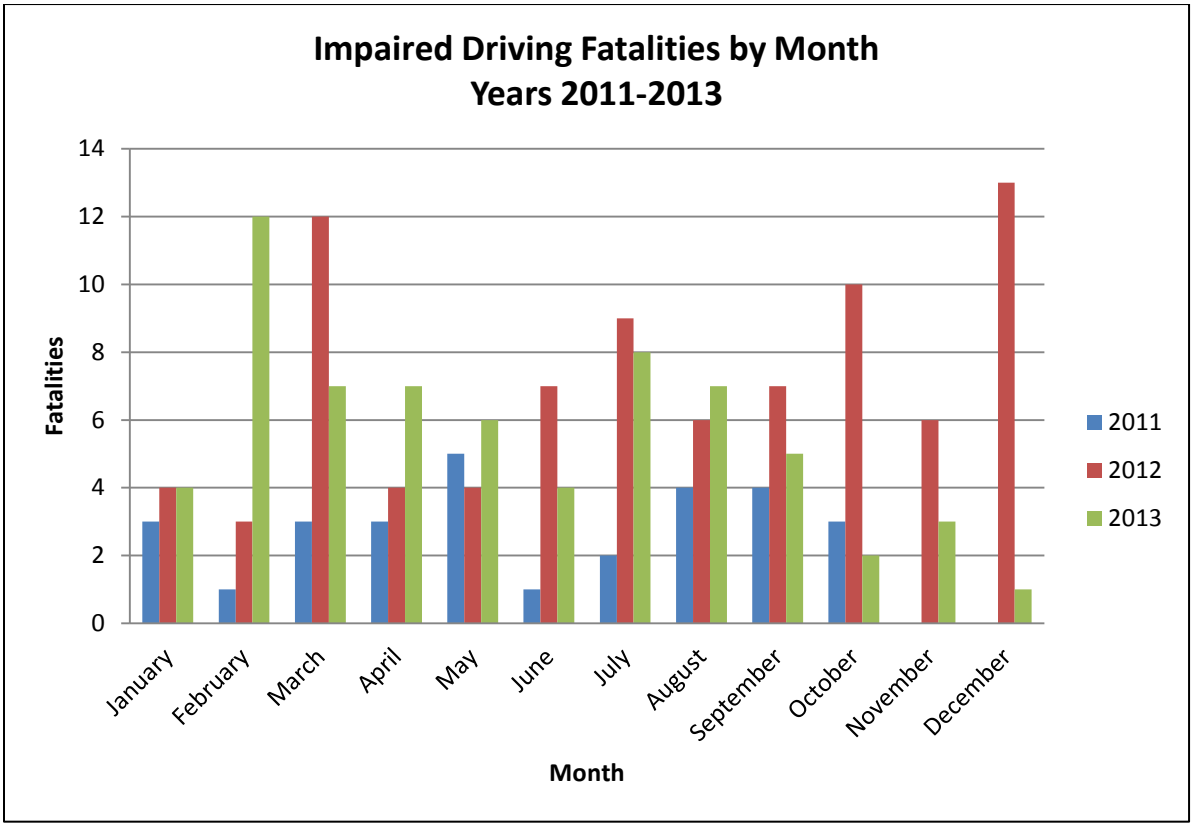



Figure 6: Impaired Driving Fatalities by Month Years 2011-2013

When analyzing alcohol impaired driving fatalities by month for this three-year period, similar numbers are observed for every month. However, March and May show the highest results, while summer months of July, August and September are tied with the second highest. Summer months accounted for 30% of total impaired driving fatalities.

Other important information regarding alcohol impaired driving:

- For years 2011 and 2012, an average of 59% of all driver fatalities were alcohol impaired.
- For years 2011 and 2012, an average of 77% of all alcohol impaired drivers killed were unrestrained.
- For years 2011 and 2012, an average of 63% of alcohol impaired motorcyclists killed were unhelmeted.
- For years 2011 and 2012, an average of 67% alcohol impaired driving fatalities also presented the speeding factor.

## Youth Alcohol

### Problem ID

Youth alcohol-impaired driving continues to be a serious matter. Although the 15-24 years age group isn't the highest in fatalities, young age, risky behaviors, and peer pressure place this age group in a hazardous position.

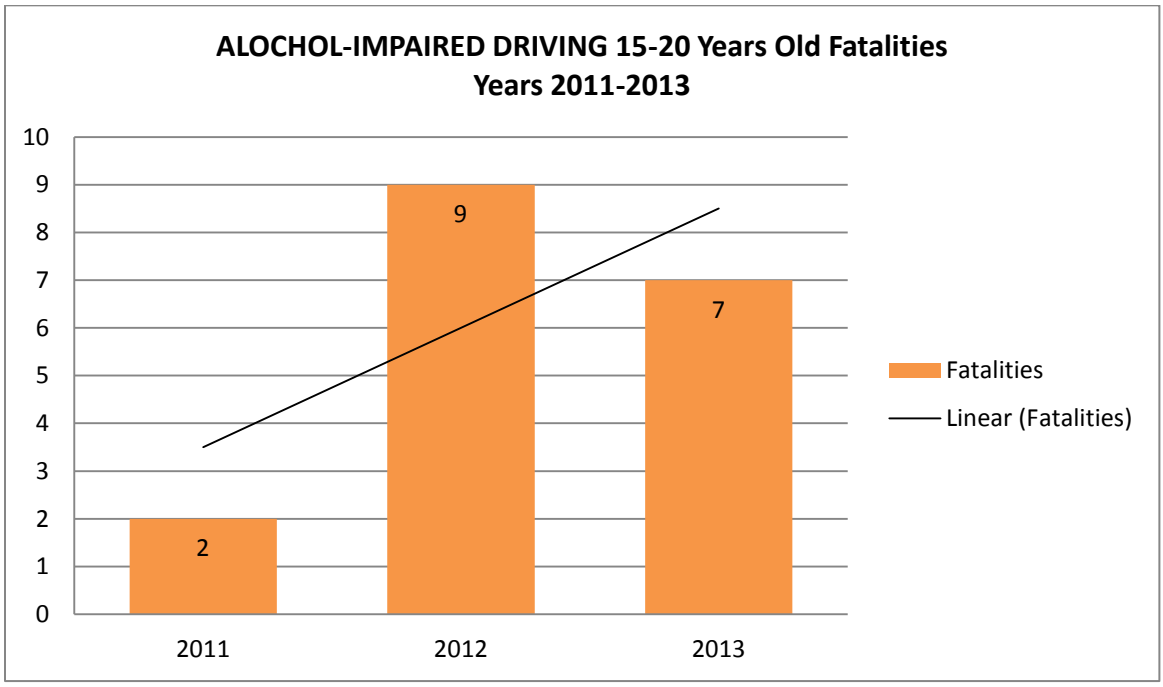



Figure 7: Impared driving 15-20 Years Old Fatalities Years 2011-2013

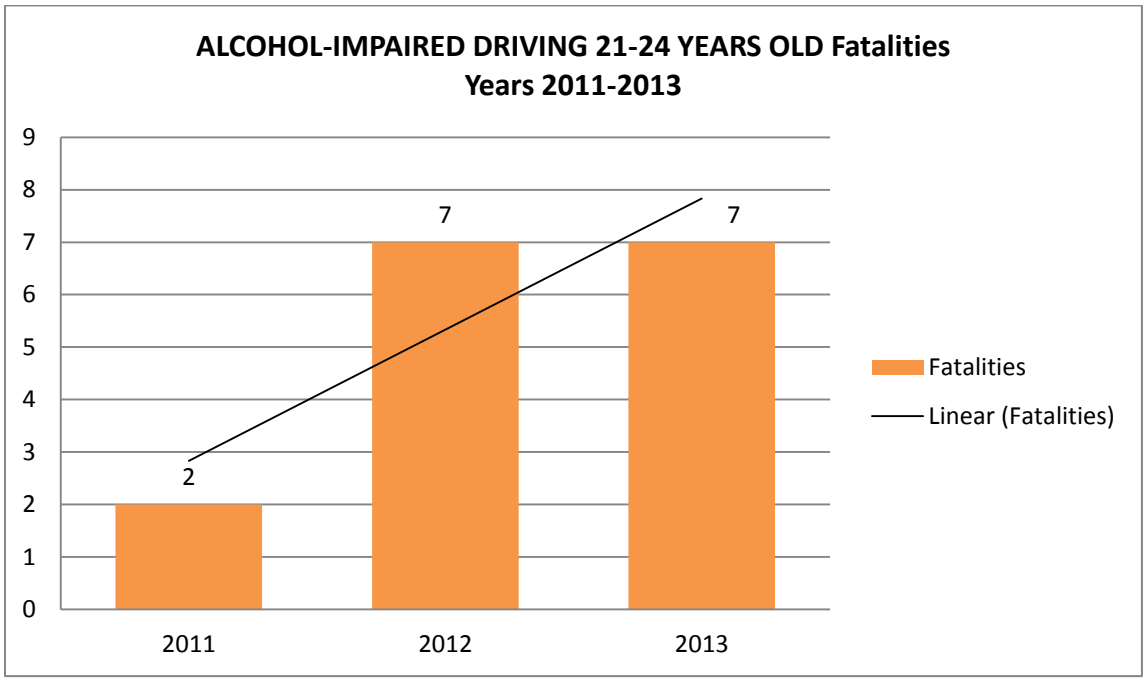



Figure 8: Impared Driving 21-24 Years Old Fatalities Years 2011-2013

Analysis regarding alcohol impaired driving by age group shows that, for the three-year period 2011-2013, 52% of youth impaired driving are in the age group 21- 24 and 48% in age group 15-20. Together, both groups (15-24 years old) rank third, accounting for 19% of total impaired driving fatalities.

Gender data analysis for youth impaired driving fatalities for the 2011-2013 period, reflects that 85% are male fatalities and 15% female fatalities.

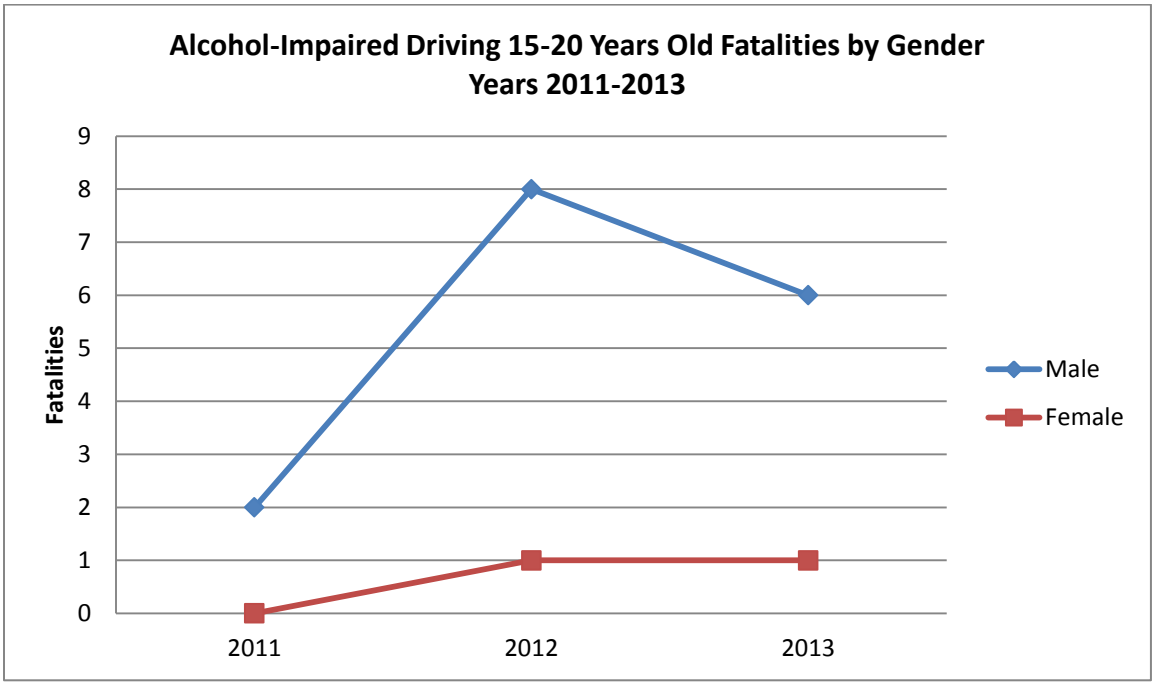



Figure 9: Impaired Driving 15-20 Years Old Fatalities by Gender Years 2011-2013

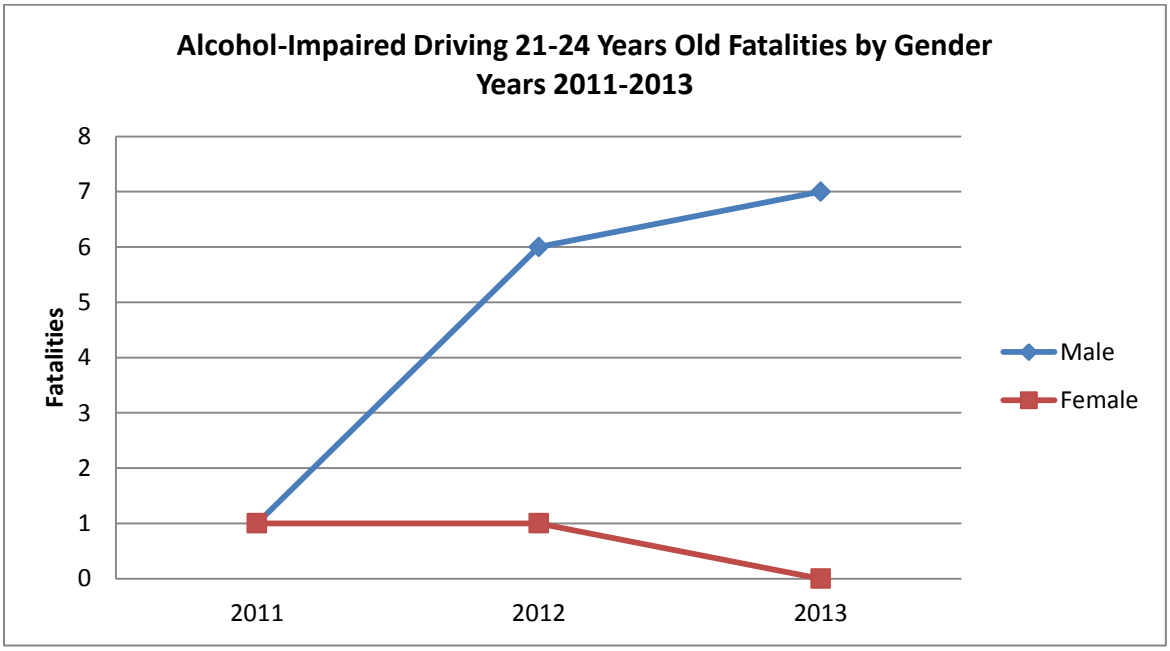



Figure 10: Impaired Driving 21-24 Years Old Fatalities by Gender Years 2011-2013

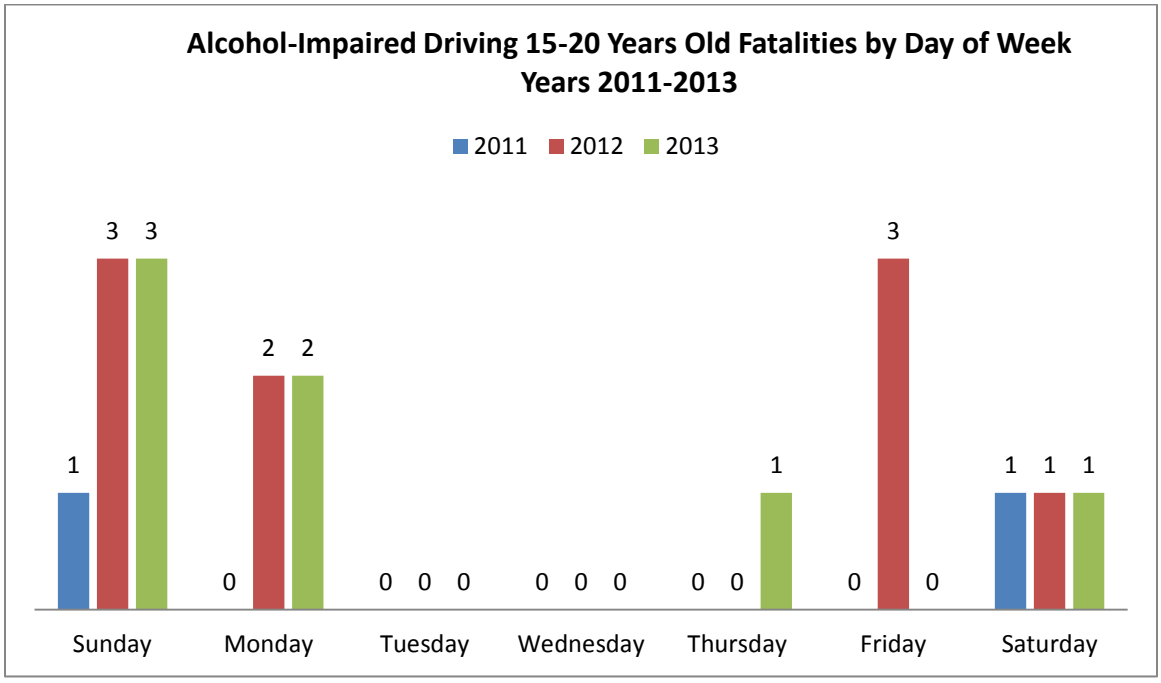



Figure 11: Impaired driving 15-20 Years Old fatalities by day of Week Years 2011-2013

Impaired driving fatalities data by day of week for the 2011-2013 period shows that most of these fatalities occurred on Saturdays, accounting for 40% of total impaired driving fatalities. Sundays accounted for 32%, and Fridays and Mondays accounted for 9% each.

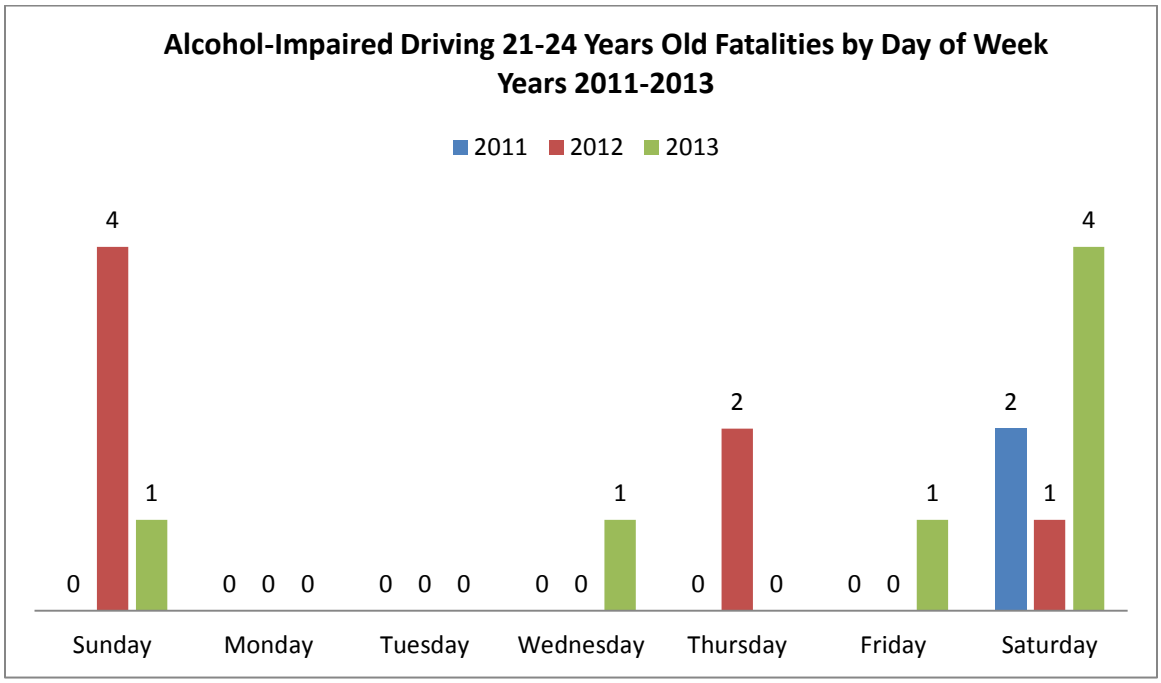



Figure 12: Impaired Driving 21-24 Years Old fatalities by Day of week Years 2011-2013

In addition, the chart below shows that during this three-year period, youth impaired driving fatalities that occurred between the hours of 12:00mn- 5:59am accounted for 72%, while fatalities between the hours of 6:00pm- 11:59pm accounted for 13%. Nighttime shows to be a predominant factor in these fatalities as well as in impaired driving fatalities in general.

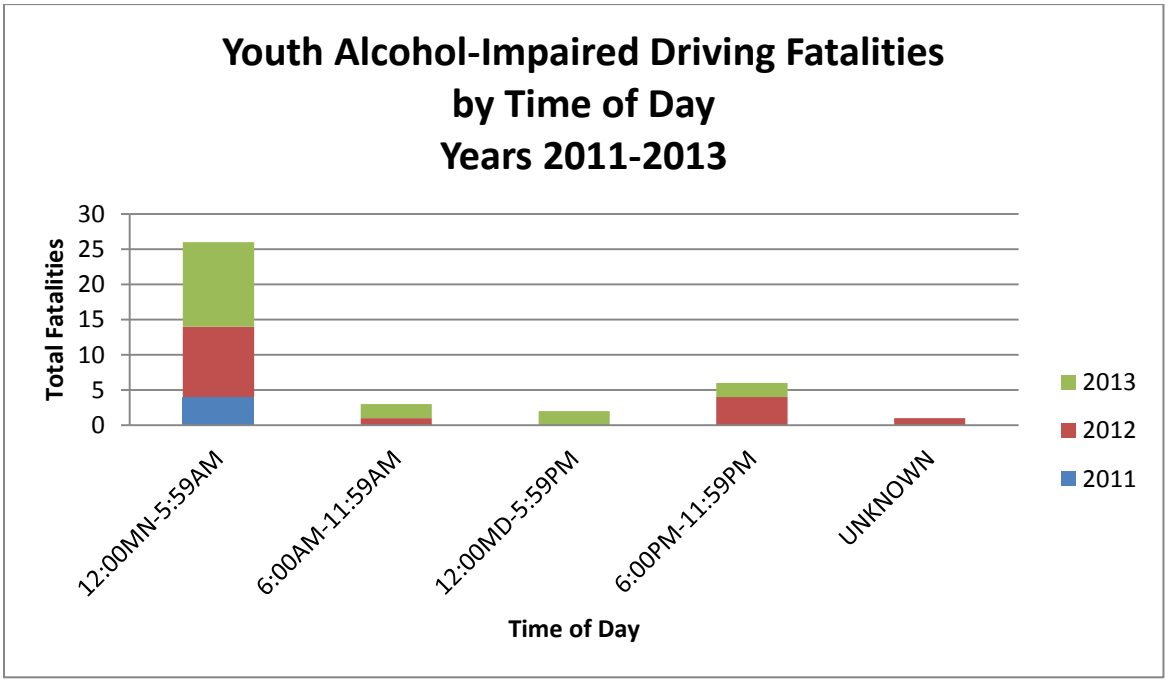



Figure 13: Youth Impaired Driving by Time of Day Years 2011-2013

Data of youth alcohol-impaired driving fatalities by month shows a regular pattern throughout the year. However, when averaging the totals for each month during the three-year period, May accounted for the highest amount of fatalities with 19%, followed by August which accounted for 14% and March for 13%. Summer months of July, August, and September average 30% of total alcohol impaired fatalities for this period.

