Analysis of Crashes in the Delaware Valley, 2010–2012

November 2014

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DELAWARE VALLEY
REGIONAL
PLANNING COMMISSION

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The symbol in our logo is adapted from the official DVRPC seal and is designed as a stylized image of the Delaware Valley. The outer ring symbolizes the region as a whole while the diagonal bar signifies the Delaware River. The two adjoining crescents represent the Commonwealth of Pennsylvania and the State of New Jersey.

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Executive Summary

An average of 380 people lost their lives in crashes on the roads of the Delaware Valley each year between 2010 and 2012. Over 44,000 people were injured each year.

Crashes, injuries, and fatalities hit a 10-year low in 2010. Unfortunately, 2011 showed an increase in fatalities and to a lesser extent crashes and injuries; and the trend continued in 2012. Though the increase could be characterized as modest, it is difficult to speak lightly about lives lost. This document presents the data and analysis findings in an effort to highlight specific areas of need to guide effective decision making to improve safety.

This memorandum is prepared before each update of the Delaware Valley Regional Planning Commission's (DVRPC) Transportation Safety Action Plan (TSAP). The current analysis will be used in the forthcoming *2014 Transportation Safety Action Plan*, using the same methodology employed in the previous plan, updated to reflect changes to definitions. The same seven emphasis areas were contributing factors in the most fatalities when analyzing 2010 to 2012 data as when 2008 to 2010 data was analyzed, although the order and number of fatalities changed slightly. In addition, an eighth emphasis area, Ensuring Young Driver Safety, was included. At the March 2014 meeting of the Regional Safety Task Force (RSTF) the group was presented with a regional data analysis of American Association of State Highway and Transportation Officials emphasis areas that considered injuries in addition to fatalities, which demonstrated the significance of young driver safety. The RSTF subsequently voted to add Ensuring Young Driver Safety as the eighth emphasis area for the 2014 TSAP update.

Based on 2010 to 2012 data, these eight safety emphasis areas were contributing factors for **over 97 percent** of the crashes that resulted in fatalities in the DVRPC region. Safety programs and improvements focused on just these eight areas would go a long way to improve traffic and travel safety in the Delaware Valley. The analysis revealed several concentration areas where targeted safety improvements and properly deployed programs could reduce the number of people being killed:

▶ Curb aggressive driving—a factor in almost half of the region's traffic fatalities. Focus on Chester, Bucks, and Montgomery counties. In Chester County, aggressive driving was a factor in more than 60 percent of fatalities.

▶ Intersection crashes were a factor in 28 percent of regional fatalities, and 43 percent in Philadelphia. The urban context presents many more intersections than non-urban locations, making intersection safety especially critical.

Intersection improvements should be designed to promote pedestrian safety, a significant issue both regionally and nationwide.

▶ Despite cultural shifts in recent decades, impaired driving remains a persistent problem—a factor in 26 percent of fatalities during the analysis period.

▶ Reducing roadway departure crashes will address approximately 37 percent of regional fatalities. Improvements in this emphasis area will be especially useful in Chester and Montgomery counties, where leaving the roadway was a factor in over 50 percent of crash fatalities.

Transportation Safety Overview

Numbers and Rates of Crashes

Fatal crashes are increasing after several years of decline.

Regionally, the numbers decreased from a high of 489 in 2007 to a low of 351 in 2010 but have been creeping back up ever since. Nationally, 40,000 to 43,000 fatalities occurred each year from 1994 to 2005, when they peaked at 43,510. Fatalities began declining in 2006 and hit a historical low of 32,367 in 2011 but rose to 33,561 in 2012, marking the first year without a decline since 2006. Regionally, the Delaware Valley experienced increases in 2011 and 2012, when it peaked at 402, though still well below the 2007 peak of 489. And in 2013 crash fatalities dropped to 362, near the 10-year low of 2010. Many factors may have influenced this recent trend, such as economic, environmental, and social, in addition to roadway safety improvements and enforcement and educational campaigns.