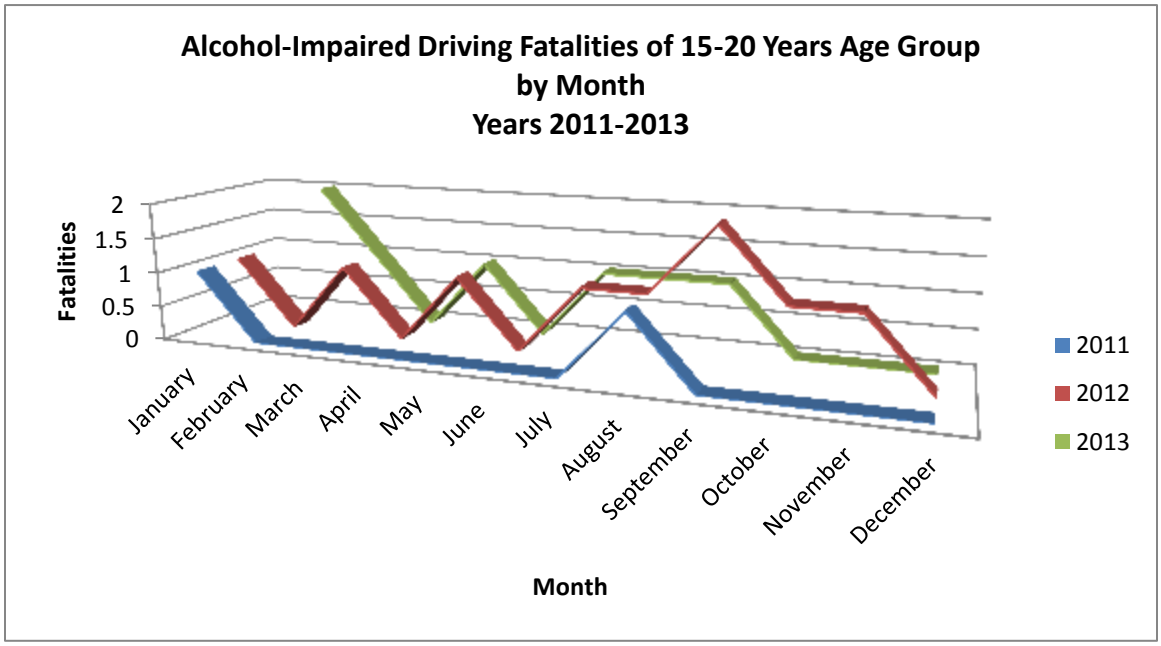



Figure 14: Impaired Driving 15-20 Years Old Fatalities by Month Years 2011-2013

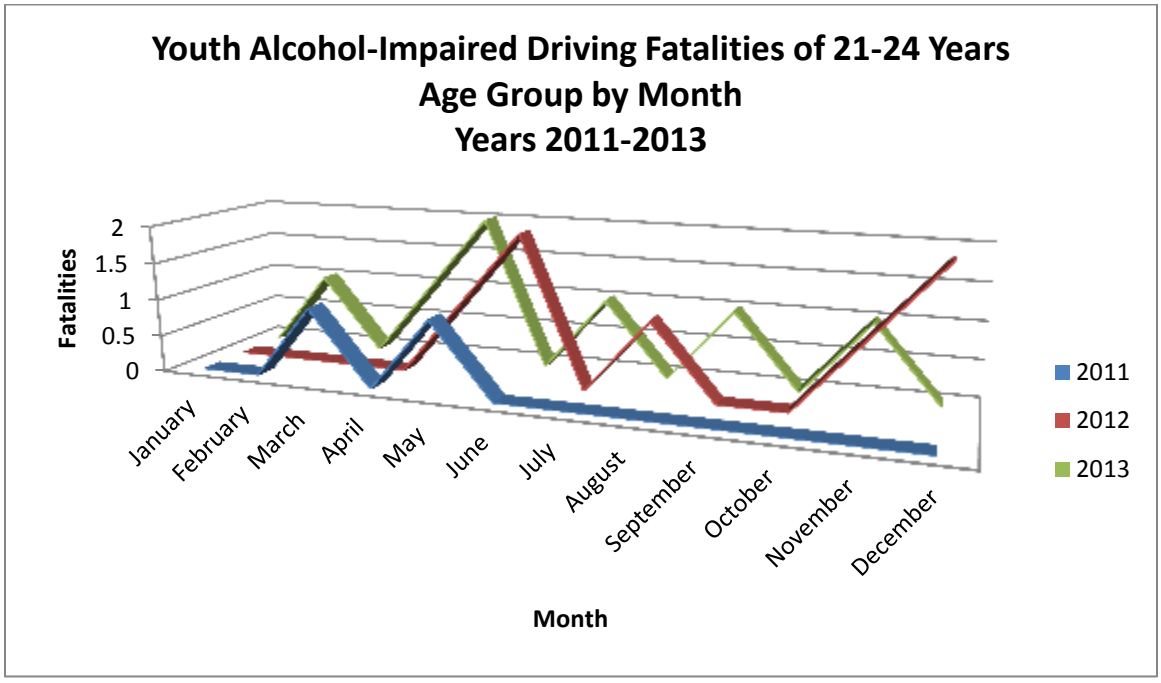



Figure 15: Youth Impaired Driving 21-24 Years Old Fatalities by Month Years 2011-2013

| YOUTH IMPAIRED DRIVING FATALITIES YEARS 2011-2013 | |
|---|---|
| RANKING | MUNICIPALITY |
| 1 | SAN JUAN |
| 2 | CAGUAS |
| 3 | BAYAMON |
| 4 | CAYEY |
| 5 | LOIZA |
| 6 | JUANA DIAZ |

Figure 16: Youth Impaired Driving fatalities by Municipalities Years 2011-2013

Data for youth alcohol-impaired driving fatalities by municipality shows that those located in the metropolitan area, such as San Juan, Caguas and Bayamón, have the highest amount of impaired driving fatalities for this three-year period.

Other important information regarding youth alcohol-impaired driving:

- For years 2011- 2013, an average of 53% of young impaired drivers killed were unrestrained.
- For years 2011- 2013, an average of 100% of young alcohol-impaired motorcyclists killed were unhelmeted.
- For years 2011- 2013, an average of 76% alcohol impaired driving fatalities also presented the speeding factor.

## Alcohol-Impaired Driving – Injury crashes

Data extracted from the CARE system was reviewed and analyzed to identify crashes involving impaired drivers. This system lists the following as descriptions of driver's condition:

- Drunk
- Fatigued
- Inebriated
- Driving under the influence of drugs
- Learner driver
- Other
- Normal
- Unknown

Note that these descriptions are not equivalent to the BAC levels that correspond to impaired driving. Moreover, the variable *"Driving Under the Influence of Drugs"* does not identify the type of drug(s) consumed.

Following table contains the summarized statistics of crashes involving impaired drivers for all years on which data is available. Overall, approximately 3-3.5% of all crashes were considered to have been DUI related. These statistics are considered to be underrepresented as other studies have identified impaired driving to be more predominant.

Table 1: Crash Statistics by Driver Condition Using CARE Data

| Year | DUI[b] | Fatigue | Other | Normal | Unknown | Total | % of DUI |
|---|---|---|---|---|---|---|---|
| **2002** | 827 | 52 | 91 | 23,922 | 2,238 | 27,130 | 3.0% |
| **2003** | 1,032 | 68 | 188 | 26,718 | 2,305 | 30,311 | 3.4% |
| **2004** | 950 | 37 | 87 | 29,298 | 2,499 | 32,871 | 2.9% |
| **2005** | 1,162 | 46 | 132 | 31,731 | 2,726 | 35,797 | 3.2% |
| **2006** | 1,067 | 30 | 132 | 30,434 | 2,591 | 34,254 | 3.1% |
| **2007** | 1,124 | 133 | 386 | 27,656 | 2,179 | 31,478 | 3.6% |
| **2008** | 964 | 203 | 661 | 25,118 | 2,022 | 28,968 | 3.3% |
| **2009** | 971 | 204 | 707 | 25,130 | 1,917 | 28,929 | 3.4% |
| **2010[a]** | -- | -- | -- | -- | -- | -- | -- |
| **2011[a]** | -- | -- | -- | -- | -- | -- | -- |
| **2012** | 878 | 176 | 718 | 21,658 | 1,671 | 25,101 | 3.5% |

[a] Crash data is not available for years 2010 and 2011.

[b] Crashes involving drunk, inebriated, and under the influence of drugs were identified as DUI crashes.

# SPEEDING & AGGRESSIVE DRIVING

## Problem ID

Speeding and aggressive driving are major contributors in fatal crashes. According to FARS, in 2013 there were 149 speed related fatalities, accounting for 43% of all traffic fatalities, an 8% increase from 2011.

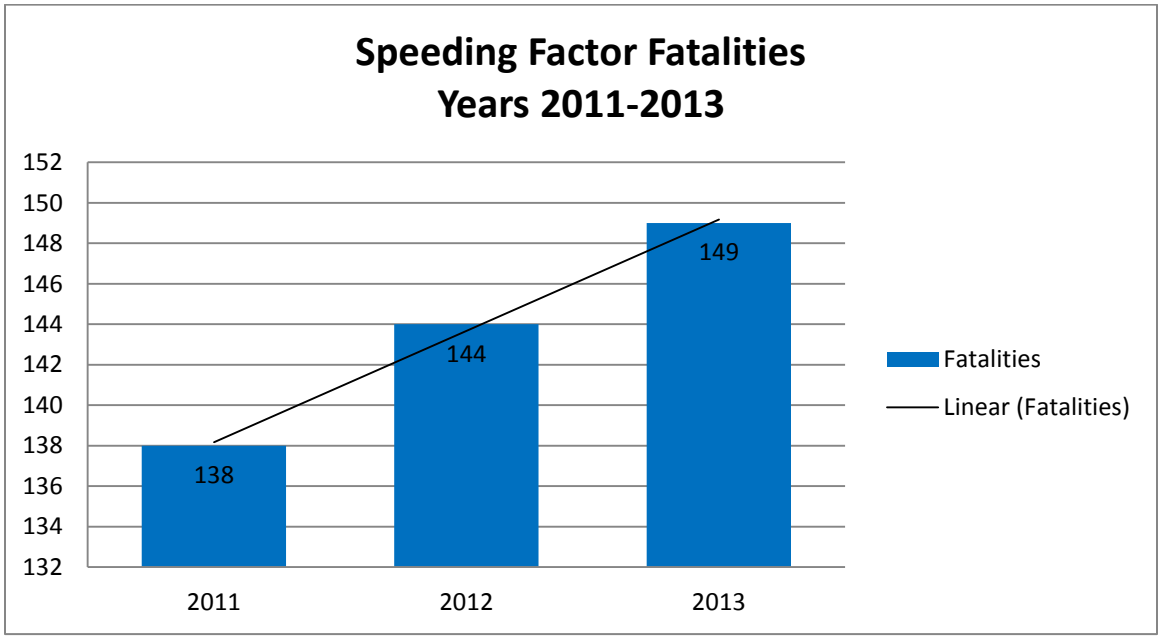



Figure 17:Speeding Factor Fatalities Years 2011-2013

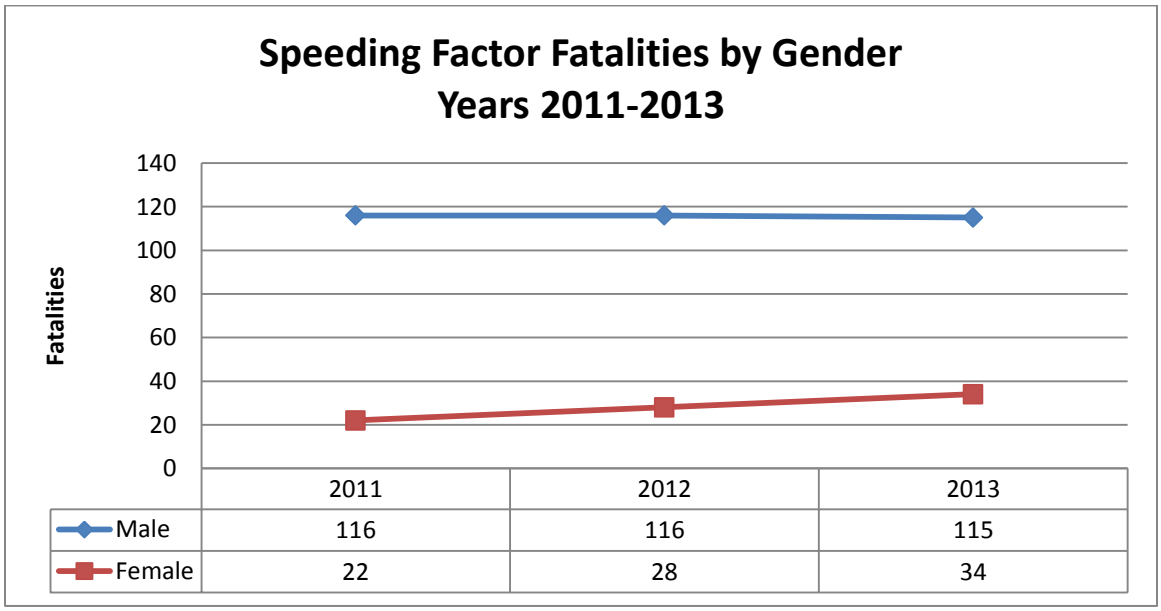



Figure 18: Speeding Factor Fatalities by Gender Years 2011-2013

Data analysis of speeding as a fatality factor established that 77% of total speeding fatalities were male. However, an increase of 54% is noted in the female category, from 22 in 2011 to 34 in 2013.

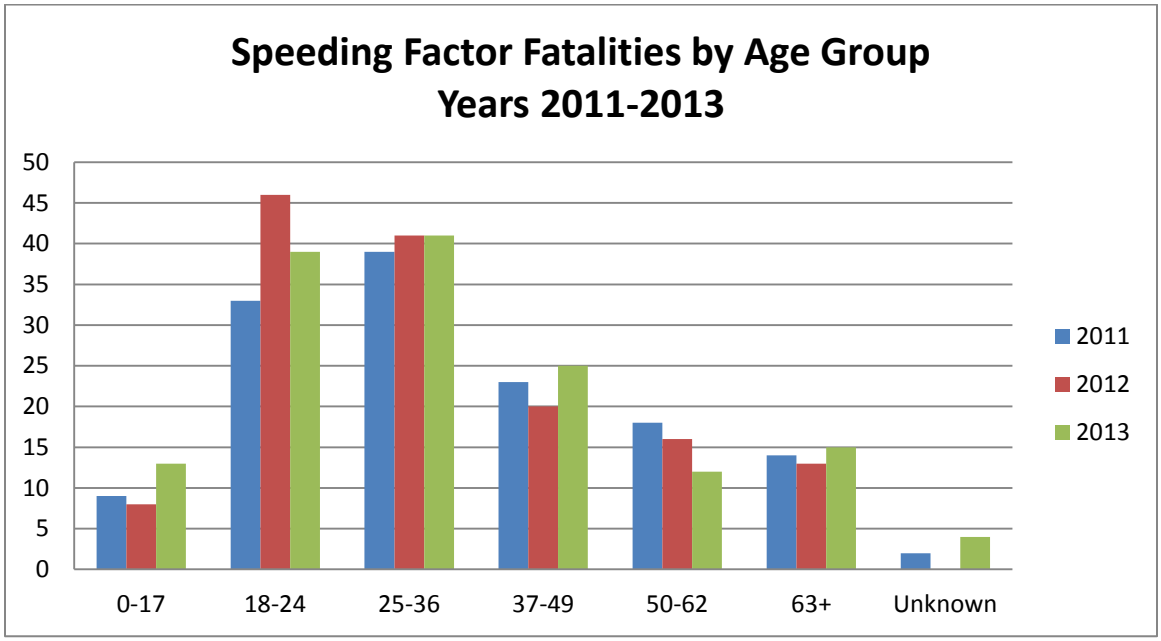



Figure 19: Speeding Factor Fatalities by Age Group Year 2011-2013

When analyzing data of speeding factor fatalities by age group for the 2011-2013 period, the 18-36 years group shows to be under highest risk, accounting for 55% of total speeding factor fatalities.

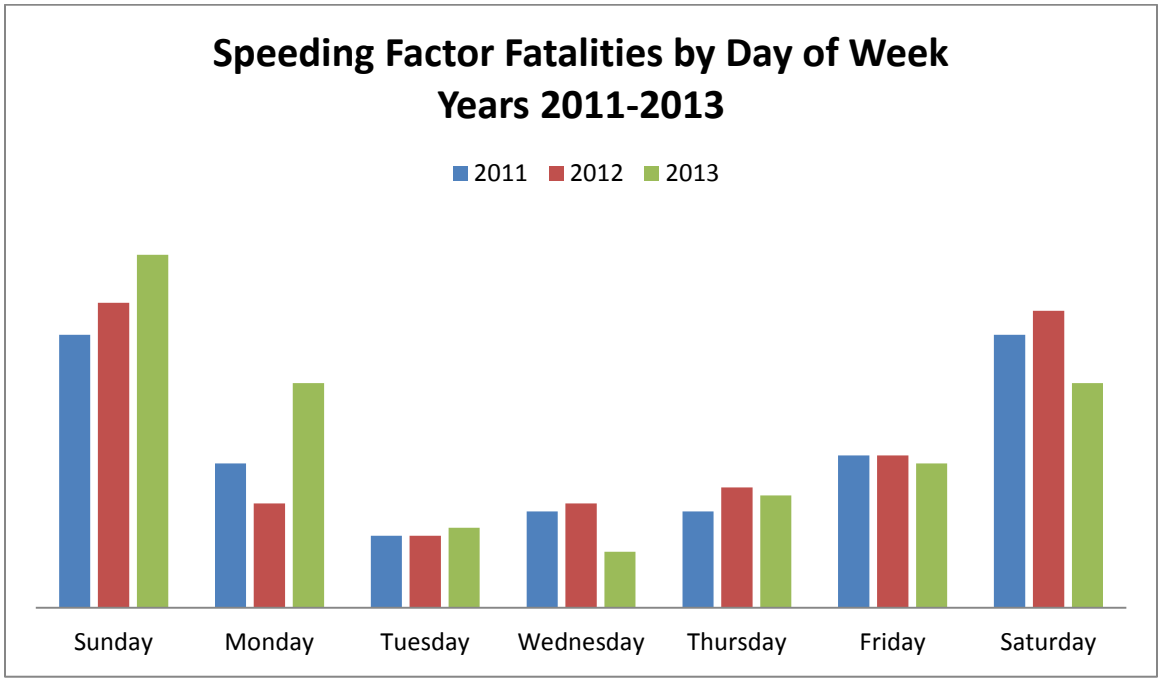



Figure 20: speeding Factor Fatalities by Day of Week Years 2011-2013

When analyzing data of speeding factor fatalities by day of week for this three-year period, Sundays accounted for the most fatalities with 23%. It is followed by Saturdays accounting for 23% and Mondays for 14%. This same pattern can be seen in impaired driving fatalities, which demonstrates that weekends represent the highest risks for fatal crashes.

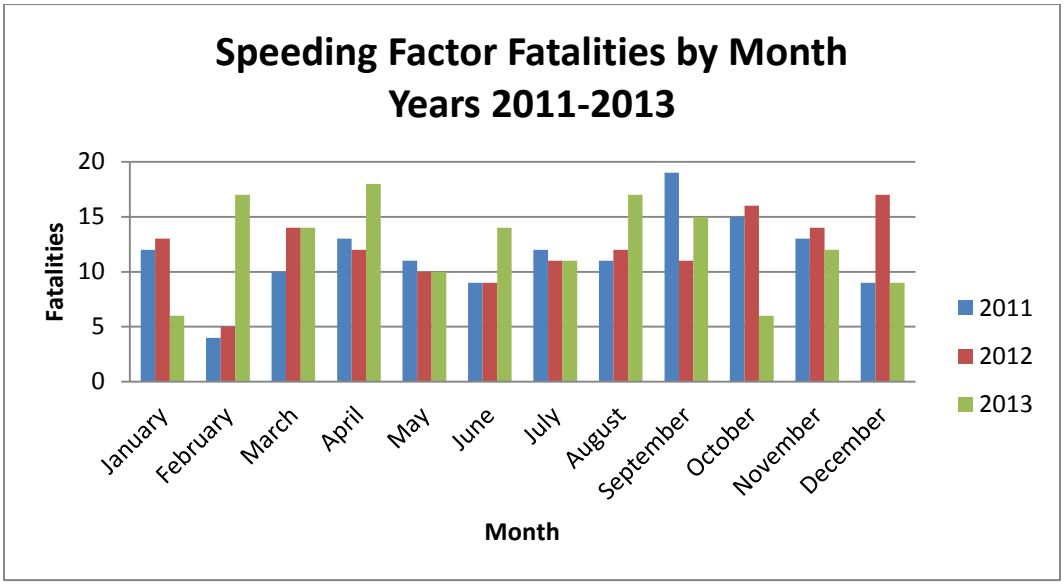
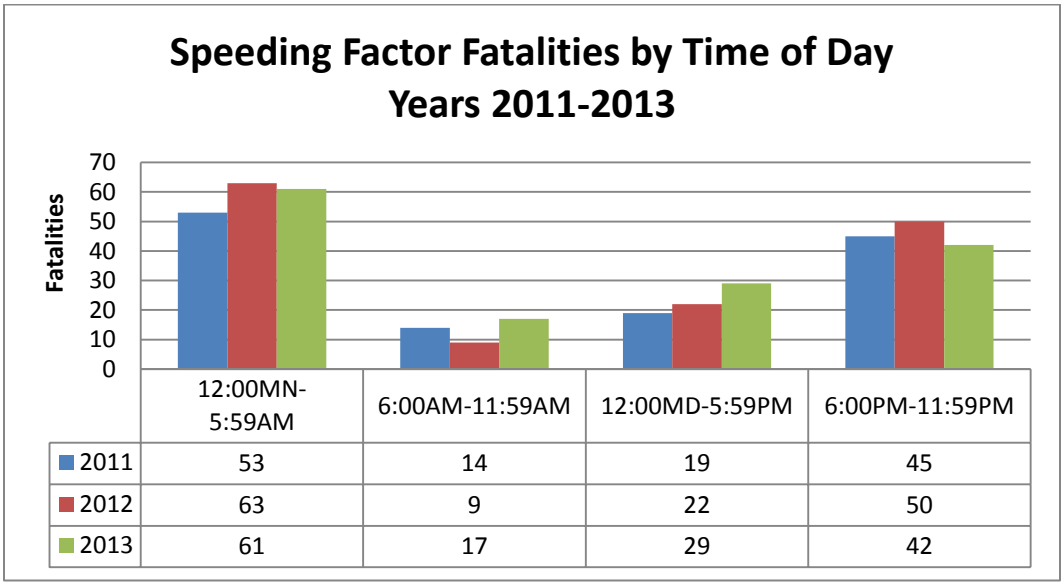



Figure 21: speeding Factor Fatalities by Month Years 2011-2013

When anlyzing data of speeding factor fatalities by month for 2011-2013 period, we find that the amount of fatalities are almost similar during this three-year period. However, slight peaks can be seen for the months of April, August, and September.

Most speed related fatalities occurred during the nighttime, with 73% taking place between the hours of 6:00pm-5:59am. These dark hours continue to represent the riskiest periods for speed-related fatalities.




| | 12:00MN-5:59AM | 6:00AM-11:59AM | 12:00MD-5:59PM | 6:00PM-11:59PM |
|---|---|---|---|---|
| 2011 | 53 | 14 | 19 | 45 |
| 2012 | 63 | 9 | 22 | 50 |
| 2013 | 61 | 17 | 29 | 42 |

Figure 22: Speeding Factor Fatalities by Time of Day Years 2011-2013

| SPEEDING FACTOR FATALITIES BY MUNICIPALITY YEARS 2011-2013 | | |
|---|---|---|
| RANKING | MUNICIPALITIES | TOTAL FATALITIES |
| 1 | SAN JUAN | 36 |
| 2 | PONCE | 17 |
| 3 | CAGUAS | 13 |
| 4 | JUANA DIAZ | 12 |
| 5 | ARECIBO | 11 |

Figure 23: Speeding Related By Municipalities Years 2011-2013

When analyzing speeding factor fatalites data by municipality during 2011-2013 period, densely populated municipalities such as San Juan, Ponce, Caguas, and Arecibo had the highest number of speeding fatalities. Although Juana Díaz, which is a smaller municipality east of Ponce, ranks fourth. The municipalities of Bayamón, Aguadilla, and Guayama rank in the sixth position, each reporting 10 speed-related fatalities. Most of these fatalities occurred on primary highways and roads.

## Speed and Aggressive Drivers – Injury Crashes

Crashes involving aggressive drivers were not specifically identified in the CARE database. Therefore, the codes in the police reports, National Highway Traffic Safety Administration (NHTSA) definitions and previous studies were reviewed to identify the factors that are most likely contributing to crashes involving aggressive drivers. Aggressive driver conducts are identified as follows:

- Disregarded traffic control
- Exceeded speed limit
- Failed to obey signal
- Failed to yield
- Followed too closely (tailgated)
- Improper lane change
- Improper passing
- Improper turn
- Street racing

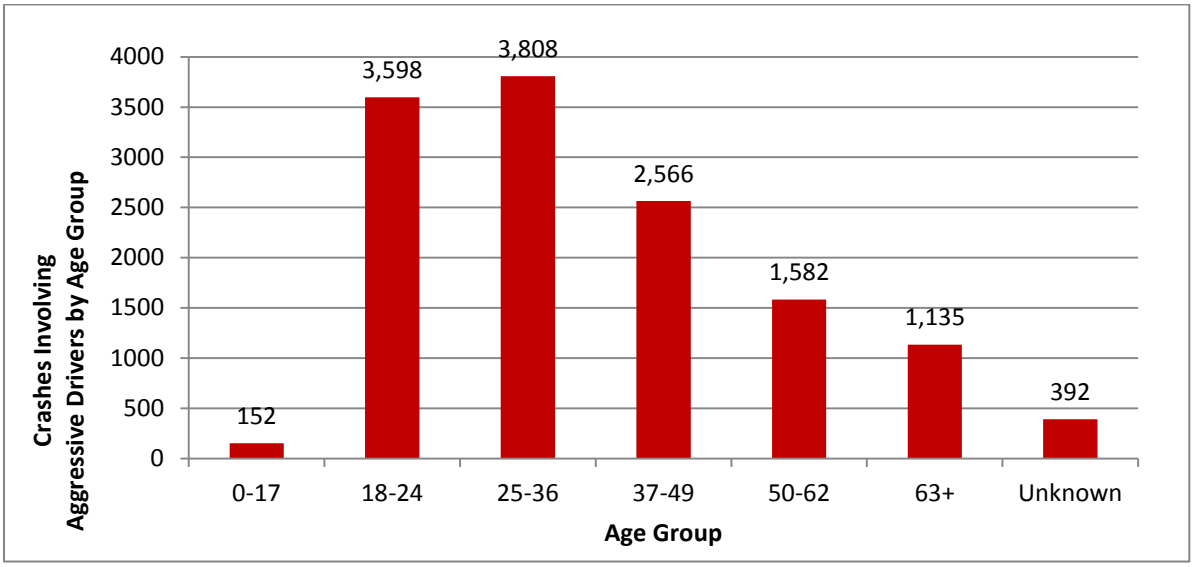



Figure 24: Average Crashes Involololving Aggressive Drivers by Age Group Years 2007-2009, 2012

When analyzing crashes involving aggressive drivers data by age group, those in the 18-24 and 25-36 years age groups were found to drive most aggressive. Both of these groups together, accounted for 56% of total crashes.

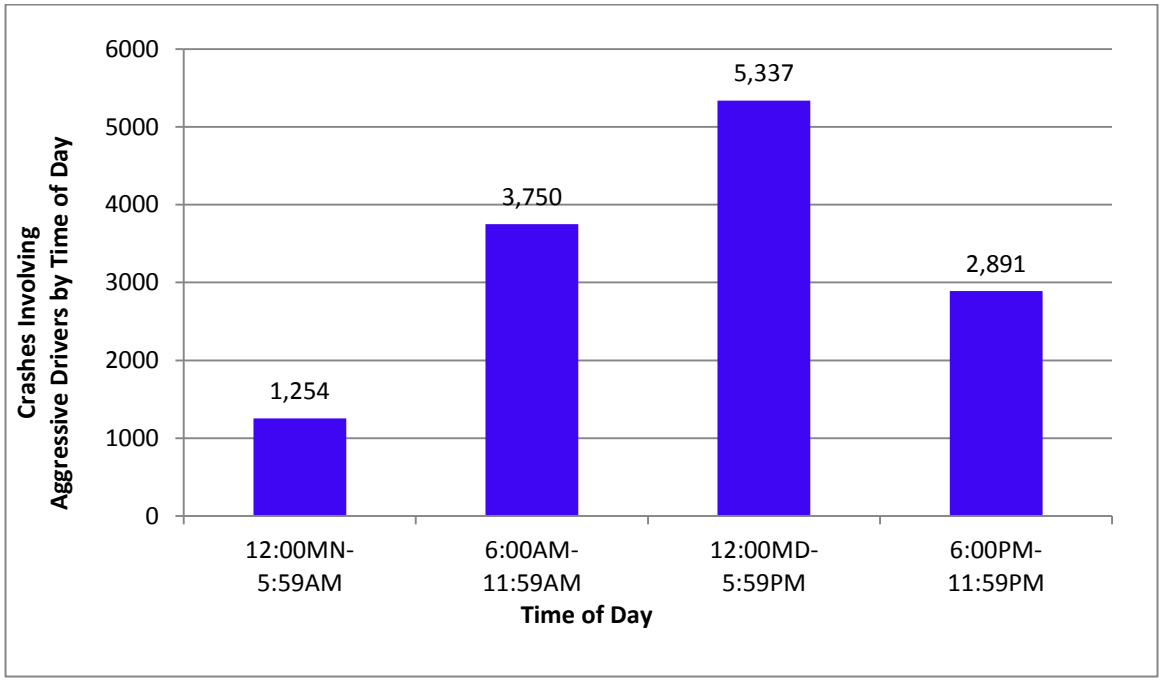



Figure 25: Ave. Annual Crashes Involving Aggressive Drivers by time of Day Years 2007-2009, 2012

When analyzing table above, crashes involving aggressive drivers by time of day were most frequent in the afternoon hours of 12:0md- 6:00pm. This time frame coincides with peak hours of heavy traffic flow.

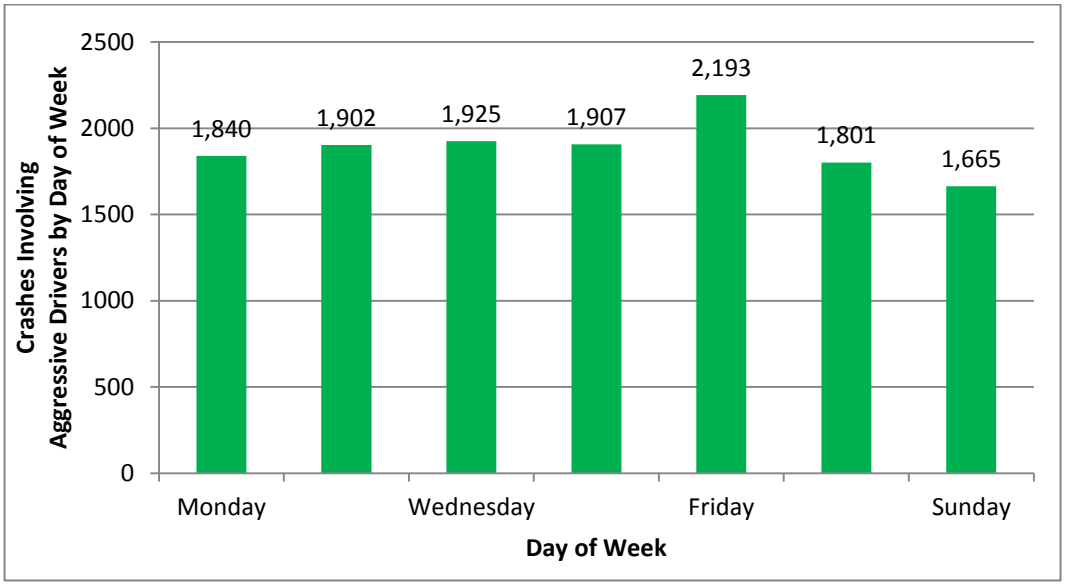



Figure 26: Avege. Annual Crashes Involving Aggressive Drivers by Day of Week Years 2007-2009,2012

When analyzing crashes involving aggressive drivers for this four-year period, results seems to be even from day to day. However, when further analisis is done, it shows Friday accounted for most of the crashes with 17%, while Sunday accounted for the least with 13%.

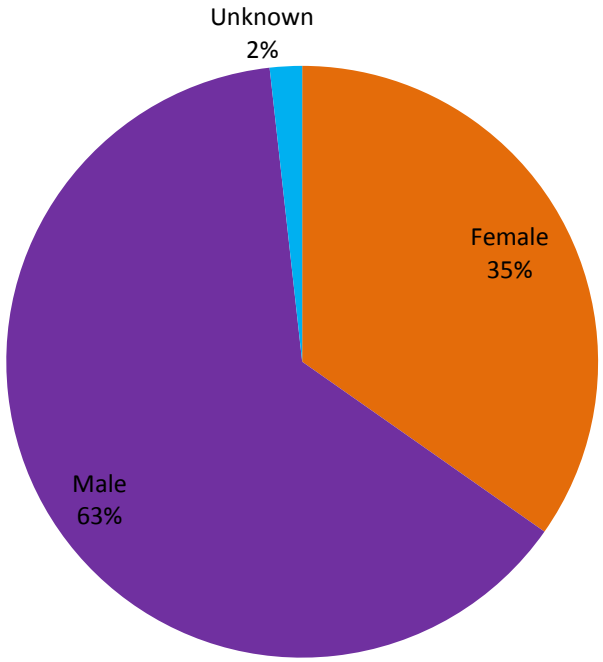



Figure 27: Crashes Involving Aggressive Drivers by Gender Years 2007-2009, 2012

Data for 2007-2009, 2012 periods, shows most aggressive drivers involved in crashes are male, accounting for 63% of total crashes. Meanwhile, female aggressive drivers accounted for 35%.

# MOTORCYCLE

## Problem ID

When analyzing motorcyclist fatalities based on 2011-2013 FARS data, it indicates there was a total of 138 fatalities. These accounted for 13% of 1,071 total traffic fatalities during this period.

Table below shows 2011 and 2012 had an equal amount of motorcyclist fatalities. However, 2013 shows a reduction of 9 fatalities, or 8%, in comparison to the previous year.

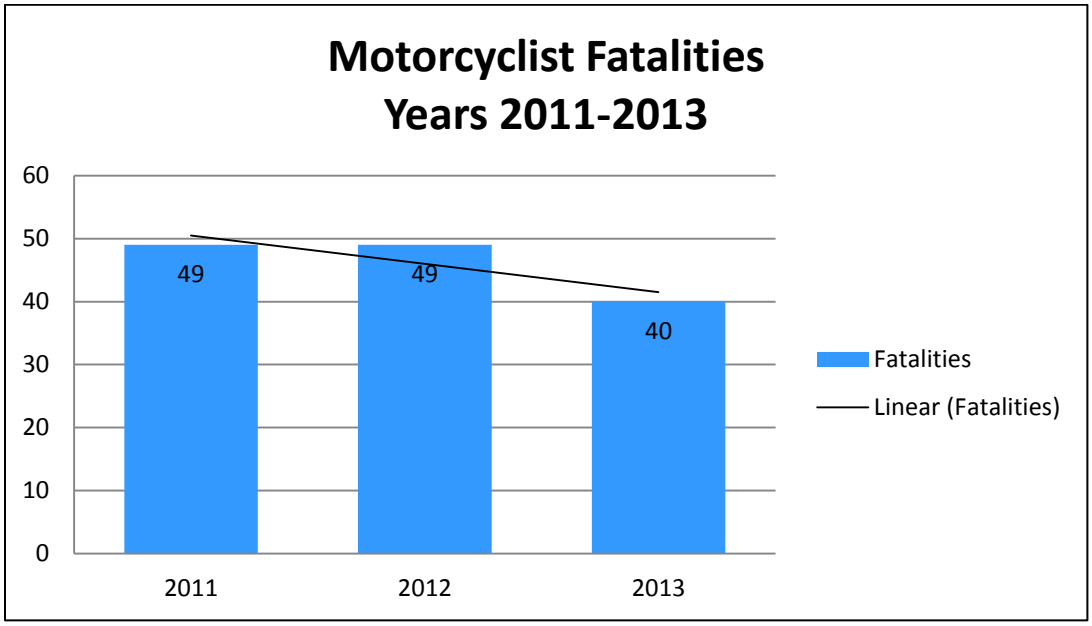



Figure 28: Motorcyclist Fatalities Years 2011-2013

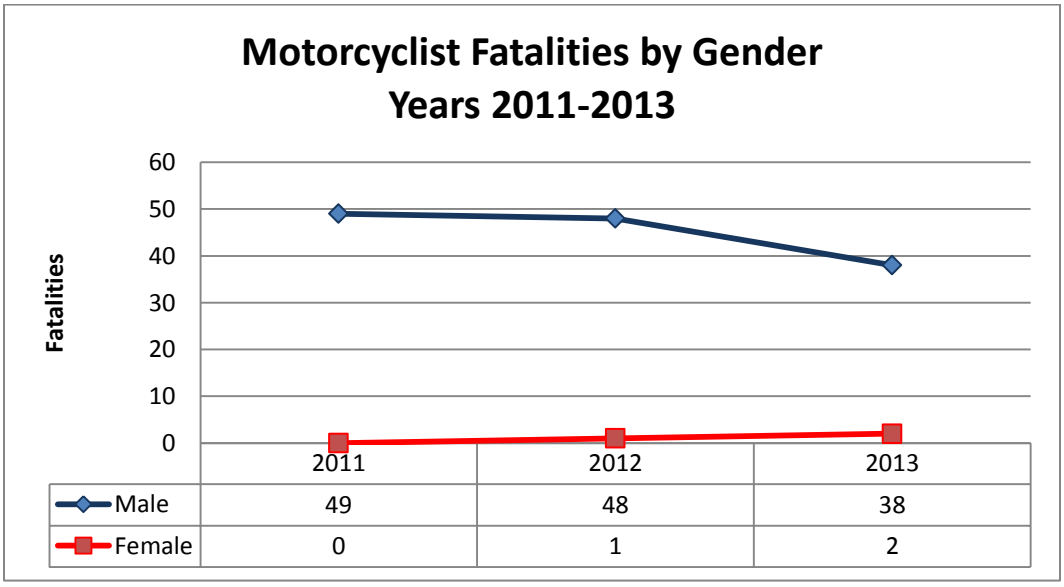



Figure 29: Motorcyclist Fatalities By Gender Years 2011-2013

When analyzing motorcylist fatalities by gender for the 2011-2013 period, these indicate that 98% of fatalities were male, while 2% were female.

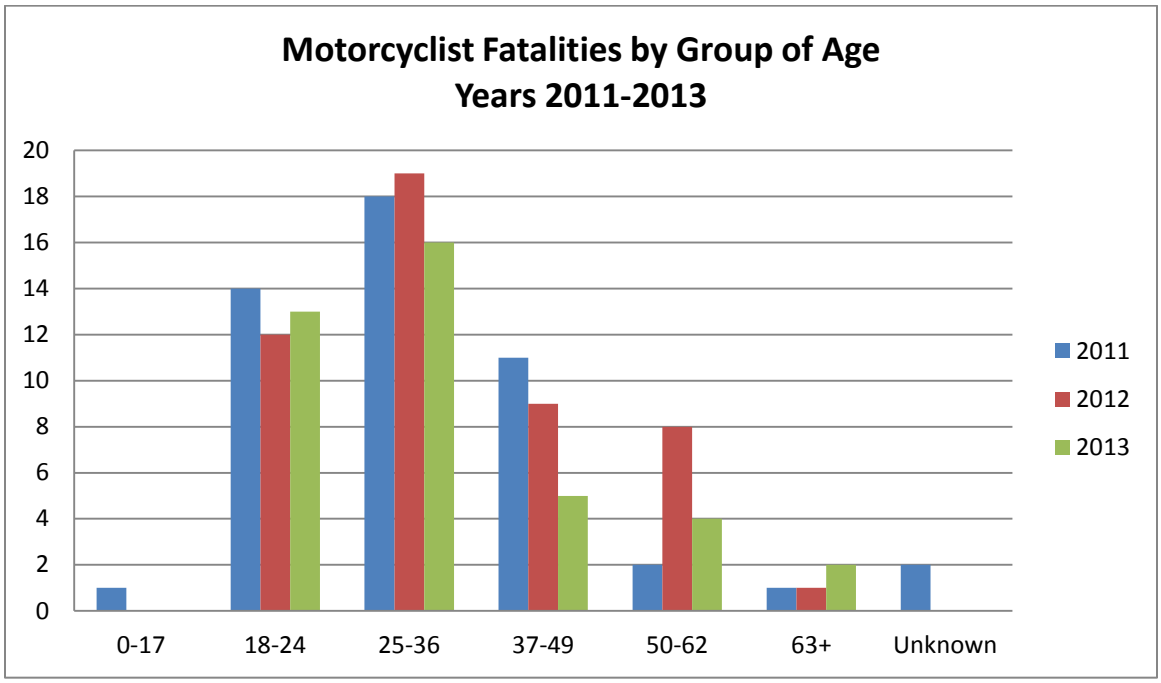



Figure 30: Motorcyclist Fatalities By Group of Age Years 2011-2013

Table above classifies motorcyclist fatalities by age group for the 2011-2013 period. Data indicates that young adults between the ages of 18-36 accounted for 67% of total motorcyclist fatalities.

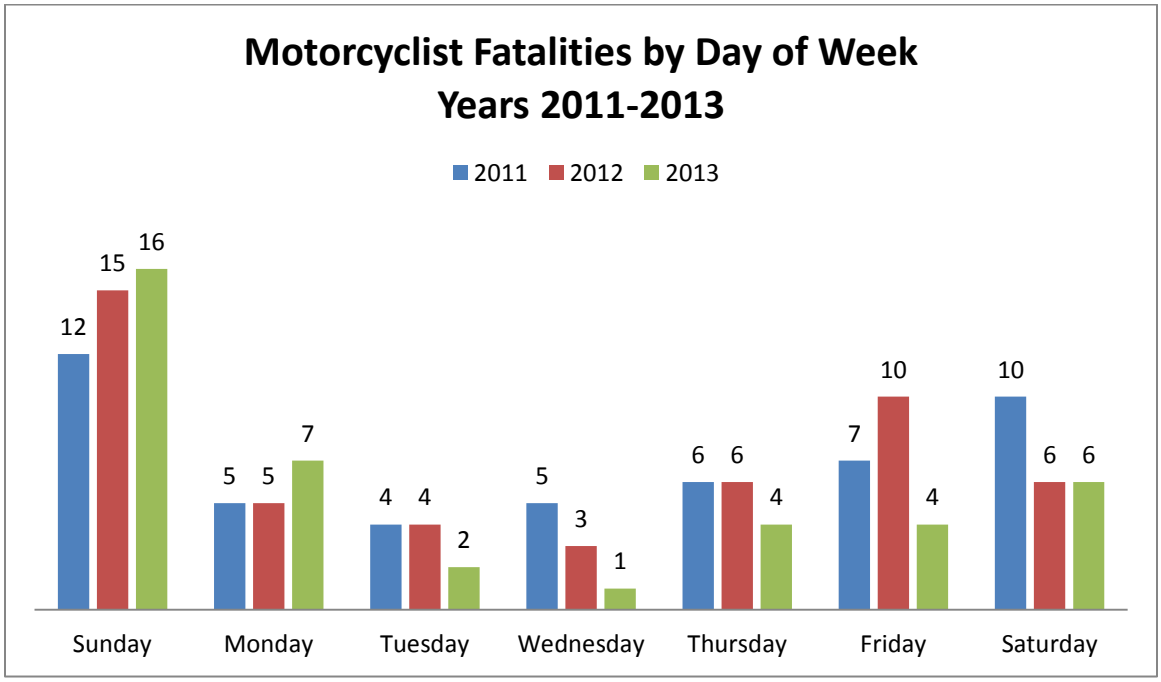
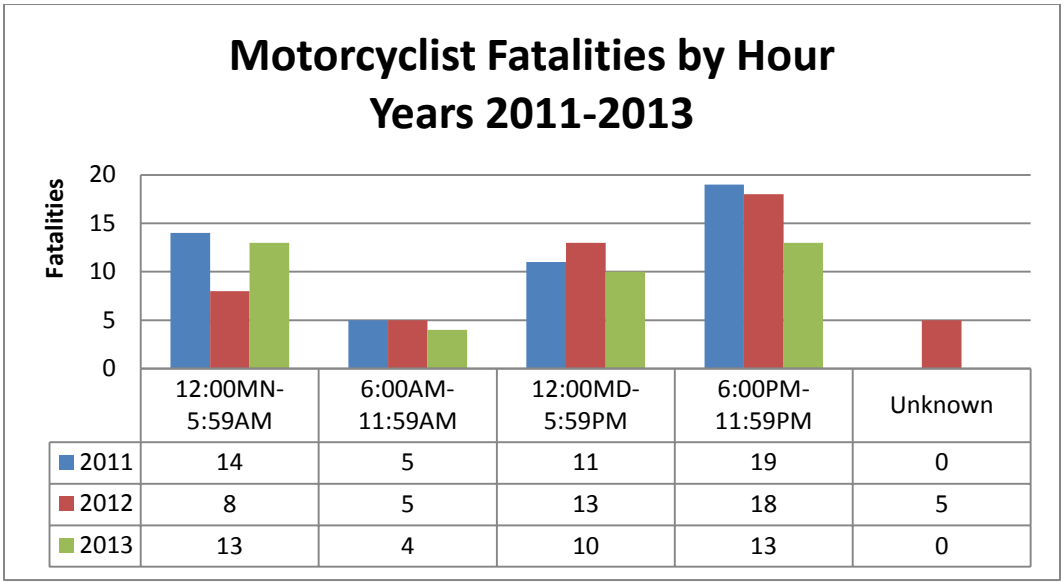



Figure 31: Motorcyclist Fatalities By Day of the Week Years 2011-2013

When analyzing motorcyclist fatalities by day of week for the 2011-2013 period, we observe that Sunday accounted for 43, or 31%, making it the day with the most fatalities. It is followed by Saturday with 22, or 16%, and Friday with 21, or 15%.