Figure 1: Lives Lost in Road Crashes in the Delaware Valley
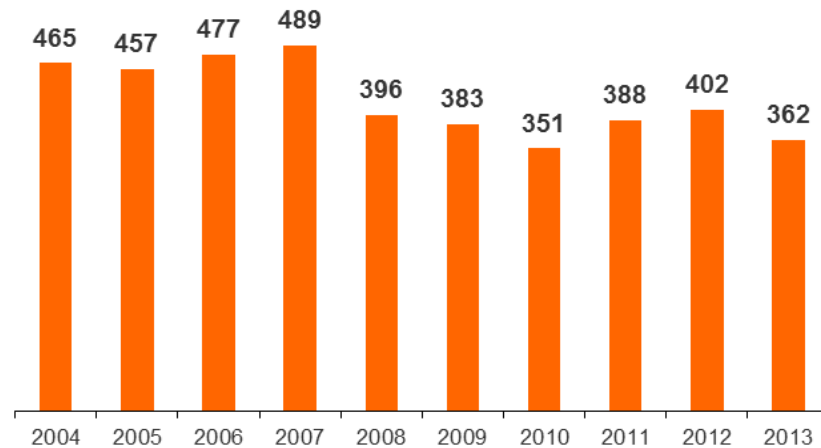
Source: NJDOT and PennDOT data.

The three basic concepts that help explain the tables in this document are:

▶ Data is reported in two ways: crash events and people involved in crashes. For example, Figure 1 uses the total number of fatalities (people killed), which is slightly higher than the number of total fatal crashes as shown in Table 1.

▶ The total number of crashes is the sum of all crashes—that is, those that resulted in injuries, fatalities, and property damage only—and all numbers are based on reportable crashes. In Pennsylvania, this is any crash that results in an injury (or death) and/or a vehicle being towed from the scene. In New Jersey the definition is any crash resulting in $500 or more of property damage independent of injury, as determined by the responding officer.

▶ Data can vary considerably from one year to the next, so it is more meaningful to consider three- or five-year averages. In this document, three-year averages are used.

Table 1: Average Crashes per Year in the Delaware Valley, 2010–2012

County	Crashes that caused:			People who were:	
	Injury	Fatality	Property Damage	Injured	Killed
Bucks	2,934	54	3,053	4,130	57
Chester	1,805	31	2,527	2,464	34
Delaware	2,355	23	2,120	3,384	27
Montgomery	4,151	38	4,156	5,767	41
Philadelphia	8,256	88	2,523	11,968	96
PA Counties Average	19,501	234	14,380	27,714	251
Burlington	3,121	42	9,724	4,376	44
Camden	4,189	35	10,724	5,897	38
Gloucester	1,854	24	5,629	2,585	25
Mercer	2,785	21	10,783	3,837	22
NJ Counties Average	11,950	122	36,859	16,696	129
Regional Average	31,451	356	51,239	44,410	380

Source: DVRPC.

There were about 83,000 crashes per year on average in the Delaware Valley between 2010 and 2012. Over 31,000 injury crashes per year resulted in over 44,000 people injured per year during the period. To put these numbers in context:

▶ The number of crashes in an average year is just less than the number of people in attendance at a typical Flyers game plus the crowd at a typical Eagles game (Lincoln Financial Field holds 68,532, and Wells Fargo Center holds 19,500). Imagine if each fan crashed on their way home from the game.

▶ The number of people who were injured in crashes in 2012 (44,421) is about equal to the number of people living in Middletown Township, Bucks County (45,436), as of the 2010 census.

Another way to evaluate safety data is by using crash rate. An example would be the number of crashes per hundred million vehicle miles traveled (VMT) in a county, allowing for uniform comparison among counties.

In the following figures, crash fatality rates were calculated based on the most recent data available at the time the analysis was done. Fatality rate by population was calculated using 2012 American Community Survey population estimates. Fatality rates by VMT and roadway miles were calculated using 2012 data, the most recent data available from the Pennsylvania Department of Transportation (PennDOT) and New Jersey Department of Transportation (NJDOT) at the time the analysis was completed.

Figure 2 shows how the crash rate per million VMT is changing over time, revealing a significantly different trend than was reported in both the 2009 and 2012 versions of this memorandum. The 2005–2007 data depicted an upward trend in the nine-county region, while 2007–2010 values showed a significant downward trend with 2010 marking the regional low point. In 2011 the trend changed direction for both the states and the region as a whole, with the five-county Pennsylvania average climbing the most. On balance, the uptick in the four-county New Jersey rate recorded in 2011 had ended with 2012 showing another decline.