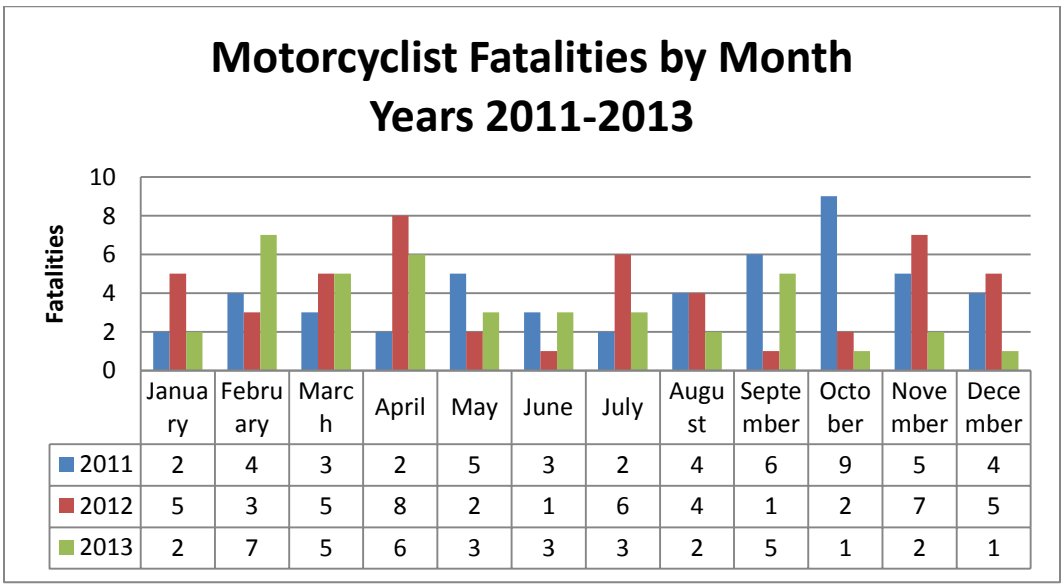
This data shows that for this period, 62% of motorcyclist fatalities occurred on weekend days.




| | 12:00MN-5:59AM | 6:00AM-11:59AM | 12:00MD-5:59PM | 6:00PM-11:59PM | Unknown |
|---|---|---|---|---|---|
| 2011 | 14 | 5 | 11 | 19 | 0 |
| 2012 | 8 | 5 | 13 | 18 | 5 |
| 2013 | 13 | 4 | 10 | 13 | 0 |

Figure 32: Motorcyclist Fatalities By Hour Years 2011-2013

When analyzing data by time of day for the 2011-2013 period, of a total of 138 motorcyclist fatalities, 50 occurred between the hours of 6:00pm- 11:59pm. These accounted for 36% of total motorcyclist fatalities, it is followed by the hours between 12:00pm- 5:59pm with 34, or 34%. This means that most fatalities occurred during the afternoon and early night hours. When put together, both periods of time account for 70% of total motorcyclist fatalities.




| | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2011 | 2 | 4 | 3 | 2 | 5 | 3 | 2 | 4 | 6 | 9 | 5 | 4 |
| 2012 | 5 | 3 | 5 | 8 | 2 | 1 | 6 | 4 | 1 | 2 | 7 | 5 |
| 2013 | 2 | 7 | 5 | 6 | 3 | 3 | 3 | 2 | 5 | 1 | 2 | 1 |

Figure 33: Motorcyclist Fatalities By Month Years 20011-2013

When analyzing motorcyclist fatalities by month during the 2011-2013 period, we can observe how the number of fatalities for this three-year period is similar. However, it is noted that the months of February, April, and November accounted for 41% of total motorcyclist fatalities.

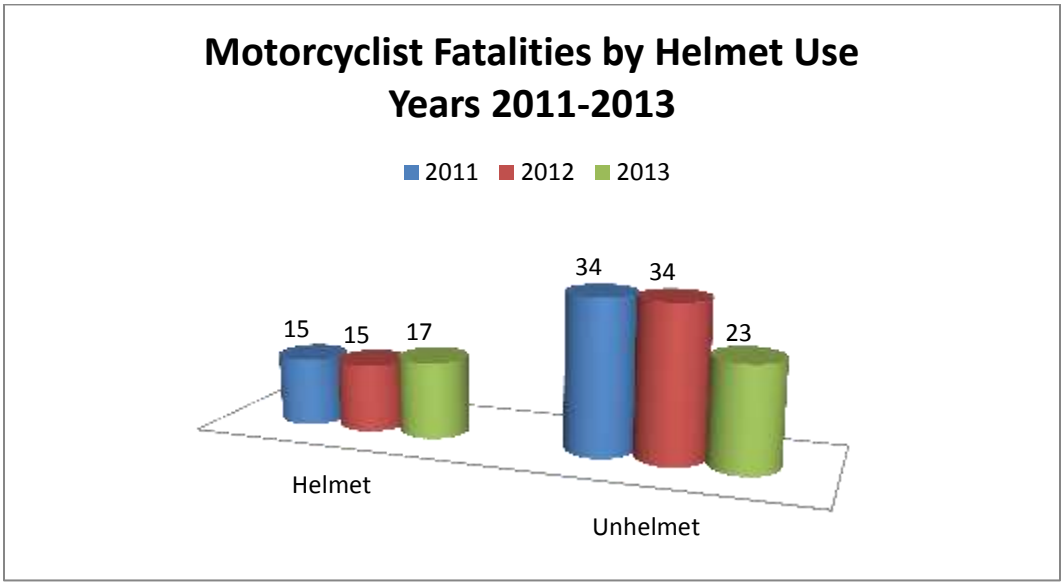



Figure 34: Motorcyclist Fatalities By Helmet Use Years 2011-2013

When analyzing data of motorcyclist fatalities by use of helmet during the 2011-2013 period, it indicates that 2011 as well as 2012 had 15 fatalities each on which motorcyclists were making use of helmets. Still, during 2013 there was an increase of this type of fatalities with a total of 17.

However, table shows that during this three-year period 66% of total motorcyclist fatalities were not making use of helmets.

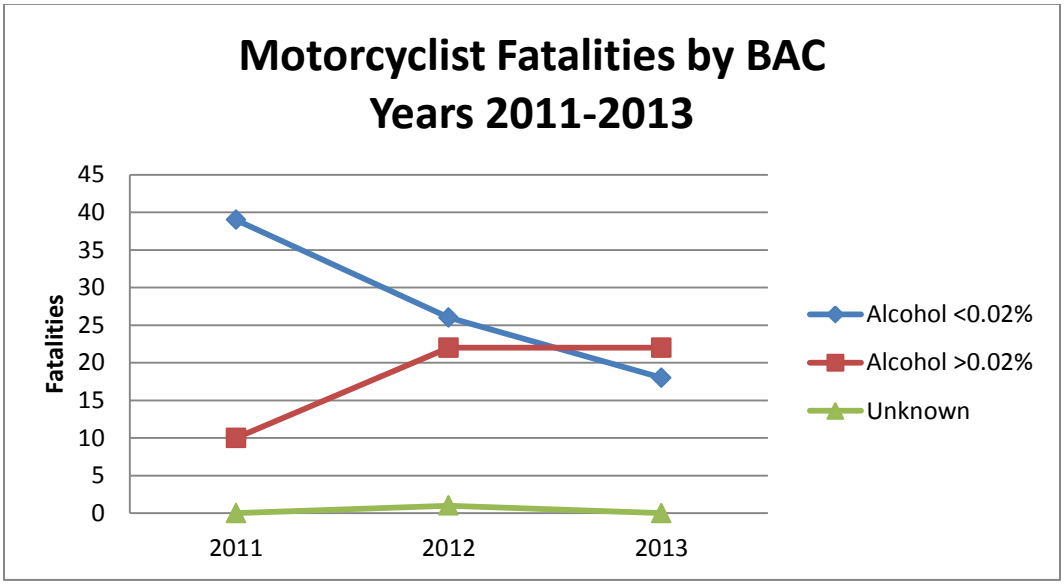



Figure 35: Motorcyclists Fatalities by BAC Years 2011-2013

When analyzing motorcyclist fatalities by BAC for the 2011-2013 period, it is noted that 39% of these had a BAC of .02% or higher.

In 2011 there were 10 fatalities that had a BAC of .02% or higher, this accounted for 20% of fatalities during this year. Meanwhile, in 2012 there was a marked increase on this type of fatality; of the 49 total fatalities for this year 26, or a 53%, had a BAC of .02% or higher. However, in 2013 there was a reduction when, of the 40 total fatalities, 18 had a BAC of .02% or higher accounting for a 45% of total motorcyclist fatalities for this year.

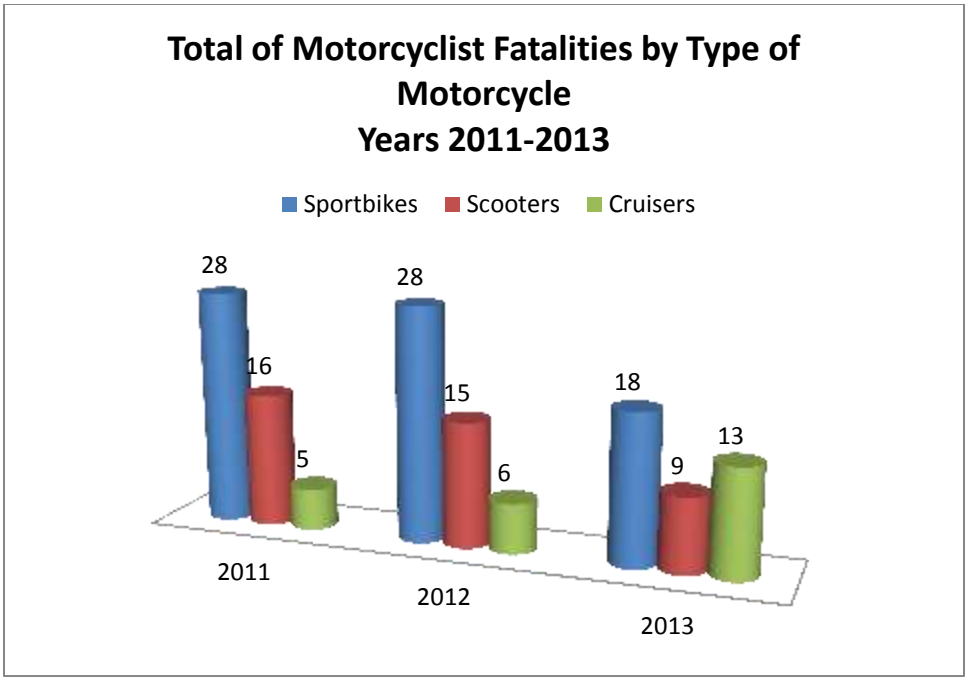



Figure 36: Total of Motorcycle Fatalities by Type of Motorcycle Years 2011-2013

During 2011-2013 period, there were 138 motorcyclist fatalities. Data indicates 74 of these occurred while riding on sportbikes, 40 on scooters, and 24 on cruisers. This means that for this period sportbike riders accounted for 54% of total motorcyclist fatalities.

| Motorcyclist Fatalities By Municipality Years 2011-2013 | | |
|---|---|---|
| **Ranking** | **Municipalities** | **Total Fatalities** |
| **1** | Caguas | 10 |
| **2** | Bayamon | 9 |
| **3** | Ponce | 9 |
| **4** | San Juan | 9 |
| **5** | Carolina | 8 |

Figure 37: Motorcyclist Fatalities By Municipalities Years 2011-2013

When analyzing motorcyclist fatalities by municipality for the 2011-2013 period, we can observe that the five municipalities with the most fatalities are Caguas, Bayamón, Ponce, San Juan, and Carolina. These municipalities accounted for 37% of total motorcyclist fatalities for this period. It should be noted that Caguas, Bayamón, San Juan, and Carolina are part of the metropolitan area.

## MOTORCYCLE – INJURY CRASHES

Data from Care system available for years 2007-2009, 2012, shows that on this four-year period a there were a total of 3,417 fatal and injury motorcycle crashes.

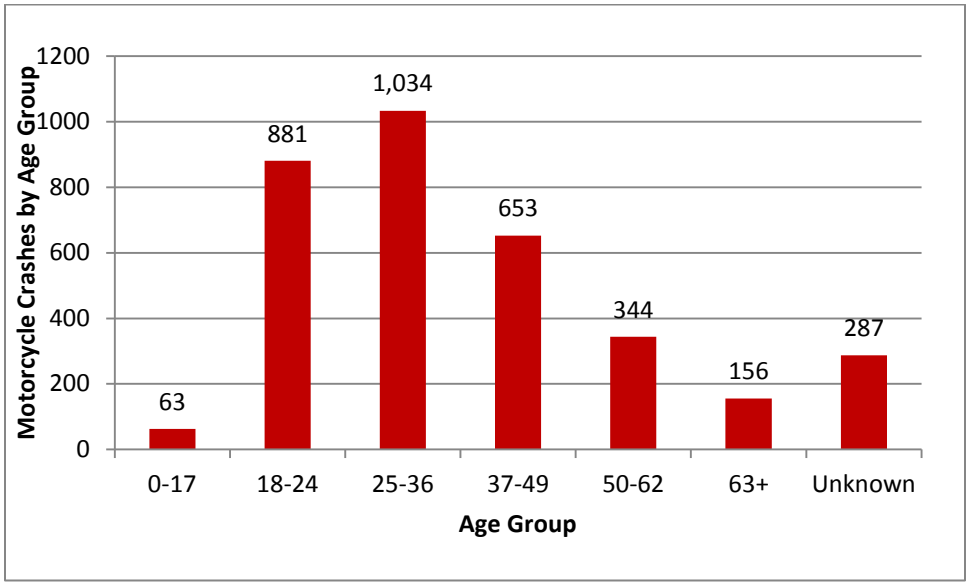



Figure 38: Average annual Motorcycle Crashes by Age Group (2007-2009,2012)

When classifying motorcycle crashes data by age group for this four-year period, we can resume that age groups of 18-24 and 25-36 years had the most fatality and injury crashes for this four-year period. Together, both groups accounted for 56% of crashes, while 0-17 years age group accounted for the least with 2%. It should be noted that age is listed as unknown in 8% of motorcycle crashes reported.

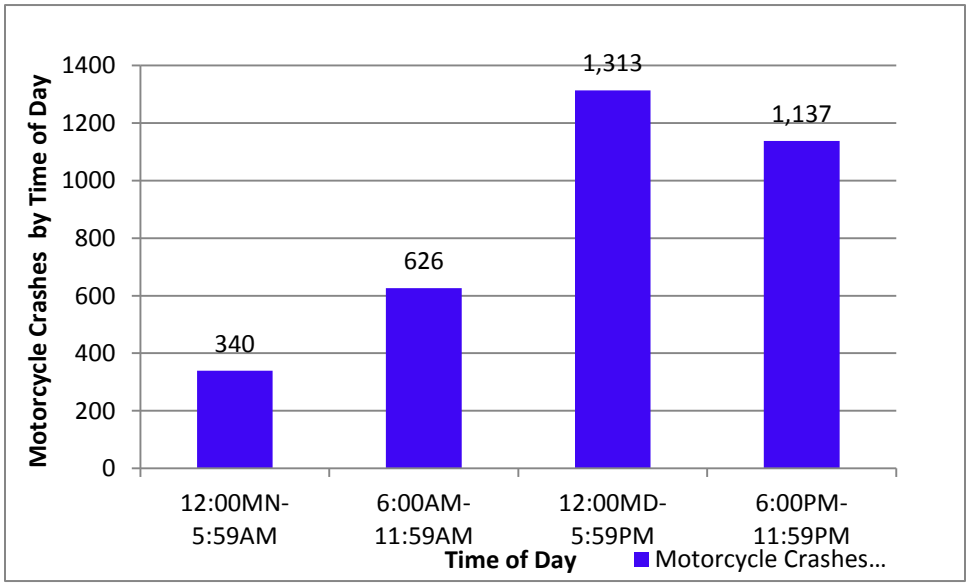



Figure 39: Average Annual Motorcycle Crashes by Time of Day 2007-2009, 2012

When analyzing motorcycle crashes during this four-year period by time of day, it is clear that most of these take place during afternoon and night hours. Period of time between 12:00md- 5:59pm accounted for 38% of total crashes, while 6:00pm- 11:59pm accounted for 33%.

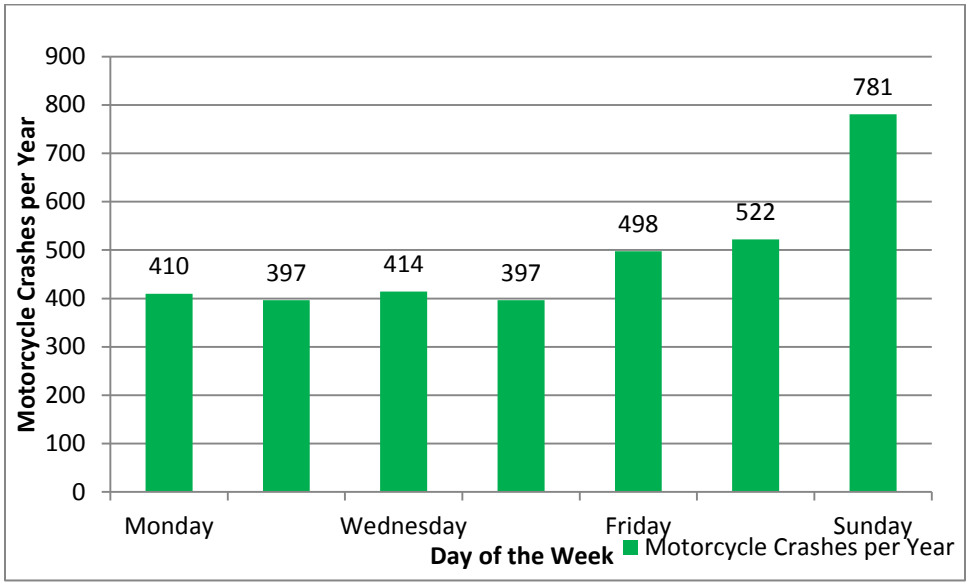



Figure 40: Average Annual Motorcycle Crashes by Day of week Years 2007-2009, 2012

When analyzing data of motorcycle fatal and injury crahes by day of week, it shows weekdays of Monday – Thursday have slightly even results accounting each for 12 % of total crashes. A slight increase can be seen on Friday and Saturday, each accounting for 15%. However, a huge increase can be seen on Sunday, this day accounted for 23% of total crashes, almost double of what weekdays accounted for.

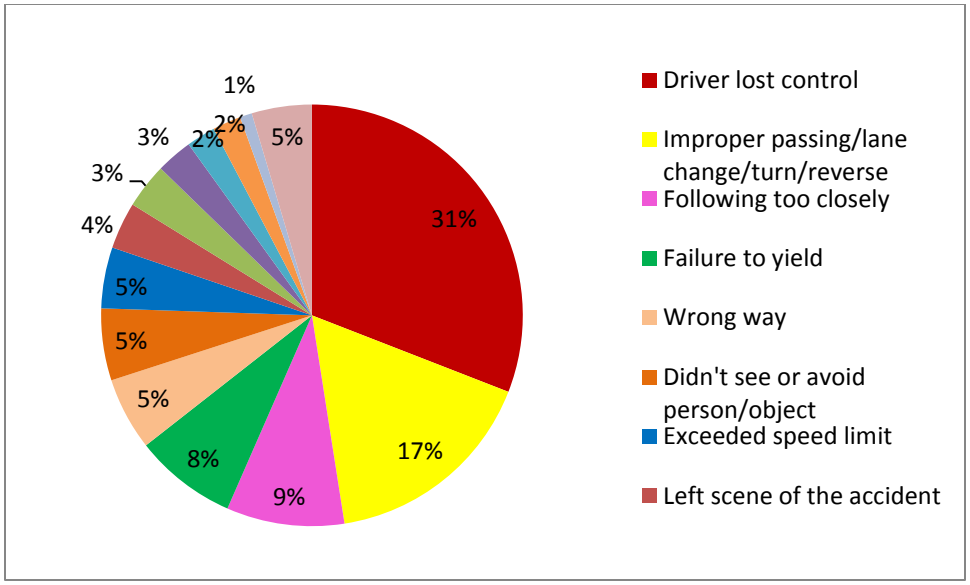



Figure 41: Motorcycle Crashes by Contributing Causes

When analyzing contributing causes for motorcycle crashes data for the 2007-2009, 2012 periods, it shows how the grand majority of crashes are caused when driver looses control, this could be attributed to aggressive driving and speeding factors. Other frequently recorded contributing causes for motorcycle related crashes are “Improper Passing, Lane Change, or Turn”, “Following too Closely”, and “Failure to Yield”.

# OCCUPANT PROTECTION

## Problem ID

According to FARS data for the 2011-2013 period, a total of 358 fatalities were unrestrained-related. The year that shows the highest amount of these fatalities is 2013 with 126, or 35% of total fatalities for this three-year period.

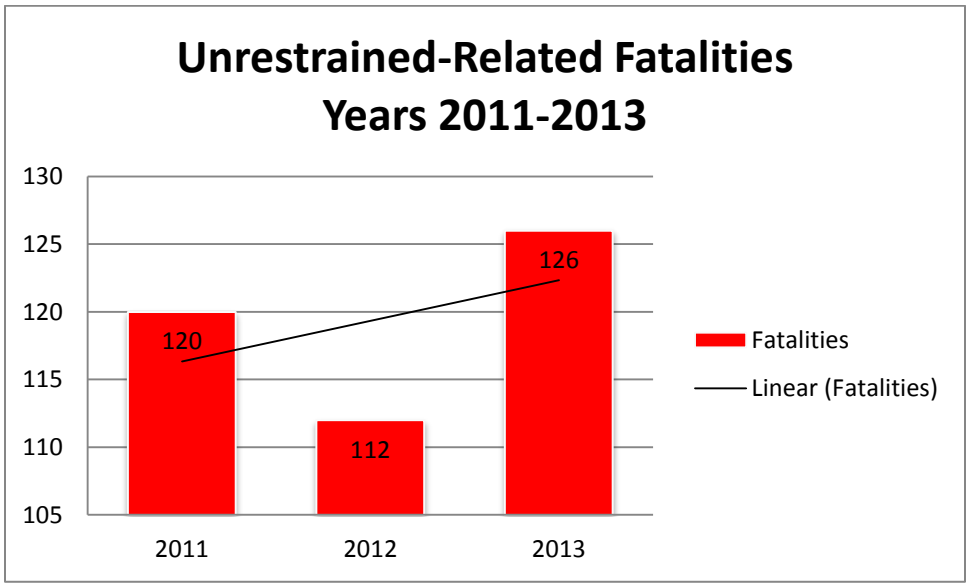



Figure 42: Unrestrained-Related Fatalities Years 2011-2013

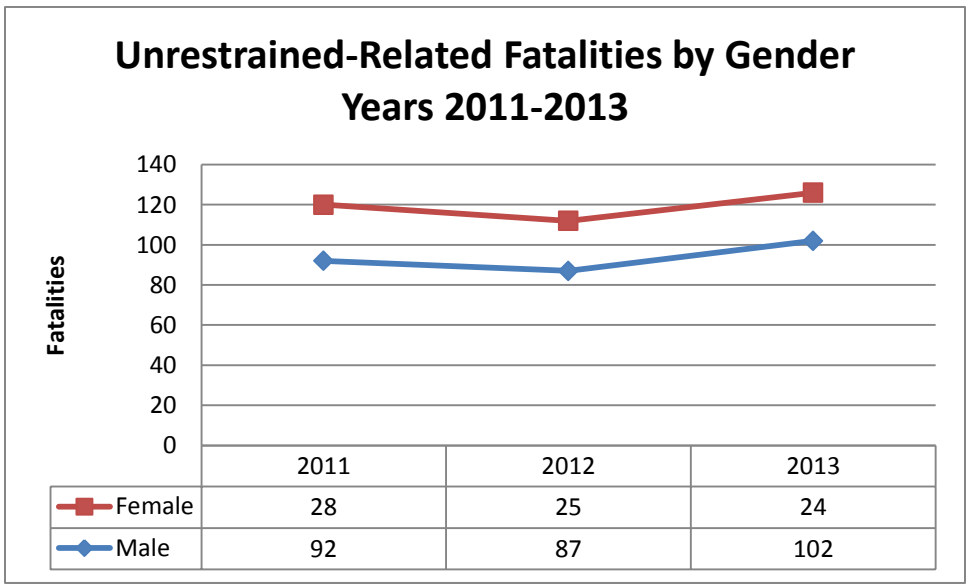



Figure 43: Unrestrained-Related Fatalities By Gender Years 2011-2013

When analyzing data of unrestrained-related fatalities by gender during 2011-2013 period, 77, or 22%, were female, while 281, or 78%, were male. In 2013, which is the year with the highest amount of fatalities with 126, 81% were male, while 19% were female.

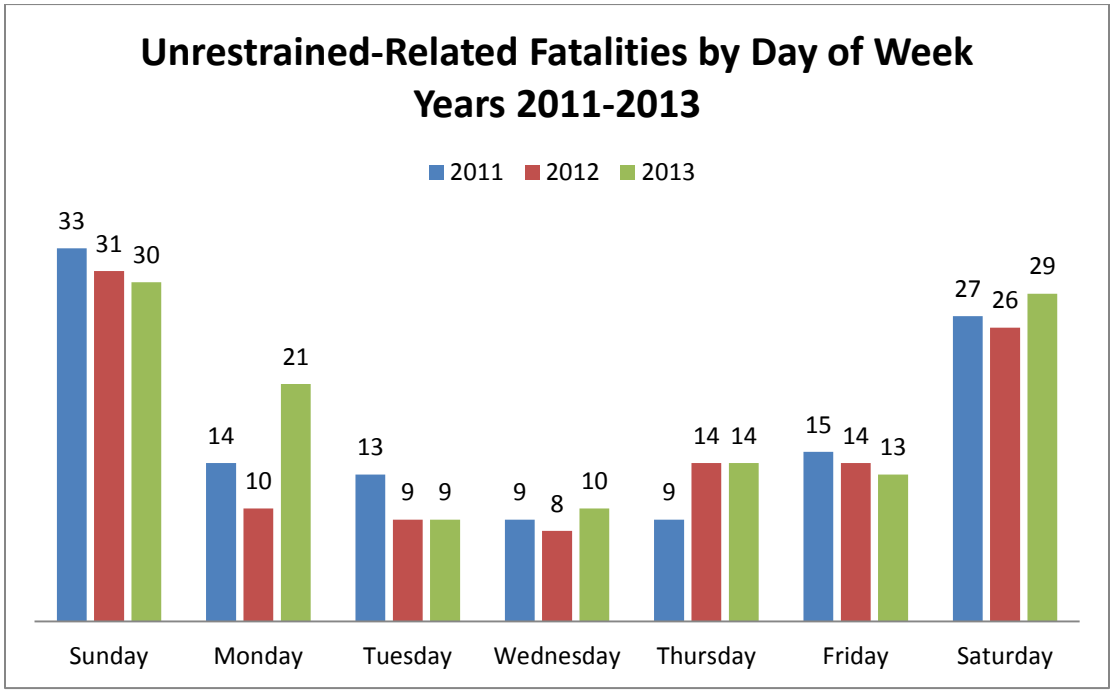



Figure 44: Unrestrained-Related Fatalities by Day of Week Years 2011-2013

When analyzing unrestrained-related fatalities data by day of week for this three-year period, we can detail the following:

- The days of the week with the highest amount of fatalities are Saturday, Sunday and Monday with a total of 221 or a 62%.
- Year 2013 shows to be the one with the most unrestrained related fatalities with a total of 80 reported on Saturdays, Sundays and Mondays for a 63%.
- Sunday shows to be the day with most fatalities during the 2011-2013 periods with a total of 94 or a 62% of total fatalities.

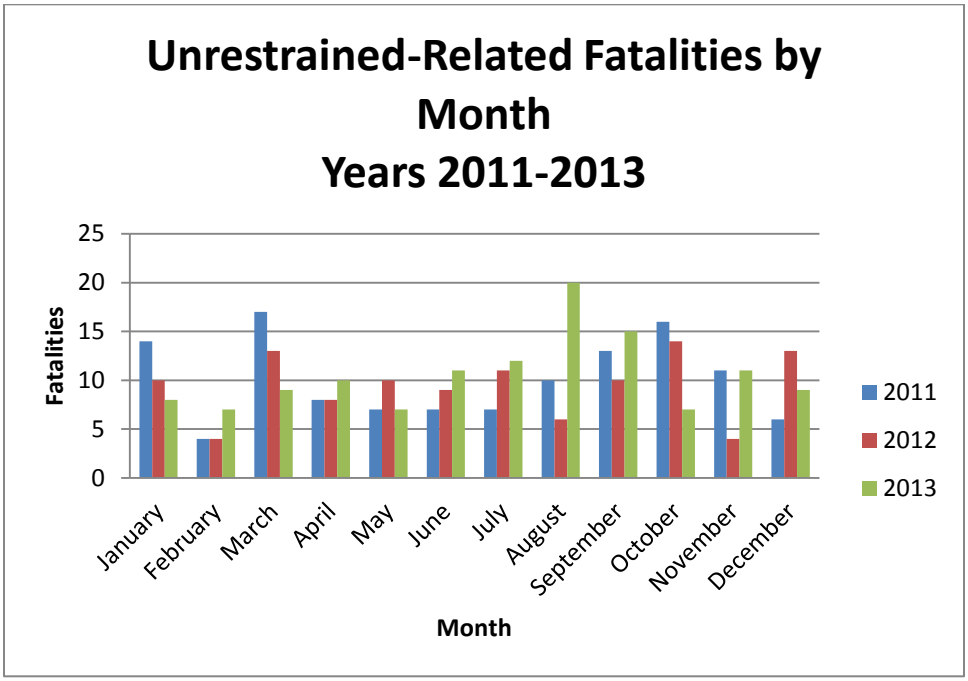



Figure 45: Unrestrained-Related Fatalities by Month Years 2011-2013

When analyzing and averaging data of unrestrained-related fatalities by month for the 2011-2013 period, the months with the highest amount of fatalities are March with 39, September with 38, and October with 37. These three months account for 32% of total fatalities for this three-year period.

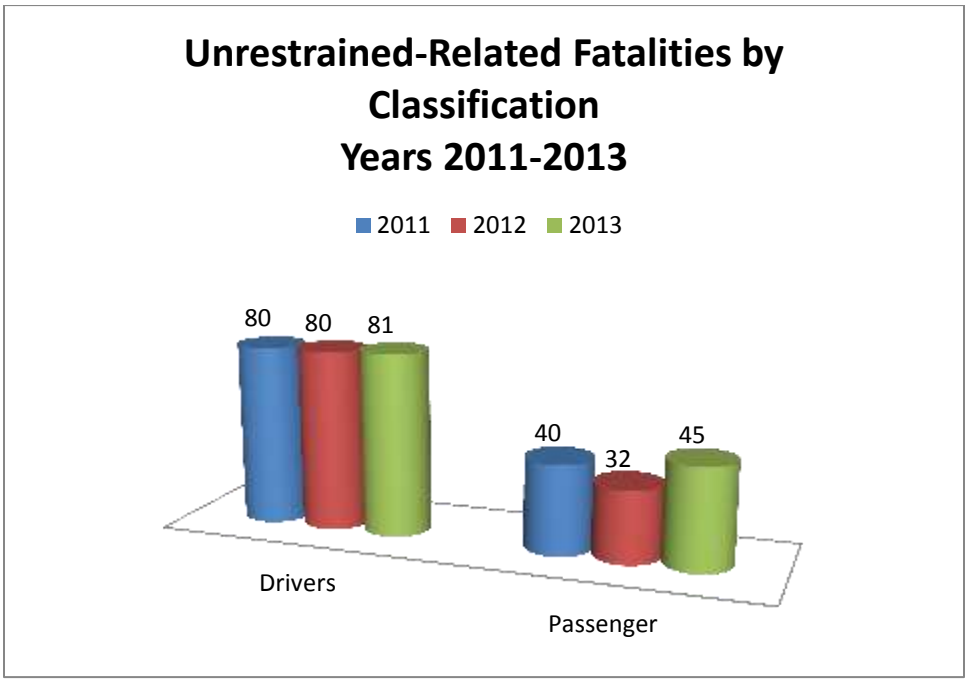



Figure 46: Unrestrained-Related fatalities by Classification Years 2011-2013

When analyzing data of unrestrained-related fatalities by driver and passenger classifications for the 2011-2013 period, 241, or a 67%, were drivers; while 117, or 33%, were passengers. During 2013, drivers accounted for 64% of total unrestrained-related fatalities.

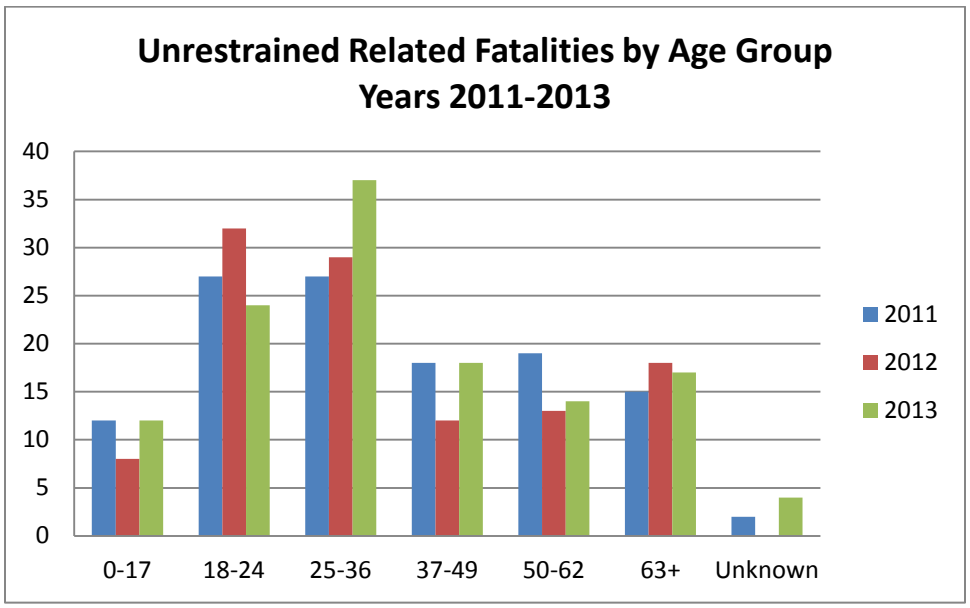



Figure 47: Unrestrained-Related Fatalities by Age Group Years 2011-2013

When analyzing unrestrained-related fatalities data classified by age groups for the 2011-2013 period, age groups with the highest amount of unrestrained-related fatalities are the 18-24 and 25-36 groups. These groups had a total of 176 fatalities, accounting for 49% of total fatalities reported during this three-year period. These are followed by the 63+ age group.

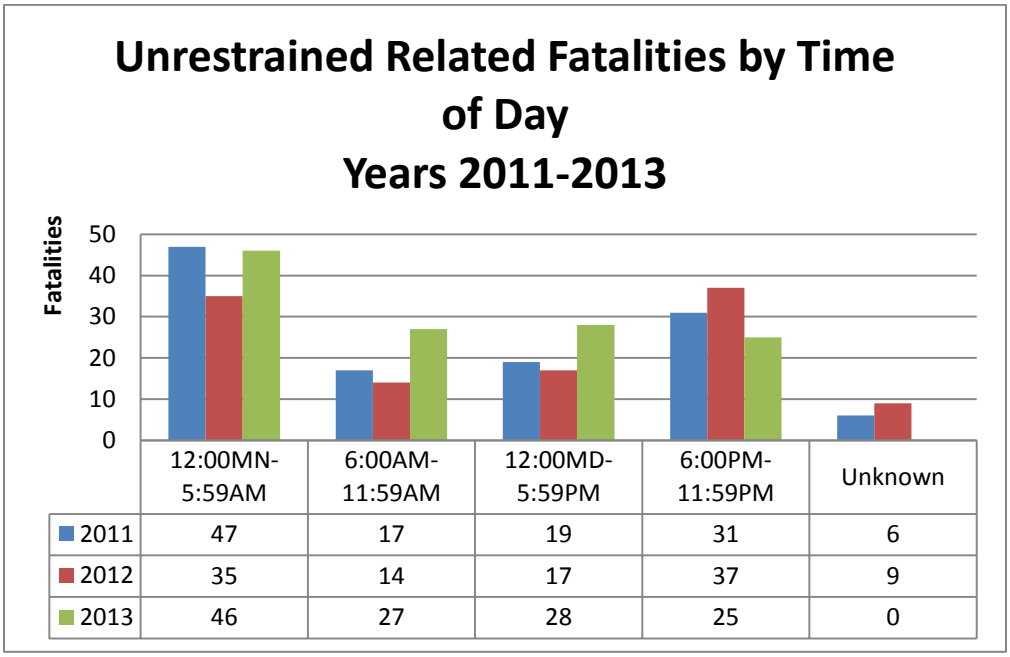



Figure 48: Unrestrained-Related fatalities by Time of Day Years 2011-2013

When analyzing unrestrained related fatalities data by time of day for the 2011-2013 period, we can reassert that the hours between 12:00am- 5:59am accounted for the highest amount of fatalities with a 36% of total fatalities. It is followed by the hours between 6:00pm- 11:59pm with 93 fatalities.

| UNRESTRAINED-RELATED FATALITIES BY MUNICIPALITY YEARS 2011-2013 | | |
|---|---|---|
| Ranking | **Municipalities** | **Total Fatalities** |
| **1** | San Juan | 22 |
| **2** | Arecibo | 14 |
| **3** | San Sebastian | 13 |
| **4** | Bayamon | 11 |
| **5** | Caguas | 11 |

Figure 49: Unrestrained related fatalities By Municipalities Years 2011-2013

After analyzing data of unrestrained related fatalities by Municipality for the 2011-2013 period, San Juan is the municipality that accounted for the highest amount with 22 fatalities, followed by Arecibo with 14. Table above details the 5 municipalities with the highest amount of fatalities for this three-year period.

# UNRESTRAINED – FATAL AND INJURY CRASHES

## Problem ID

Statistics for fatal and injury crashes involving unrestrained drivers was provided for years 2007-2009, 2012 through the CARE system. Although statistics, together with behavioral studies, show that a very high percentage of drivers are restrained, around one-third are still driving while unrestrained. Very often, crashes involving unrestrained drivers have severe outcomes.

Statistics on Seatbelt Usage in Fatal and Injury Crashes by Year

| Year | Fatal | | | Injury | | | Total F+I Crashes | %of Fatal Crashes Involving Unbelted Drivers | %of Injury Crashes Involving Unbelted Drivers |
|---|---|---|---|---|---|---|---|---|---|
| | Unbelted | Belted | Total[1] | Unbelted | Belted | Total[1] | | | |
| **2007** | 146 | 257 | 451 | 4,385 | 24,687 | 31,027 | 31,478 | 32% | 14% |
| **2008** | 107 | 232 | 388 | 3,266 | 23,234 | 28,580 | 28,968 | 28% | 11% |
| **2009** | 106 | 192 | 345 | 2,668 | 23,843 | 28,584 | 28,929 | 31% | 9% |
| **2012** | 118 | 196 | 348 | 2,047 | 20,929 | 24,753 | 25,101 | 34% | 8% |

Figure 50: Statistics on Seatbelt Usage in fatal and Injury Crashes by Year

[1] Total includes crashes where seatbelt usage was unknown.

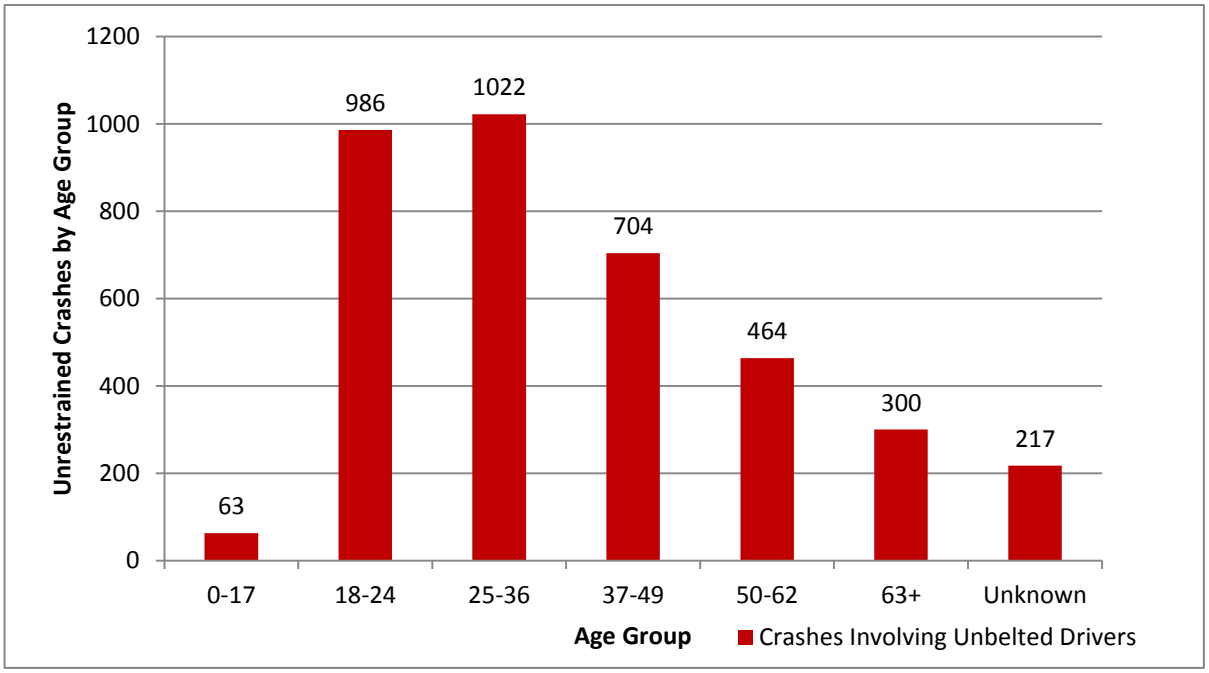



Figure 51: Average Annual Statistics on Unrestrained Crashes by Age Group Years 2007-2009, 2012

Analisis of data for crashes involving unrestrained drivers by age group for this four-year period, shows that young adults are most likely not to be restrained at the moment of a crash. They are included in the 18-24 and 25-36 age groups, and respectively accounted for 26% 27% of total crashes.

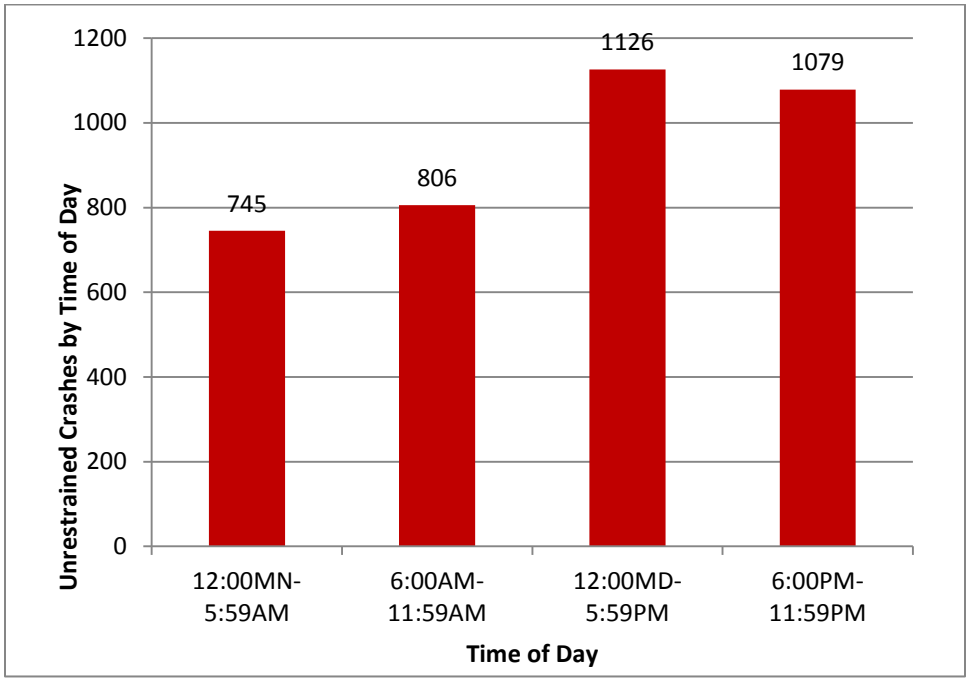



Figure 52: Average Annual Statistics on Unrestrained Crashes by Time of Day Years 2007-2009, 2012

When analyzing unrestrained crashes data by time of day for the 2007-2009, 2012 periods, it shows most unrestrained crashes occurred during the hours of 12:00md-5:59pm. These hours accounted for 30% of unrestrained crashes, closely followed by hours between 6:00pm- 11:59pm which accounted for 29% of total. Early morning hours between 12:00mn- 5:59am accounted for the least amount of unrestrained crashes with near 20%.

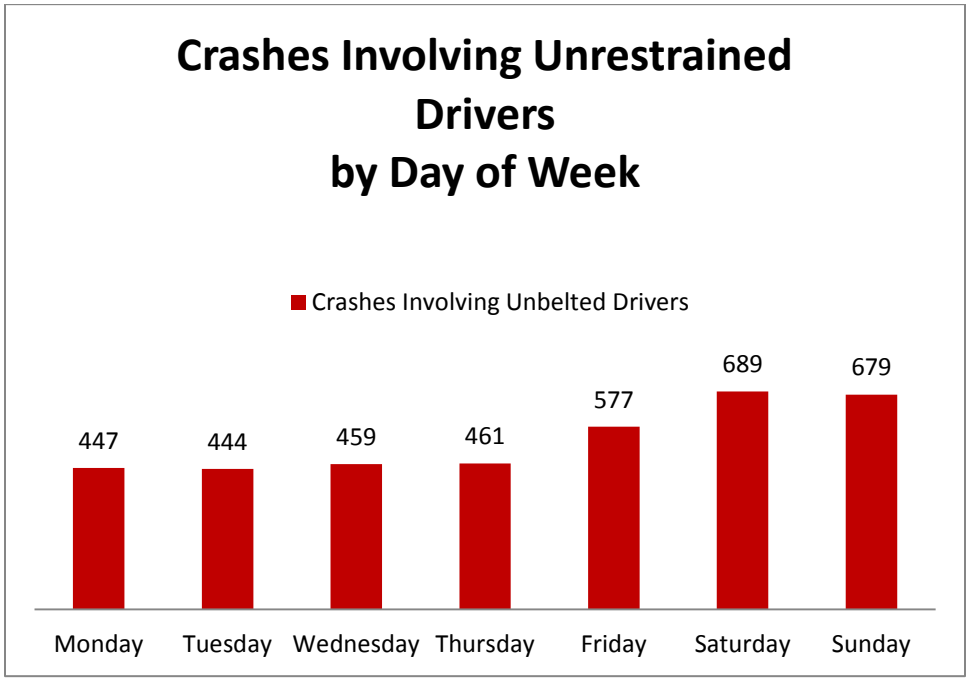



Figure 53: Statistics on Unrestrained Crashes by Day of Week Years 2007-2009, 2012

When analyzing data of crashes involving unrestrained drivers by day of week for this four-year period, weekend days of Saturday and Sunday show to be the days with the highest incidences. Respectively, each accounted for 19% and 18% of total crashes. This is followed by Friday, also a weekend day, which accounted for 15% of total. Weekdays of Monday- Thursday show to have the least incidences, all accounted for 12% of total crashes each.