Figure 2: Fatality Rate per Hundred Million Vehicle Miles Traveled
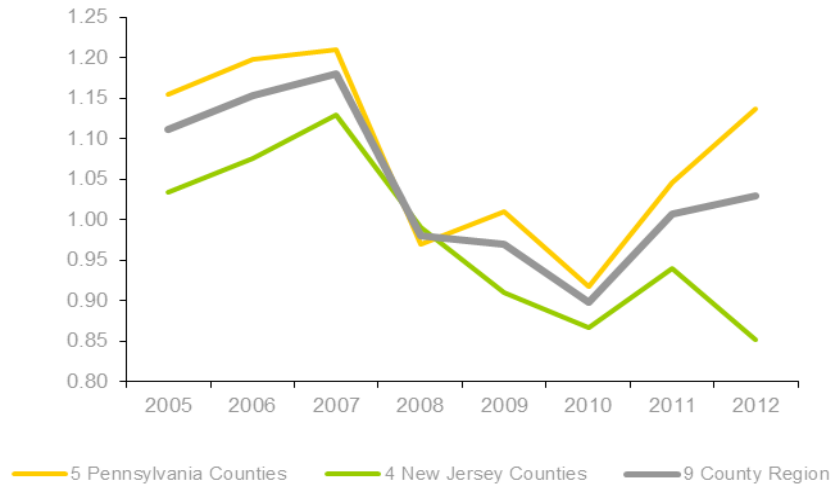
Source: Crash data from NJDOT and PennDOT analyzed in VMT Calculations_2014 update.xlsx.

Figure 3 displays variation in fatality rates by population. In the Delaware Valley, Burlington, Bucks, and Gloucester counties had significantly higher fatality rates than other counties in the region.

Figure 3: Fatality Rate by Population, 2012
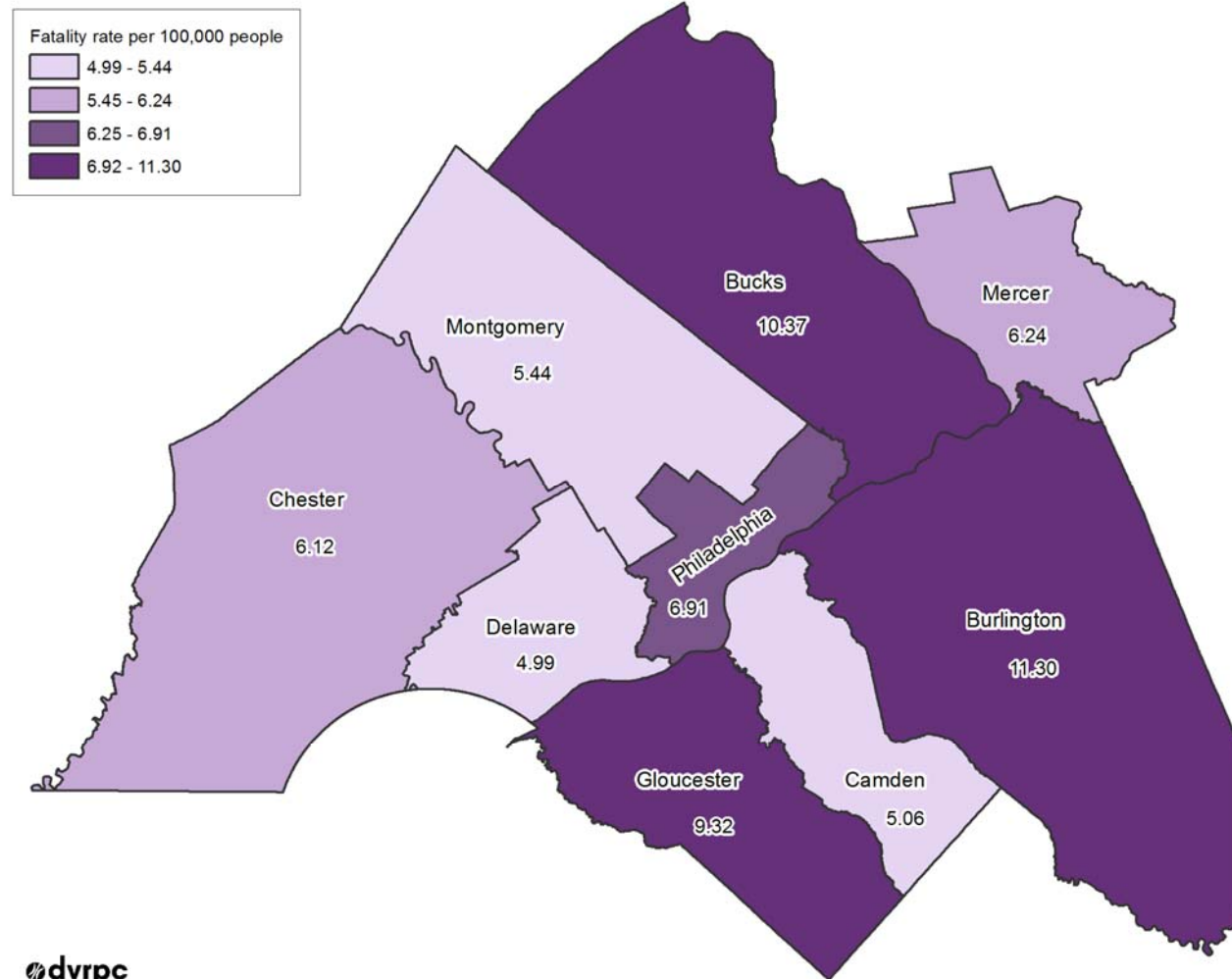
Source: DVRPC.