## NON OCCUPANT

### Problem ID

Out of 1,071 total traffic fatalities reported during 2011-2013 period, 348, or 32, of these were non-occupants, of which 310, or 89%, were pedestrians. In 2011, a total of 112 pedestrian fatalities were reported, in comparison with 2012 which reported 25 less fatalities. This represents a 22% reduction for this non-occupant group.

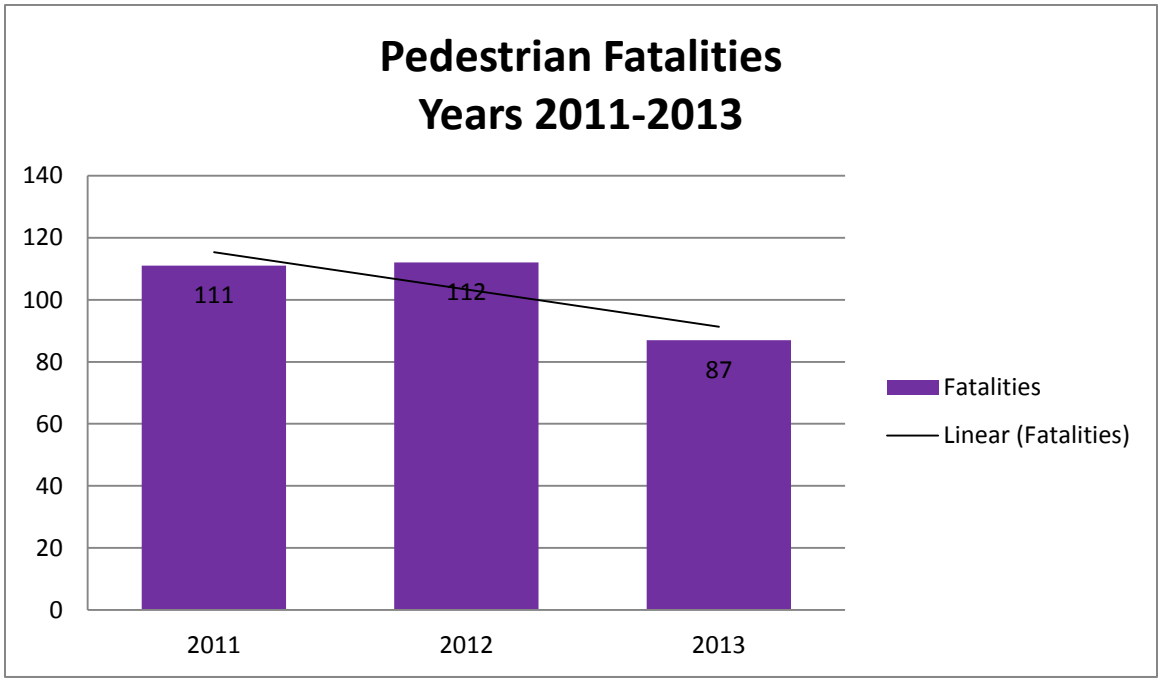



Figure 54: Pedestrian Fatalities Years 2011-2013

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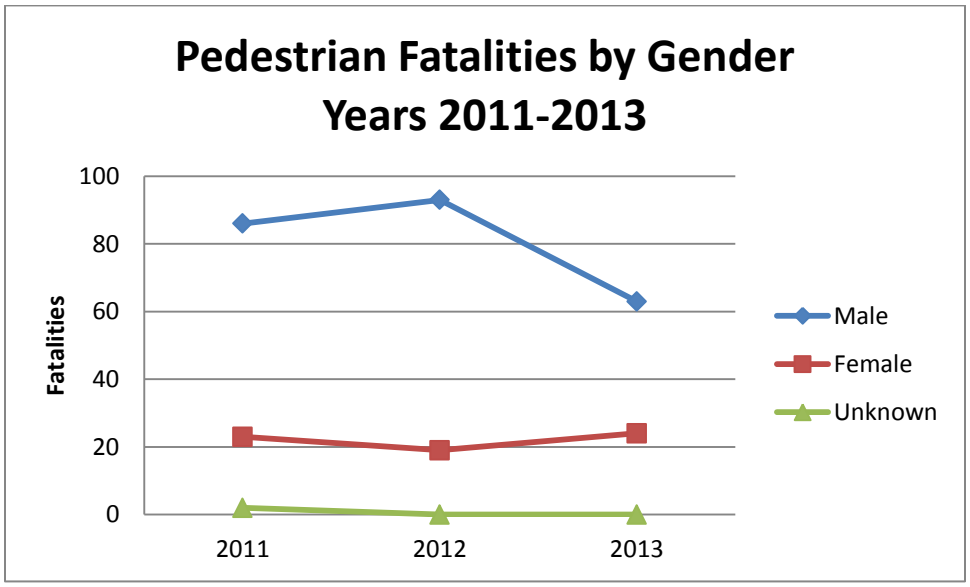



Figure 55: Pedestrian Fatalities by Gender Years 2011-2013

When analyzing pedestrian fatalities data by gender during 2011-2013, we find that 242, or 78%, of these were male and 66, or 21%, were female. The other 1% of fatalities is listed as unknown.

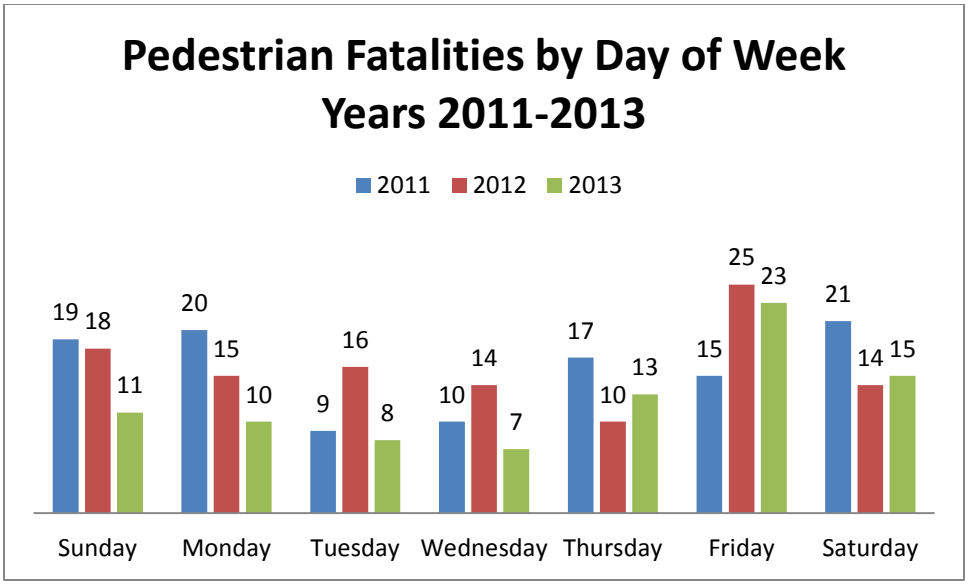



Figure 56: Pedestrian Fatalities by Day of Week Years 2011-2013

When analyzing pedestrian fatalities by day of week during 2011-2013, we find Friday to be the day with the highest amount of reported fatalities with 63, or 20%. Wednesday is the day with the least amount of pedestrian fatalities, reporting 31, or 10%.

| Day of the Week | 2011 | 2012 | 2013 | Total |
|---|---|---|---|---|
| Sunday | 19 | 18 | 11 | **48** |
| Monday | 20 | 15 | 10 | **45** |
| Tuesday | 9 | 16 | 8 | **33** |
| Wednesday | 10 | 14 | 7 | **31** |
| Thursday | 17 | 10 | 13 | **40** |
| Friday | 15 | 25 | 23 | **63** |
| Saturday | 21 | 14 | 15 | **50** |
| **Total** | **111** | **112** | **87** | **310** |

During the 2011-2013 period, weekend days of Thursday through Sunday, a total of 201 pedestrian fatalities were reported. These accounted for 65% of total pedestrian fatalities. Monday through Wednesday reported a total of 109 fatalities, or 35%.

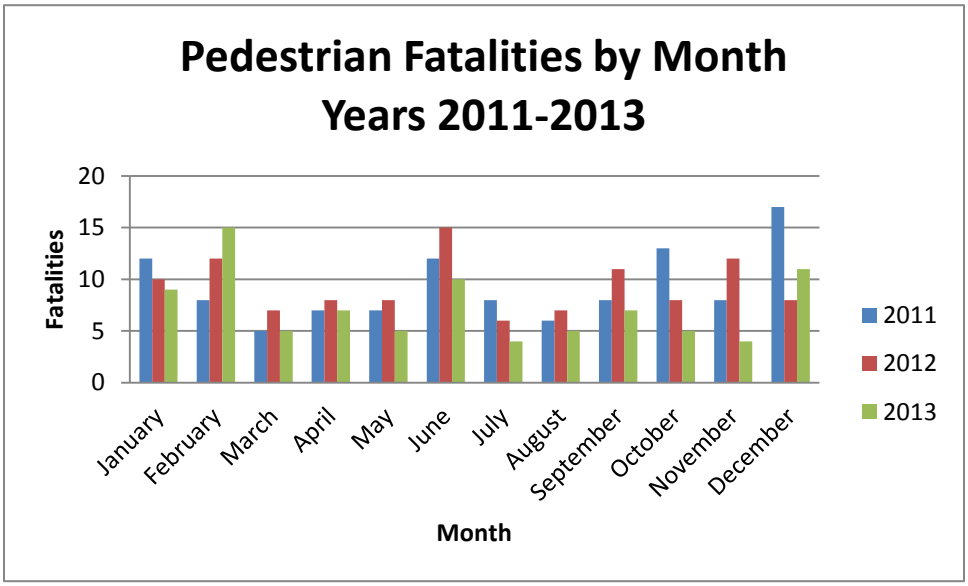



Figure 57: Pedestrian Fatalities by Month Years 2011-2013

When analyzing pedestrian tendencies by month during 2011-2013 period, we find that June reported the highest amount of pedestrian fatalities with 37, equivalent to 12%. March, July, and August are the months with the least amount of reported fatalities in this category, each accounted for 6%.

| Month | 2011 | 2012 | 2013 | Total |
|---|---|---|---|---|
| January | 12 | 10 | 9 | **31** |
| February | 8 | 12 | 15 | **35** |
| March | 5 | 7 | 5 | **17** |
| April | 7 | 8 | 7 | **22** |
| May | 7 | 8 | 5 | **20** |
| June | 12 | 15 | 10 | **37** |
| July | 8 | 6 | 4 | **18** |
| August | 6 | 7 | 5 | **18** |
| September | 8 | 11 | 7 | **26** |
| October | 13 | 8 | 5 | **26** |
| November | 8 | 12 | 4 | **24** |
| December | 17 | 8 | 11 | **36** |
| **Total** | **111** | **112** | **87** | **310** |

Figure 58: Pedestrian Fatalities Tendencies by Month Years 2011-2013

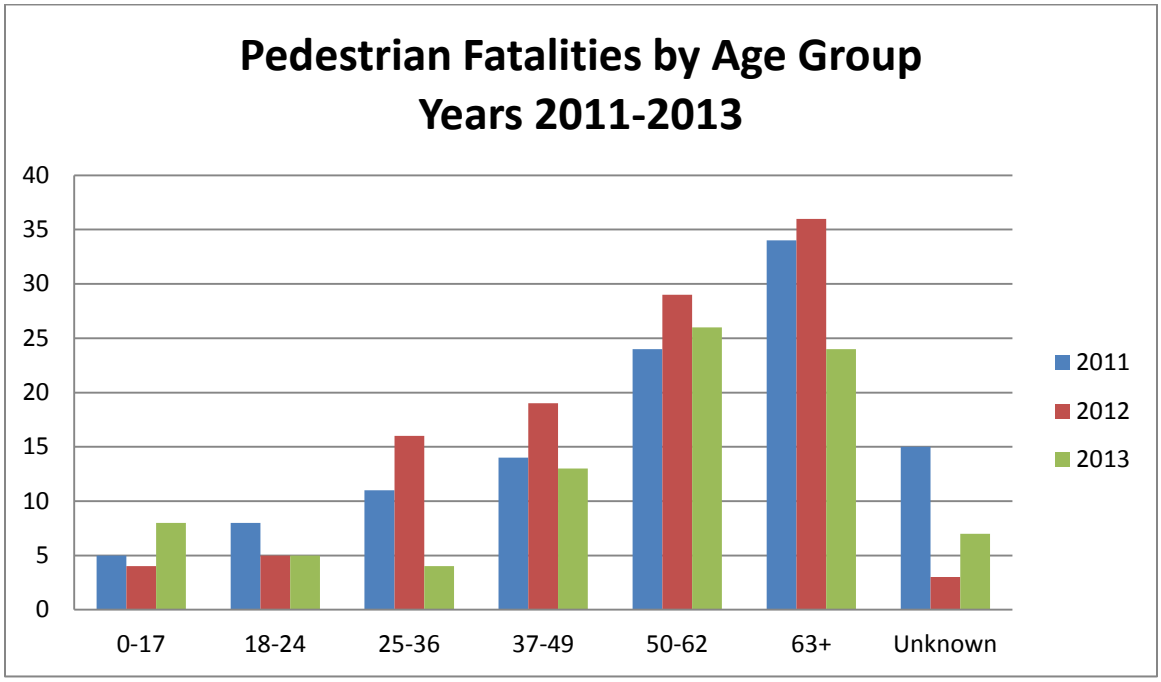



Figure 59: Pedestrian Fatalities by Age Group Years 2011-2013

To be able to realize an effective analysis within pedestrian age groups, six representative groups were created. In this category pedestrians who are 63+ years of age show to be at highest risk with 94 fatalities reported, the equivalent of 30% of total fatalities.

| Grupo Edad | 2011 | 2012 | 2013 | Total |
|---|---|---|---|---|
| 0-17 | 5 | 4 | 8 | **17** |
| 18-24 | 8 | 5 | 5 | **18** |
| 25-36 | 11 | 16 | 4 | **31** |
| 37-49 | 14 | 19 | 13 | **46** |
| 50-62 | 24 | 29 | 26 | **79** |
| 63+ | 34 | 36 | 24 | **94** |
| Unknown | 15 | 3 | 7 | **25** |
| **Total** | **111** | **112** | **87** | **310** |

Figure 60: Pedestrian Fatalities Tendencies by Month Years 2011-2013

Pedestrians between the ages of 50-62 reported 79 fatalities or a 26% of total fatalities, 37-49 age group reported 46 or a 15%, and the 25-36 age group 31 or a 10%. The "unknown" age group reported 25 fatalities for an 8%, the 18-24 age group with 18 for a 6%, and finally the 0-17 age group with 17 fatalities for a 5% of total fatalities.

In this pedestrian classification, the youngest fatality was a one year old baby who fell out of the car he was in; while the oldest was a 94 year old man.

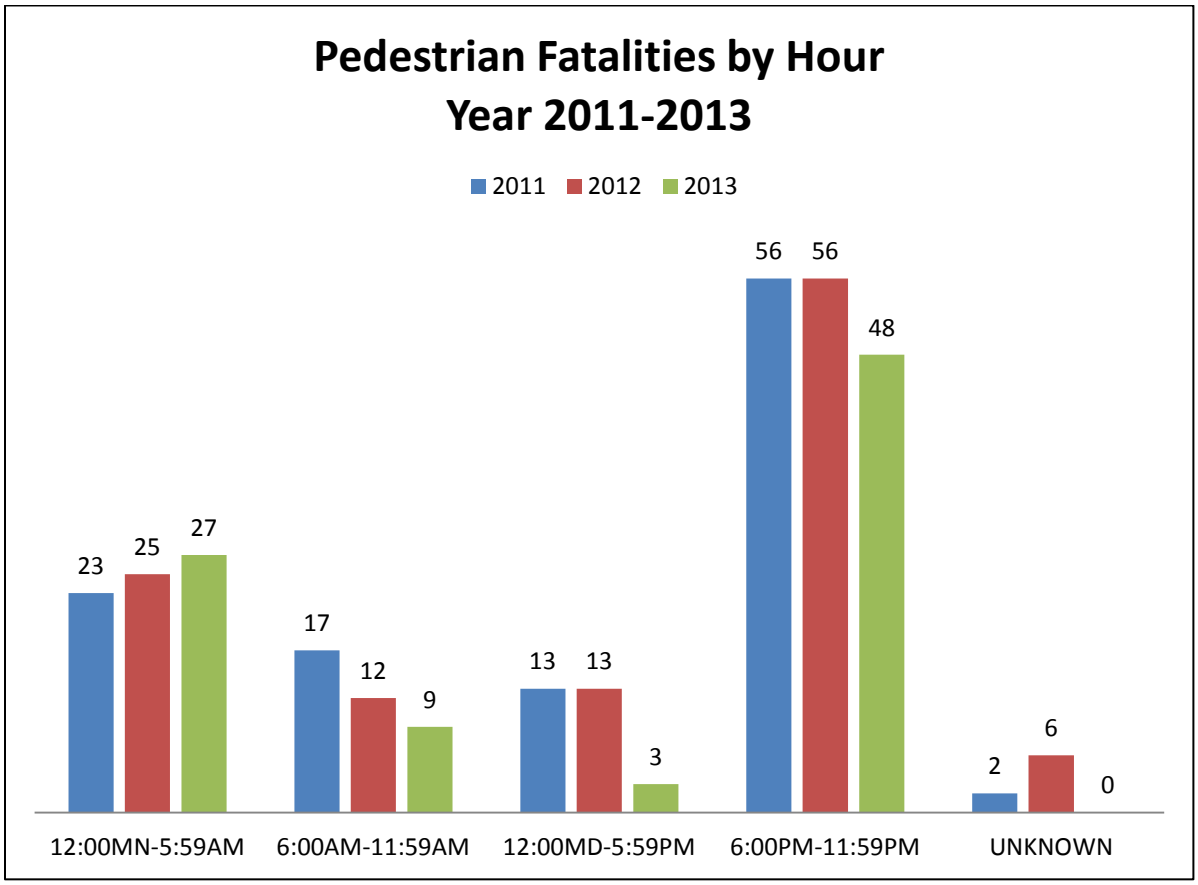



Figure 61: Pedestrian Fatalities by Hour Years 2011-2013

The table shown above shows the distribution of pedestrian fatalities according to the time of day. The highest amount of these fatalities occurred during the 6:00 – 11:59 pm period with 160 fatalities or 52%, followed by the 12:00– 5:59 am period with 38 or a 24% of total fatalities. Within the 310 pedestrian fatalities, 189 or a 61% of these occurred during the nighttime, while 113 or a 36% occurred during the daytime. A total of 8 or a 3% were classified as unknown.

It should be noted that during 2011-2013, 3 people on wheelchairs or some other type of assisting equipment were among the fatalities. These were 2 males and 1 female and were fatally injured on a Friday; 2 of them during the month of March and 1 in May; 1 between the hours of 12:00 – 5:59 pm and 2 between 6:00 – 11:59 pm. Of these fatalities, 2 were reported in the municipality of San Juan and 1 in Luquillo.

| Pedestrian Fatalities By Municipality Years 2011-2013 | | |
|---|---|---|
| **Ranking** | **Municipality** | **Total Fatalities** |
| **1** | San Juan | 41 |
| **2** | Bayamón | 19 |
| **3** | Carolina | 16 |
| **4** | Aguadilla | 14 |
| **5** | Arecibo | 14 |

Figure 62: Pedestrian Fatalities By Municipalities Years 2011-2013

The 5 municipalities reporting the highest number of pedestrian fatalities are among those with the highest number of residents in the metropolitan area, like San Juan which reported 41 fatalities or a 13% of fatalities total, Bayamón with 19 or an 6%, and Carolina with 16 or a 5%. Arecibo, located in the northern region of the island, and Agudailla, on the western region, both report 14 fatalities for a 5% of total fatalities each.

Among the gathered information, a total of 104 or a 34% of pedestrian fatalities were reported in these 5 municipalities, while 206 or 66% of fatalities are distributed amongst the remaining ones

CARE system provided data for 2007-2009, 2012 periods, in this four-year period accounted for a total of 2,617 fatal and injury crashes involving pedestrians.

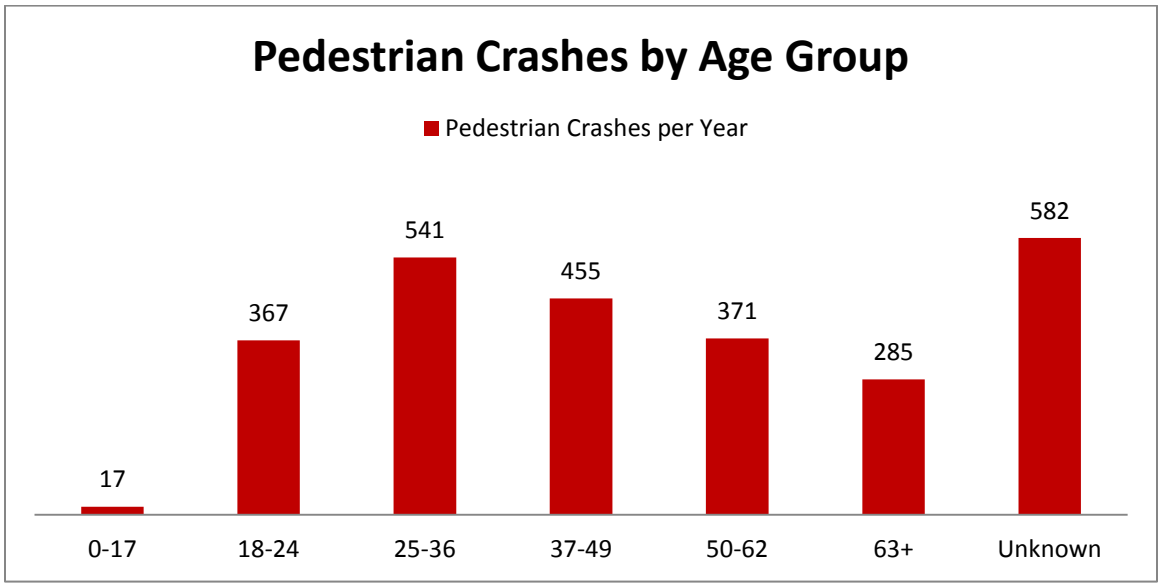



Figure 63: Average Annual Pedestrian Crashes by Age Group Years 2007-2009, 2012

When analyzing pedestrian crashes data by age group for the 2007-2009, 2012 periods, it shows that the 25-36 years age group accounted for the most crashes, with 21% of total. This group is followed by the 37-49 and 18-24 groups, these respectively accounted for 17% and 14% of total crashes. It should be noted that, in the majority of pedestrian crashes, age is listed as “unknown”, accounting for 22% of total.

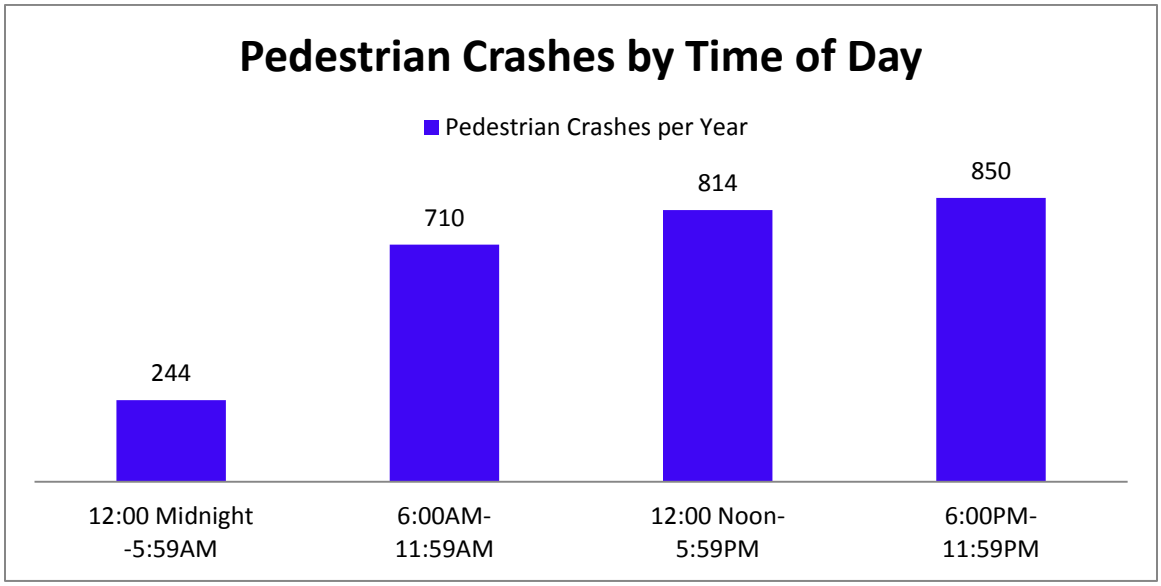



Figure 64: Average Annual Pedestrian crashes by Time of Day Years 2007-2009, 2012

When breaking down pedestrian crashes data by time of day for this four-year period, we can deduce most crashes take place during afternoon and night hours. Hours between 12:00md- 5:59pm accounted for 31%, while hours between 6:00pm- 11:59 pm accounted for 32% of total pedestrian crashes. Early morning hours between 12:00mn-5:59am accounted for the least crashes with 9%.

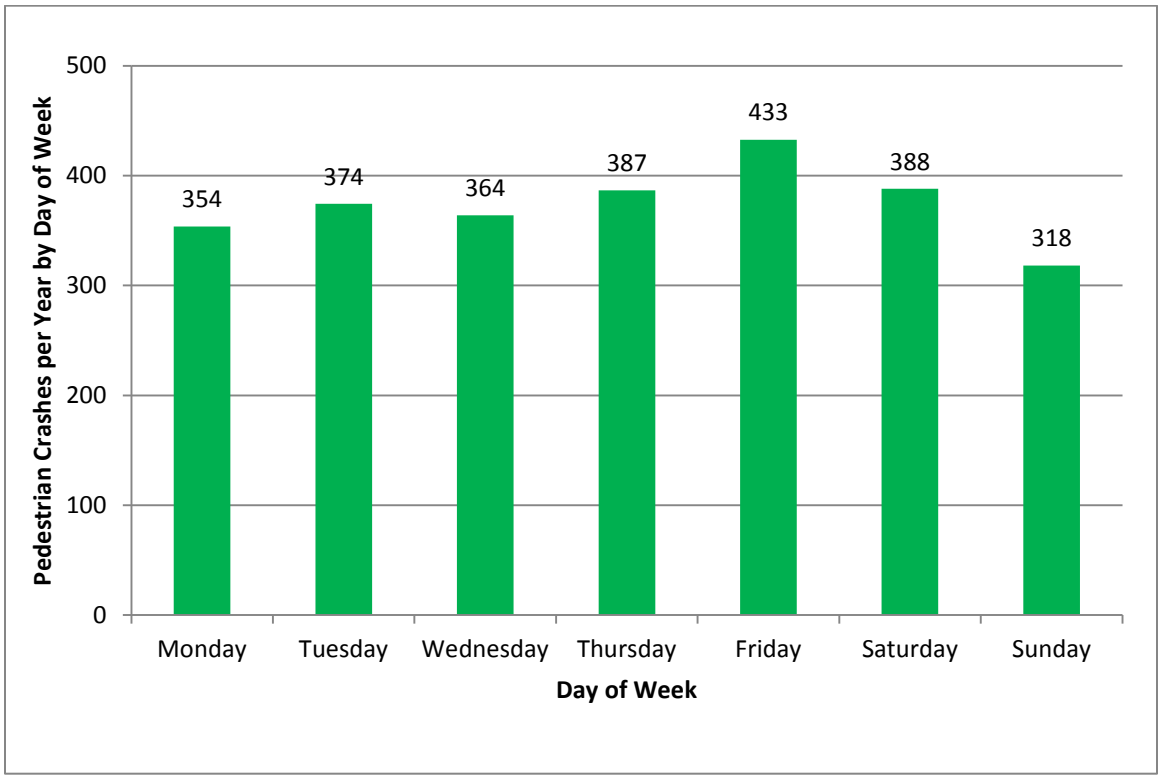



Figure 65: Average Annual Pedestrian Crashes by Day of Week Years 2007-2009, 2012

Results for pedestrian crashes data by day of week for the 2007-2009, 2012 periods seem to be almost even, with the exception of a slight increase on Friday. When analyzing this data, it shows this day accounted for 17% of total pedestrian crashes. It is closely followed by Thursday and Saturday accounting for 15% each, and Monday, Tuesday and Wednesday accounting for 14% each. The day that accounted for the least amount of pedestrian crashes was Sunday with 12% of total.

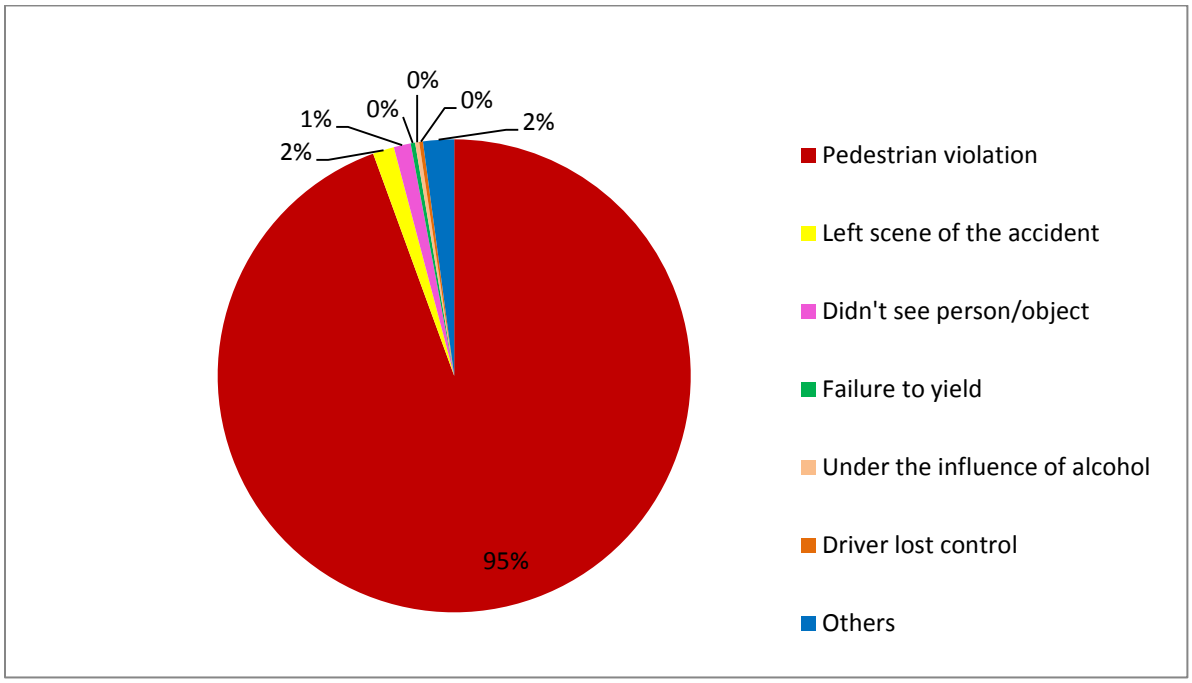



Figure 66: Pedestrian Crashes by Contributing Cause

When analyzing the contributing causes of pedestrian crashes for this four-year period, it is more than clear that the great majority are due to some sort of pedestrian violation, accounting for 93% of total crashes. A very small amount of at least 5% of these crashes, are due to other causes, such as: driver lost control, failure to yield, under the influence of alcohol, didn't see person or object, and others. It should be noted that the contributing cause for 2% of crashes is unknown, as it is listed as "left scene of accident".

## Cyclist - Fatalities

When analyzing data for cyclist fatalities provided by FARS for the 2011-2013 period, we have found this category accounted for 3% of total traffic fatalities. It also accounted for 11% of all non-occupant fatalities. However, year 2013 shows a decline in cyclist fatalities of 31%, when compared to 2012.

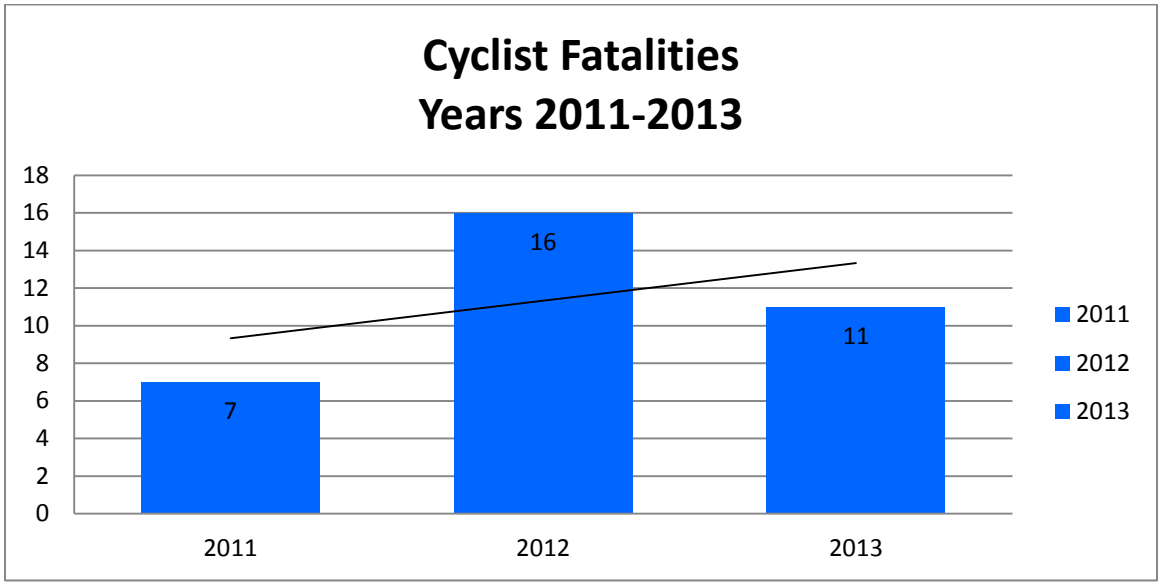



Figure 67: Pedestrian Fatalities Years 2008-2012

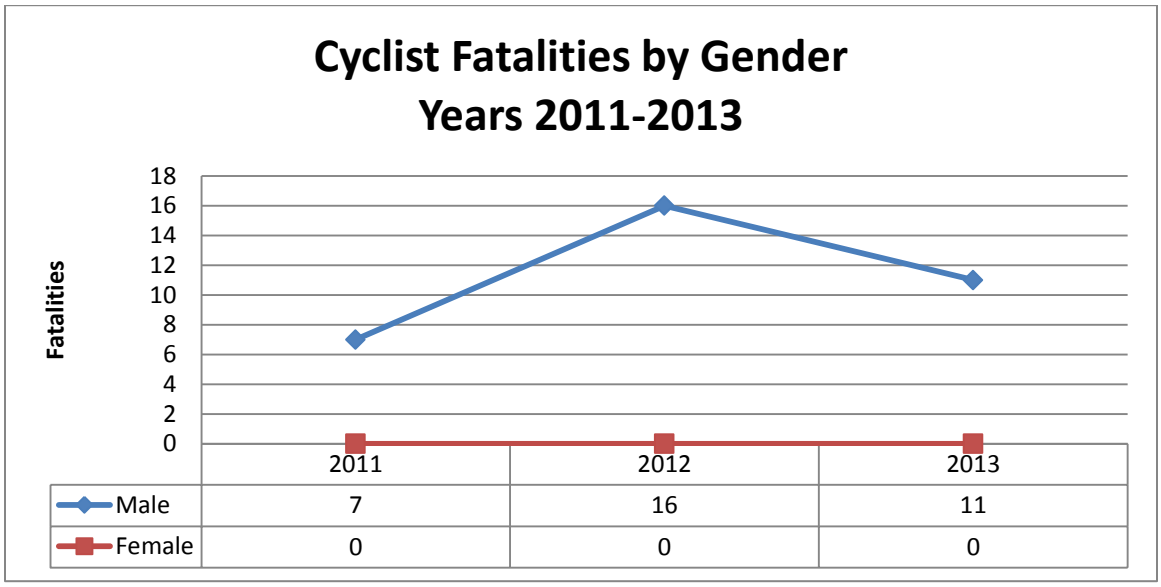



Figure 68: Cyclist Fatality by Gender Years 2011-2013

When analyzing the total of cyclist fatalities for the 2011-2013 period, we find that during this three-year period 100% of fatalities were male.

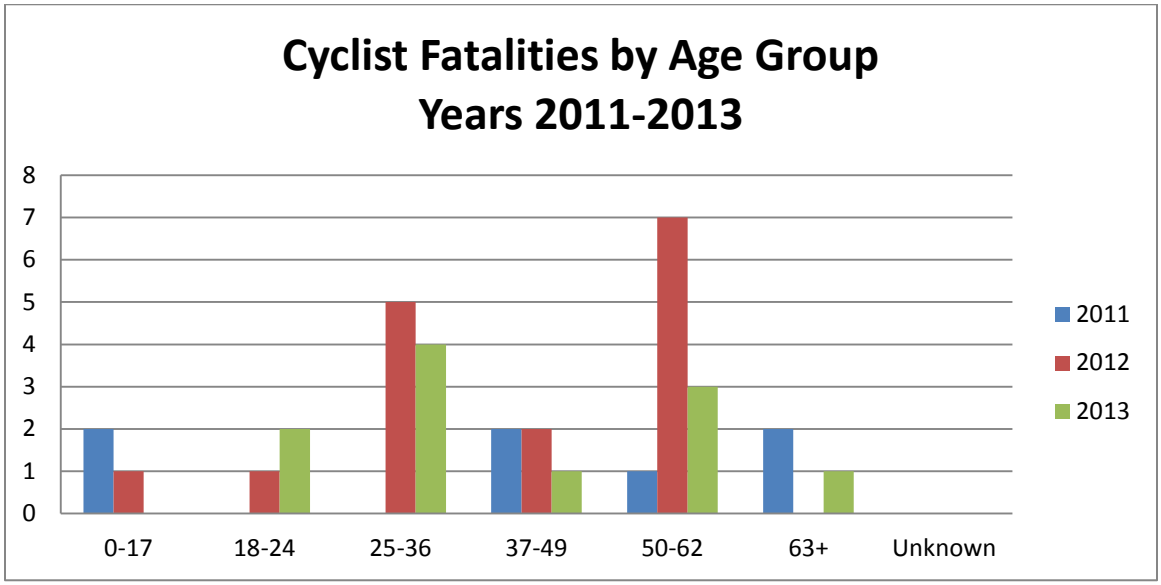



Figure 69: Cyclist Fatalities by Age Group Years 2011-2013

| Age Group | 2011 | 2012 | 2013 | Total |
|---|---|---|---|---|
| 0-17 | 2 | 1 | 0 | **3** |
| 18-24 | 0 | 1 | 2 | **3** |
| 25-36 | 0 | 5 | 4 | **9** |
| 37-49 | 2 | 2 | 1 | **5** |
| 50-62 | 1 | 7 | 3 | **11** |
| 63+ | 2 | 0 | 1 | **3** |
| Unknown | 0 | 0 | 0 | **0** |
| **Total** | **7** | **16** | **11** | **34** |

Figure 70: Age Group Distribution Charst Years 2011-2013

When analyzing cyclist fatalities data by age group for this three-year period, cyclists between the ages of 50-62 show to be at highest risk, reporting 11 fatalities, or 32%. Of these, 7 were reported during year 2012. This is followed by the 26-36 years age group with 9 fatalities, or 26%, and the 37-49 years age group with 15%.

The age groups of 0-17, 18-24, and 63+ reported 3 fatalities each, this places them at a lower risk. The cyclist with the most years of age was 74.

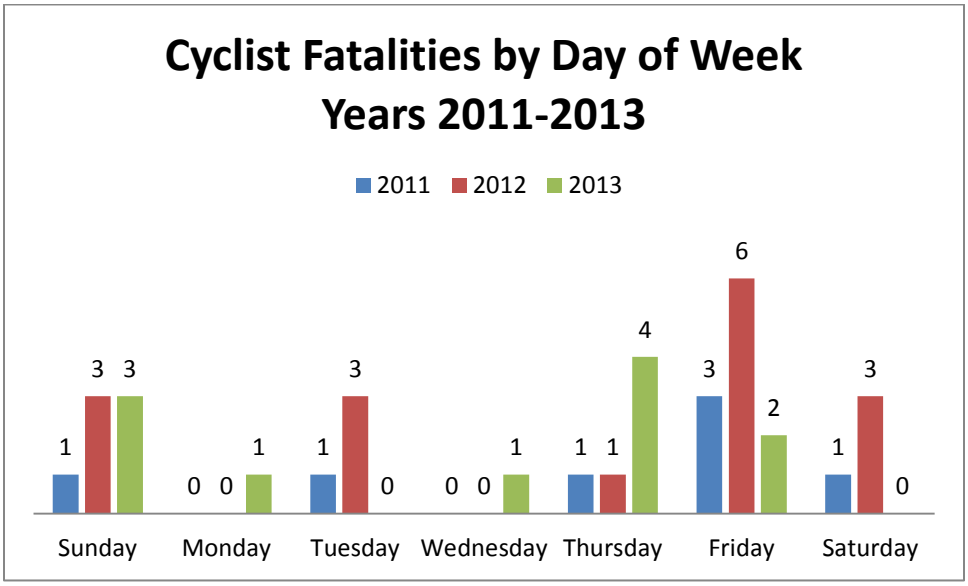


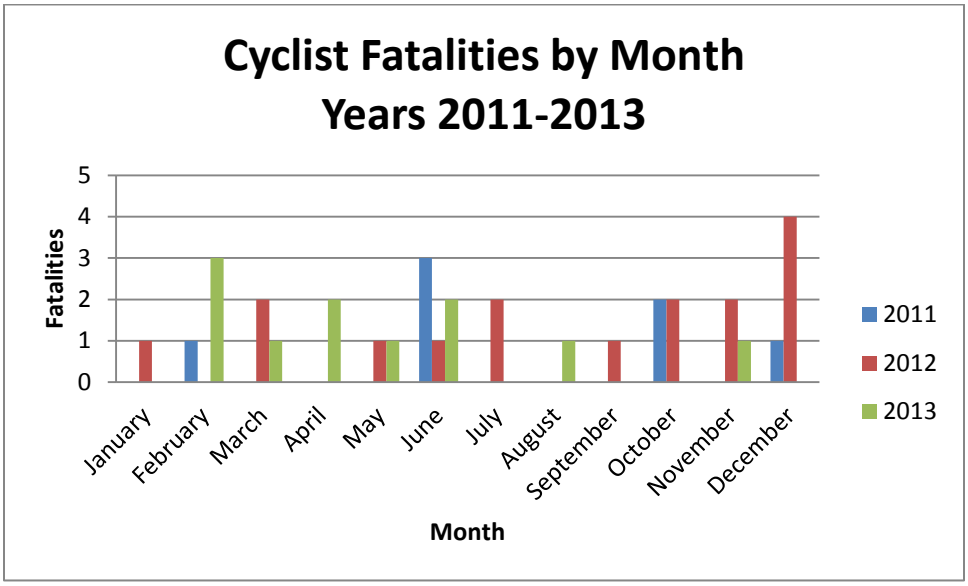

Figure 71: Cyclist fatalities by Day of Week Years 2011-2013

| Day of the Week | 2011 | 2012 | 2013 | Total |
|---|---|---|---|---|
| Sunday | 1 | 3 | 3 | 7 |
| Monday | 0 | 0 | 1 | 1 |
| Tuesday | 1 | 3 | 0 | 4 |
| Wednesday | 1 | 0 | 1 | 2 |
| Thursday | 0 | 1 | 4 | 5 |
| Friday | 3 | 6 | 2 | 11 |
| Saturday | 1 | 3 | 0 | 4 |
| **Total** | **7** | **16** | **11** | **34** |

Day of the Week distribution chart years 2011-2013

After analyzing tables above, we find that during 2011-2013 period the day reporting the highest amount of cyclist fatalities is Friday with 11 of the 34 in total. This accounted for 32% of total fatalities. The day with the least amount is Monday with 1 fatality. During 2012, 6 fatalities were reported on Friday, this year had the highest amount of cyclist fatalities reported in this three-year period.

During the weekend days of Thursday through Sunday, 27 fatalities occurred; this acounted for 79% of total fatalities reported during this three-year period. The remaining 21% of fatalities occurred between Monday and Wednesday.




Cyclist Fatalities by Month Years 2011-2013

| Month | 2011 | 2012 | 2013 | Total |
|---|---|---|---|---|
| January | 0 | 1 | 0 | **1** |
| February | 1 | 0 | 3 | **4** |
| March | 0 | 2 | 1 | **3** |
| April | 0 | 0 | 2 | **2** |
| May | 0 | 1 | 1 | **2** |
| June | 3 | 1 | 2 | **6** |
| July | 0 | 2 | 0 | **2** |
| August | 0 | 0 | 1 | **1** |
| September | 0 | 1 | 0 | **1** |
| October | 2 | 2 | 0 | **4** |
| November | 0 | 2 | 1 | **3** |
| December | 1 | 4 | 0 | **5** |
| **Total** | **7** | **16** | **11** | **34** |

Cyclist Fatalities by Month Distributuion Chart Years 2011-2013

During the 2011-2013 period, June showed to be the month with the highest number of cyclist fatalities reporting 6, or 18% of total fatalities. The months with the highest number of reported fatalities are during the school recess periods, summer vacations, as well as in Christmas time.

January, August, and September reported 1 fatality each, which makes them the months with the least amount of fatalities during the 2011-2013 period.