Figure 4 shows fatality rate per 100 miles of roadway, though it only takes into account state-owned roads. Philadelphia, in contrast to surrounding counties, owns most of its roads. As a result, the numbers for Philadelphia are skewed. The next highest is in Mercer County, and the lowest is Chester County at 2.9 fatalities per 100 miles of roadway.

Figure 4: Fatality Rate by Roadway Miles, 2012

Fatality rate per 100 miles of roadway*
- 2.90 - 5.70
- 5.71 - 6.81
- 6.82 - 14.23
- 14.24 - 28.40

Bucks 6.5
Mercer 14.1
Montgomery 5.1
Chester 2.9
Philadelphia 28.4
Delaware 6.0
Burlington 7.11
Gloucester 4.9
Camden 6.04

dvrpc *Does not include mileage on municipal roadways
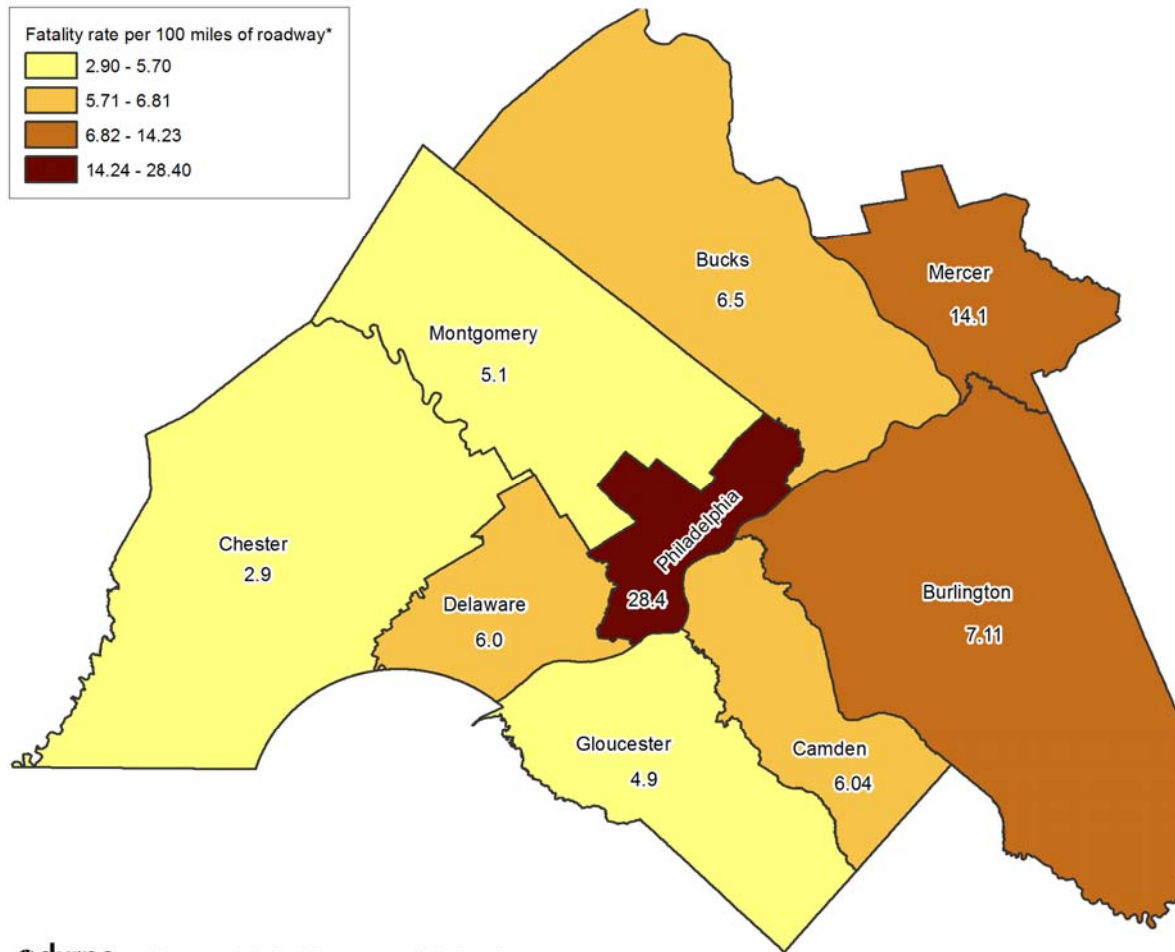
Source: DVRPC.