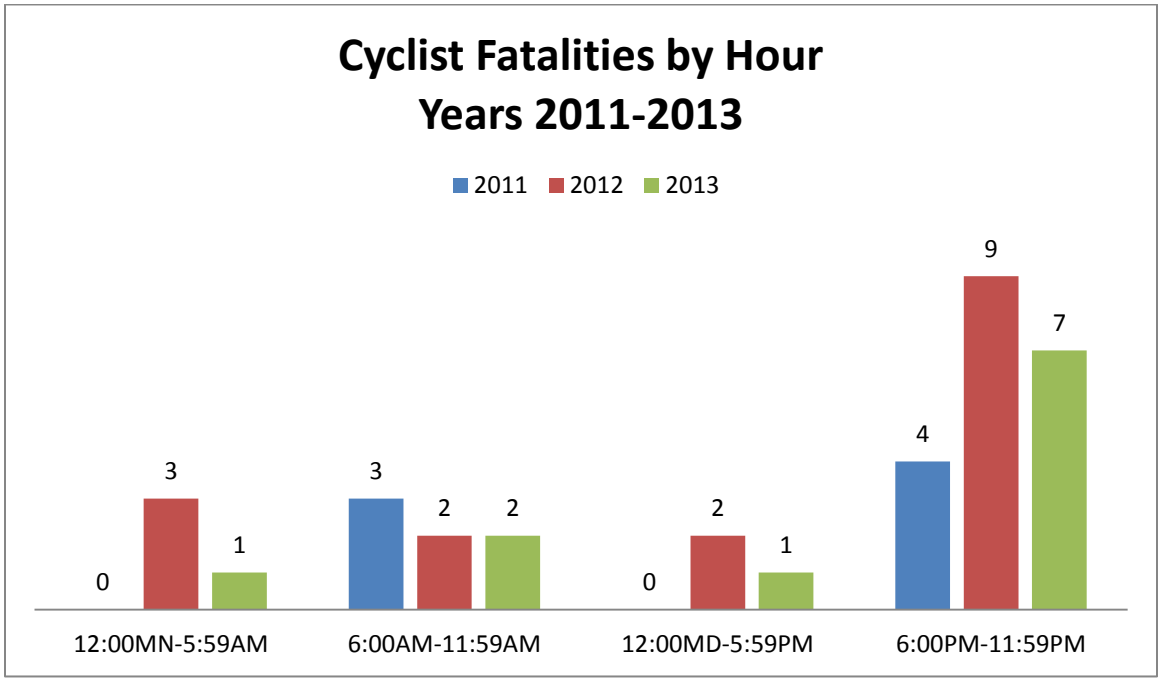



Figure 72: Cyclist Fatalities by Hour Years 2011-2013

The table shown above clearly shows how 20 out of a total of 34 cyclist fatalities were reported between the hours of 6:00 – 9:00 pm. This represents a 59% of total fatalities that occur in crashes during the nighttime for the 2011-2013 period.

| Cyclist Fatalities By Municipality Years 2011-2013 | | |
|---|---|---|
| **Ranking** | **Municipality** | **Total Fatalities** |
| **1** | San Juan | 4 |
| **2** | Caguas | 3 |
| **3** | Aguadilla | 2 |
| **4** | Gurabo | 2 |
| **5** | Añasco | 1 |

Figure 73: Cyclist Fatalities by Municipalities years 2011-2013

When analyzing data of cyclist fatalities by Municipality, it shows that the Municipalities of San Juan, Caguas, Aguadilla, Gurabo, and Añasco are the ones with the highest number of reported cyclist fatalities.

## CYCLIST – FATAL & INJURY CRASHES

According to data provided by CARE system for 2007-2008, 2012 periods, there were a total of 631 fatal and injury crashes involving cyclists.

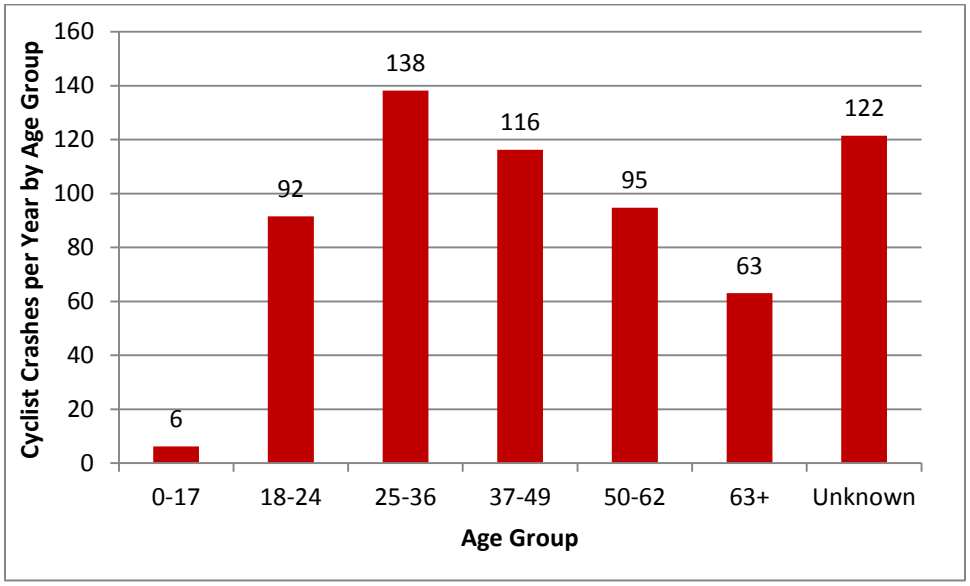



Figure 74: Average Annual Cyclist crashes by Age Group Years 2007-2009, 2012

When analyzing data of bicycle crashes by age group for this four-year period, it shows that 25-36 years age group was at the highest risk of being in a crash, accounting for 22% of total crashes. This age group is closely followed by the 37-49 years group, accounting for 18% of total. The age group of 0-17 years is in the lowest risk, accounting for 1% of total. It should be noted that 19% of bicycle crashes are listed as age “unkown”.

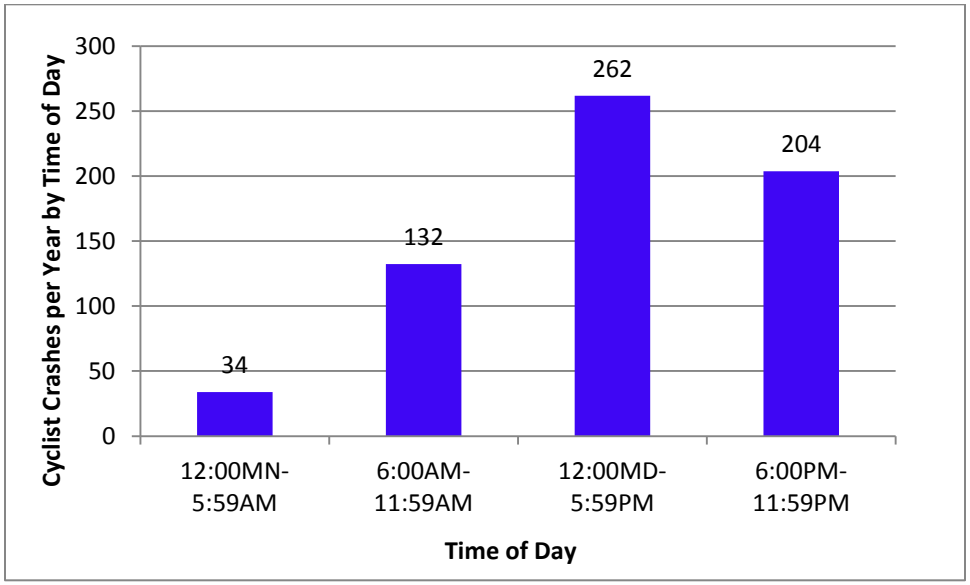



Figure 75: average Annual cyclist Crashes by Time of Day Years 2007-2009, 2012

Data analisis of bicycle crashes by time of day for 2007-2008, 2012 periods, demonstrates most of these crashes occurred during the afternoon hours, with 41% accounting for time period of 12:00md- 5:59pm. It is followed by the night period of 6:00pm- 11:59pm, accounting for 32%.

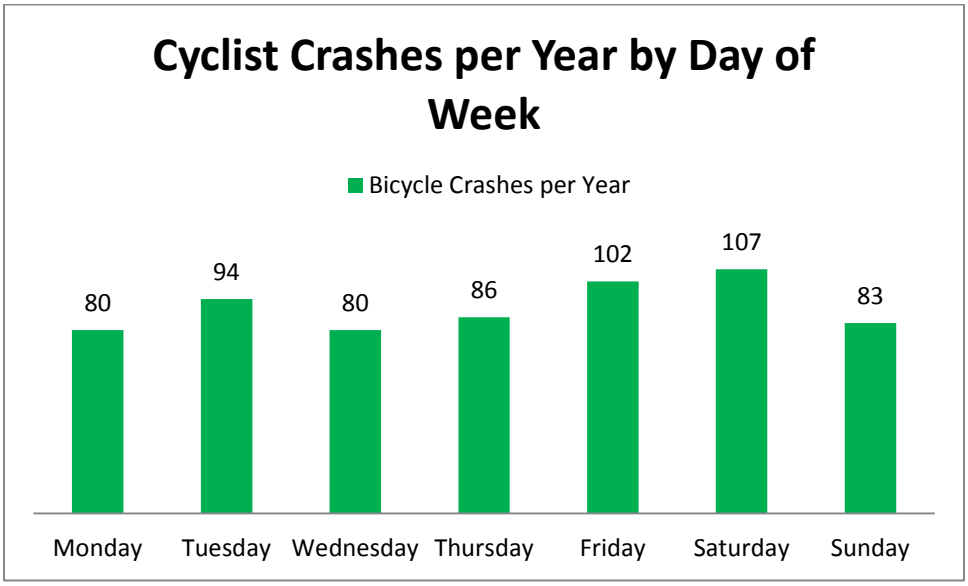



Figure 76: Average Annual cyclist Crashes by Day of Week Years 2007-2009, 2012

When breaking down bicycle crashes data by day of week for years 2007-2009, 2012, it shows most bicyle crashes occurred on Saturday, accounting for 17% of total. It is closely followed by Friday with 16%. Monday and Wednesday are the days that show the least amount of bicycle crashes, both accounted for 13% of total.

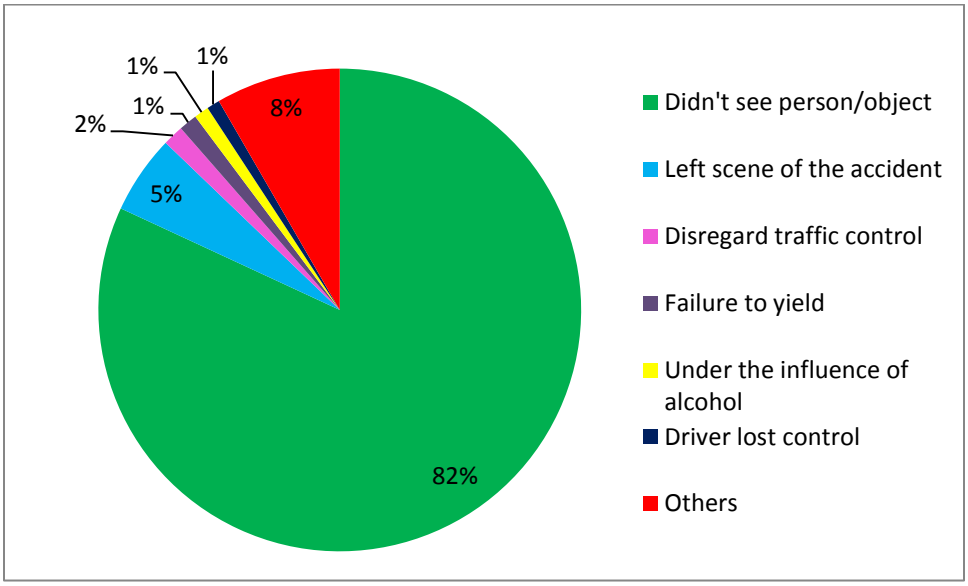



Figure 77: Cyclist Crashes by Contributing Causes years 2007-2009, 2012

When analyzing contributing causes for cyclist crashes for this four-year period, it is clear that the great majority allege not seeing the person/object as the cause of crash. It should be noted that the second and third contributing causes for cycsclit crashes are not specified, since they are listed as “others” and “left the scene of the accident”, respectively.

# APPENDIX

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## GIS Heat Maps by Municipality

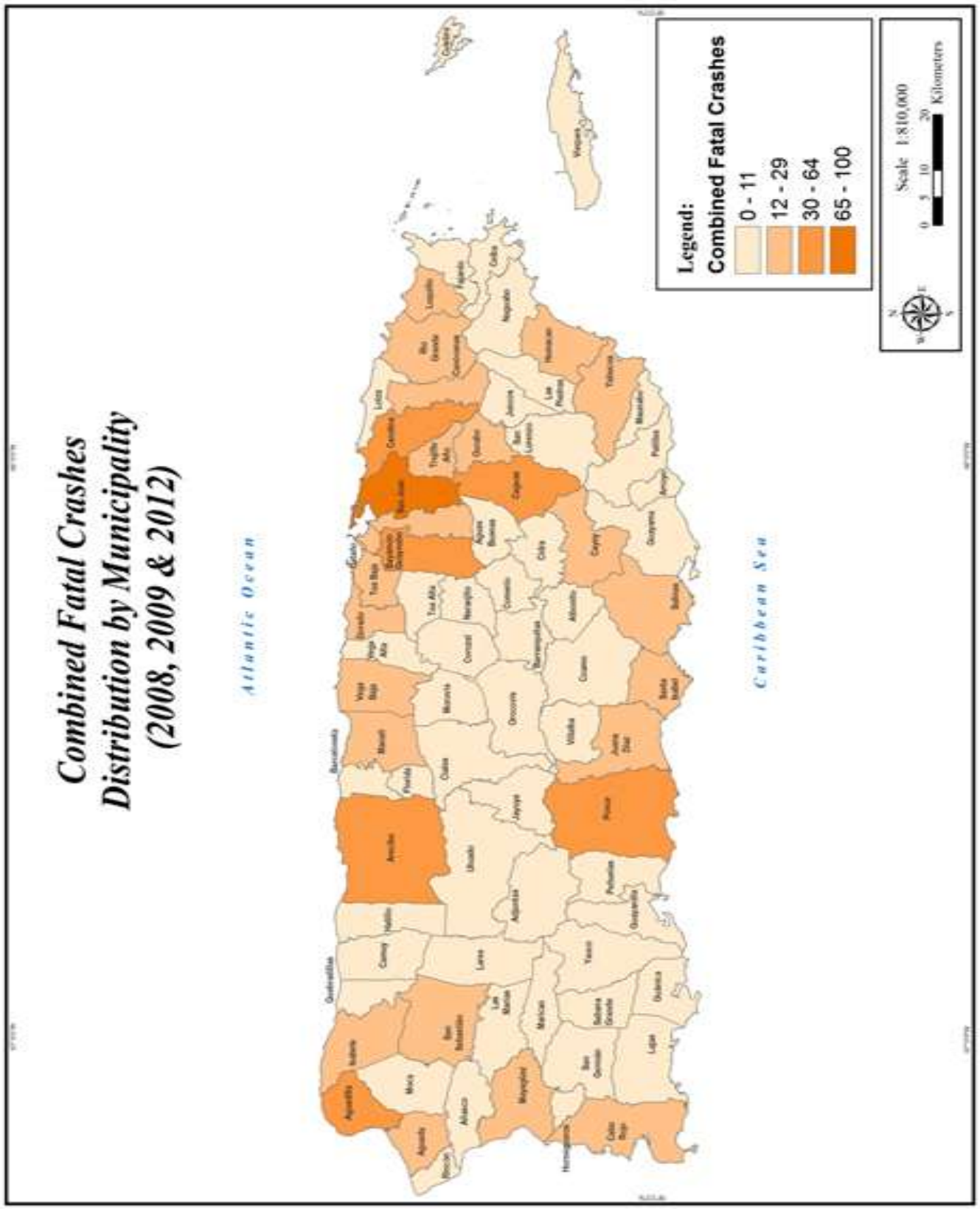


Figure 78:Comnined Fatal Crashes Distribution by Municipality

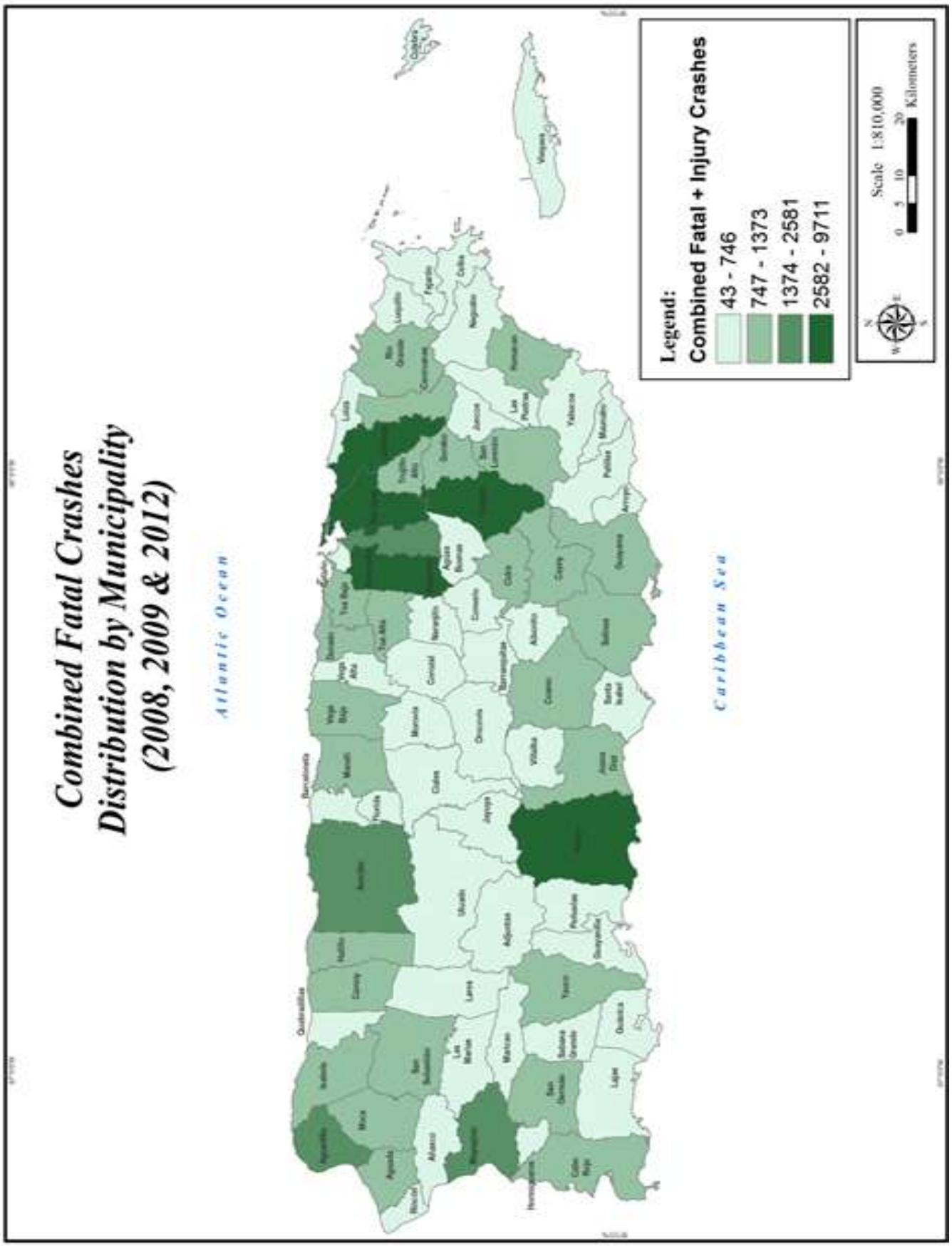


Figure 79: Combined Fatal + Injury Crashes Distribution by Municipality

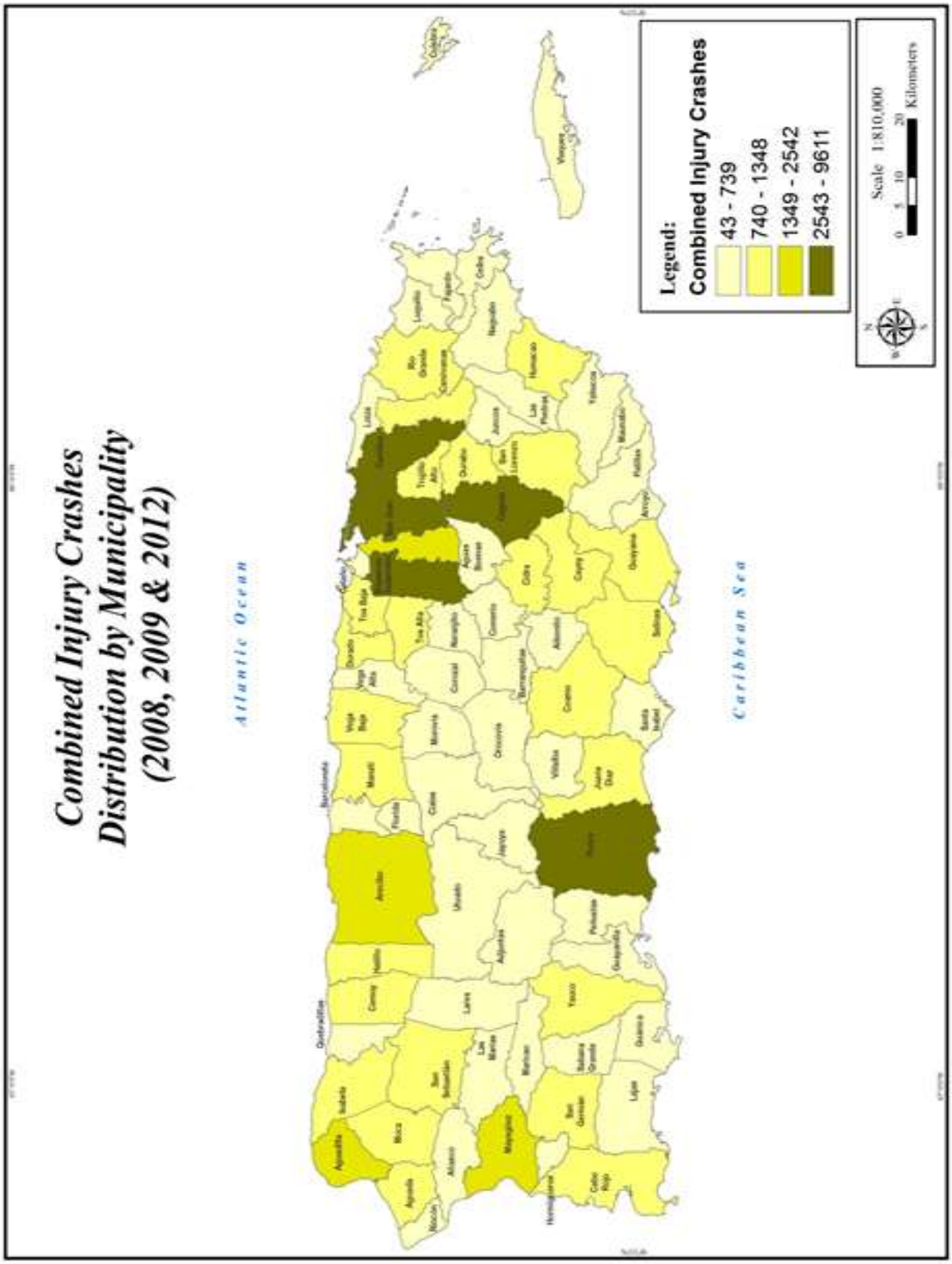


Figure 80: Combined Injury Crashes Distribution by Municipality