Figure 5 represents fatality rates by VMT. The highest rate is in Philadelphia, followed by Bucks County and Burlington County.

Figure 5: Fatality Rate by Vehicle Miles Traveled, 2012
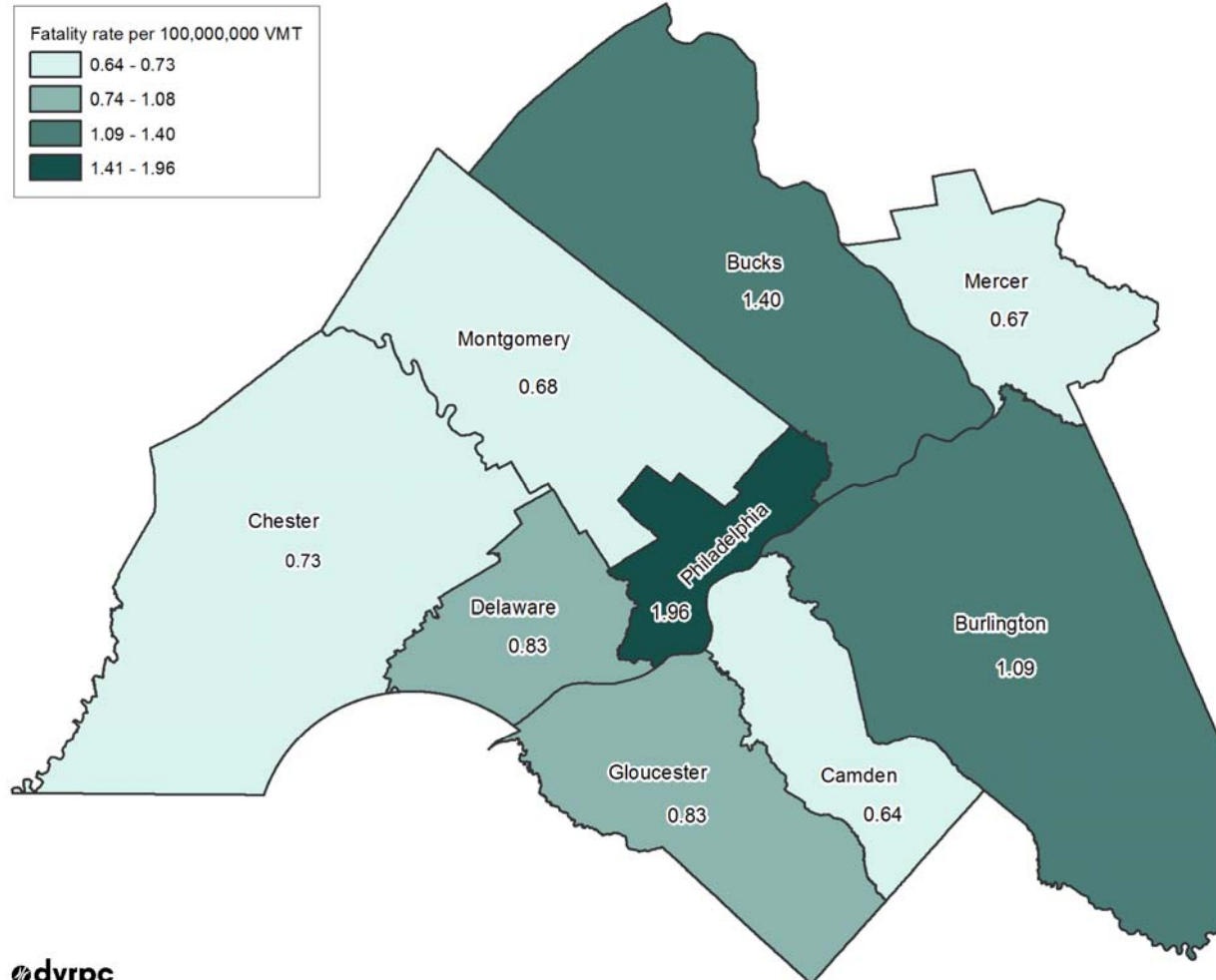
Source: DVRPC.

Drivers in Crashes

Most of the memorandum thus far has focused on fatalities: that is, all people killed in crashes. In this section, the focus shifts to drivers and specifically considers the age of drivers. In the *2014 Transportation Safety Action Plan* there will be a discussion of the special needs of younger drivers and of senior drivers, including strategies to improve safety for both age groups.

The crash summary information provided in this report does not indicate who is at fault in a crash but rather provides details regarding each incident and for each person involved. If multiple vehicles are involved, data on all drivers is reported, as well as pedestrians and bicyclists. In previous editions of DVRPC's safety action plan, younger driver data was not consistent between New Jersey and Pennsylvania. For the 2014 update, young drivers are defined as people age 16 to 20 for both states. Senior drivers are defined in both states as people age 65 or older.

Figure 6: Summary of Age Groups of Drivers in Crashes, 2010–2012

Other Age Groups, 67%
Older Drivers, 15%
Young Drivers, 18%
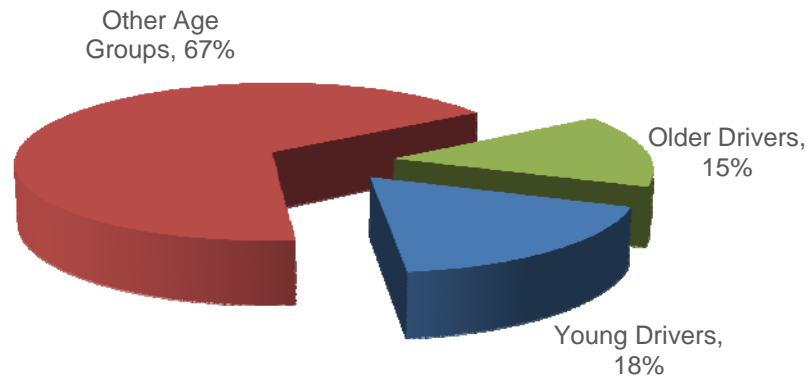
Source: DVRPC.

According to Figure 6, approximately 67 percent of crashes involve drivers whose ages fall between the younger and senior driver age groups. This highlights the fact that although these two groups are a relatively small share of the driver-age demographic, they represent a particularly vulnerable population. Further, the percentage of total crashes may seem comparatively low at a combined 33 percent for young and senior drivers, but the corresponding percentage of fatalities in context of the actual number of people driving in those age groups is what is important.

The U.S. Census Bureau's 2012 Statistical Abstract included crash statistics by age group for the year 2009 (most recent data available), which helps explain the relationship between crashes and age populations. For instance, in 2009 U.S. drivers aged 16 to 20 years old were 6.2 percent of licensed drivers but were involved in 13.8 percent of all crashes and 10.6 percent of all fatal crashes. Although licensed driver data by age was not available for the region, people aged 16 to 20 years old—potential young drivers— represented less than 9 percent[1] of the region's population (in the four New Jersey counties percentage of the population, and percentage of the population in the five Pennsylvania counties). However, young drivers were over-represented in crashes at 18 percent on average in the 2010–2012 analysis period (see Table 2). As noted previously, the data does not indicate if the young driver was at fault.

Table 2: Young Driver Crash Percentages by State in the Delaware Valley

Geography	Group of Drivers	Percentage of All Crashes in Region, 2010–2012
PA Counties	Young Drivers (16–20)	18%
NJ Counties	Young Drivers (16–20)	18%
Regional Total	Young Driver	18%

Source: DVRPC.

Considering senior drivers, just over 13 percent of the Delaware Valley's residents are 65 years of age or older—13.1 percent in New Jersey and 13.6 percent in Pennsylvania—though not necessarily licensed drivers. In the U.S. in 2009,[1] drivers 65 years of age or older represented 15.6 percent of licensed drivers. Despite being involved in a relatively low number of crashes (8.2 percent of all licensed drivers), they represented over 15 percent of all people killed, demonstrating that with age comes frailty. Further, as people age they may experience physical or cognitive changes that increase the risk of certain crash types. Not all seniors drive, and some do not even have a driver's license. Table 3

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[1] 2008–2012 American Community Survey Five-Year Average.

shows the percentage of crashes involving a senior driver is about the same in DVRPC's New Jersey counties as in the Pennsylvania counties, averaging 15 percent for the region as a whole.

Table 3: Senior Driver Crash Percentages by State in the Delaware Valley

Geography	Group of Drivers	Percentage of All Crashes in Region, 2010–2012
PA Counties	Senior Drivers (65+)	14%
NJ Counties	Senior Drivers (65+)	15%
Regional Total	Senior Driver (65+)	15%

Source: DVRPC.
Note: Licensed driver data only found at state level.

Both young drivers and senior drivers log similar, relatively low numbers of miles per year compared to drivers of other ages. At the national level, average annual miles per driver by age group for each of these two age groups is approximately half (56 percent) of the average miles driven per year by the other age segments of the driving public (Source: www.fhwa.dot.gov/ohim/onh00/bar8.htm). Data for this analysis was taken from the 2012 American Community Survey.

Roadway Type

This analysis highlights the importance of addressing safety on all roads. Crash rates can vary significantly by roadway type, such as an interstate highway, a state or county road, a local road or street, or private property such as a parking lot. Understanding how crashes vary by roadway type helps to determine where to invest effort and what type of strategies to use to reduce crashes. On the national level, the Federal Highway Administration (FHWA) reports that "rural roads account for approximately 40 percent of the vehicle miles traveled in the U.S., but almost 57 percent of fatalities" (Source: http://safety.fhwa.dot.gov/local_rural/).

Figure 7 shows a breakdown of crashes by road type for the region as a whole. There are many useful analyses possible as a result of the differentiation of road types, such as examining the miles of each type of road or severity of the crashes.

As shown in Figure 7, the crash distribution by road type shows a smaller percentage of crashes on interstate highways (7 percent) than on other road types. The highest percentage was recorded on state highways (40 percent).

It is important to note the differences in the classification of road types between Pennsylvania and New Jersey. In the DVRPC region, the Commonwealth of Pennsylvania owns and maintains much more of the roadway system than the State of New Jersey owns, both in total lane miles and by percentage, so more crashes occur on state-owned roads in Pennsylvania. In New Jersey, counties own and maintain more roadway facilities than their Pennsylvania counterparts, so more county-road crashes occur in New Jersey. This discrepancy is reflected in the regional split between roadway types.

Figure 7: Crashes by Type of Road in the Delaware Valley, 2010–2012
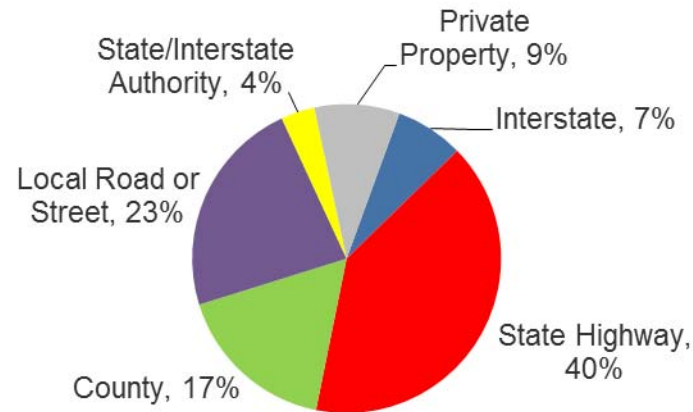
Source: DVRPC.

Collision Types

Collision type determinations help us understand how a crash occurred and may lead to understanding why. Considering collision types in a multi-year, corridor-wide, or intersection analysis can reveal crash trends that can be addressed with specific countermeasures. Figure 8 shows the distribution of crashes by collision type, accounting for all types included in the New Jersey and Pennsylvania police reporting forms combined.

The chart suggests that it would be effective to focus efforts on reducing rear-end crashes and angle crashes which frequently occur at intersections, and that efforts to reduce hit-fixed-object and pedestrian crashes would also be beneficial.

While this analysis is useful in considering how to reduce total crashes by collision type, not all types contribute equally to fatalities and injuries. For example, rear-end crashes, at 30 percent, were the most commonly reported between 2010 and 2012 but caused only 9 percent of the fatalities. On the other hand, hit-fixed-object crashes were 19 percent of total crashes but caused 33 percent of fatalities, the highest fatality concentration by collisions type. Angle crashes, at 23 percent, represent the second most common crash type, whereas pedestrian crashes at only 4 percent of the total account for 22 percent of fatalities, the second highest percentage of fatalities by collision type.

Figure 8: Crashes by Collision Type in the Delaware Valley, 2010–2012
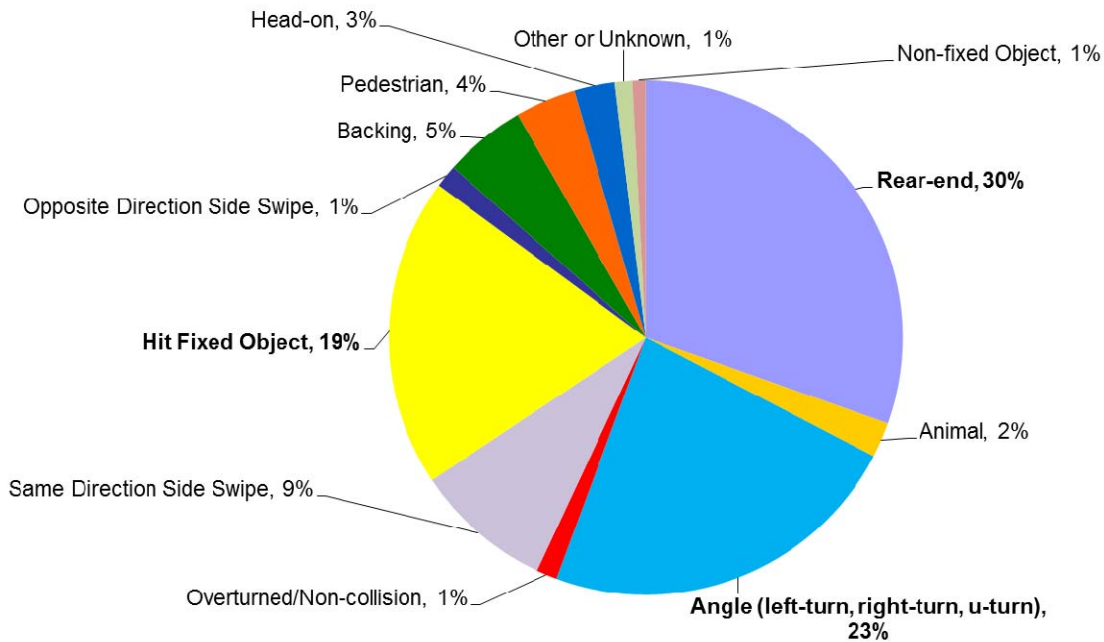
Source: DVRPC.

Additional Kinds of Analysis

This memorandum provides information about crashes by type of road and by types of crashes. These analyses are all steps toward making transportation safer. Safety planners and others interested in more in-depth analysis may request additional data from PennDOT and NJDOT.

DVRPC maintains a crash data management system that can be used to analyze crash data for various criteria, as well as for specific roads or intersections. The results can serve as a decision support tool when selecting project locations and identifying countermeasures. DVRPC's Data Navigator is an online tool that provides public access to crash summary information by county and municipality (http://www.dvrpc.org/asp/DataNavigator/default.aspx). Another DVRPC product that may be useful to those interested in working with crash data is the report *Using Crash Data to Improve Safety in the Delaware Valley* (DVRPC Publication #09020), available for free download here: http://www.dvrpc.org/asp/pubs/publicationabstract.asp?pub_id=09020.

The analysis covered so far has focused on drivers and passengers in vehicles, although fatality totals also include anyone else who may have been killed, including pedestrians and bicyclists. The *2014 Transportation Safety Action Plan* will also briefly address safety of transit passengers and bicyclists. The DVRPC safety program is coordinated with these other DVRPC offices: the Office of Transit, Bicycle and Pedestrian Planning, the Office of Freight and Aviation Planning, the Office of Transportation and Corridor Studies, and the Office of Transportation Operations Management. Data and analysis are shared with these offices for their projects. DVRPC also routinely supports the safety work of its municipal, county, and state partners, by sharing data and collaborating on projects.

Transportation Safety Emphasis Areas

Safety Emphasis Areas Overview

Concerted efforts in just eight emphasis areas could have a significant impact on reducing driving-related deaths in the Delaware Valley. The data-driven collaborative process used by DVRPC and its RSTF to select these emphasis areas employed the same methodology that was used in the previous three iterations of the data. It is interesting to note that the same seven emphasis areas highlighted previously again rose to the top in the analysis of the 2010–2012 data. However, after examining injury and fatality data for young drivers (16 to 20 years old), it was recommended that this emphasis area should be added. Thus the *2014 Transportation Safety Action Plan* will contain eight emphasis areas.

The appendices have additional background information, and the *2014 Transportation Safety Action Plan* will include the methodology and strategies for action.

Any one crash can have multiple contributing factors. For example, a crash in which a car driven by an intoxicated driver hit a pedestrian before the car hit a tree would be recorded with the emphasis areas of impaired driving, ensuring pedestrian safety, and reducing roadway departure crashes. Actions in one of these emphasis areas could reduce crashes in multiple areas. Urban locations like Philadelphia and Camden naturally have many more pedestrians than suburban and rural areas of the region; thus, pedestrian fatalities and injuries are likely to be higher. This holds true for all densely populated places in the region and exemplifies how highlighting emphasis area concentrations by county can lead to better targeting of improvement strategies for increased benefit.

Three questions were answered for each emphasis area, as follows:

▶ *How many fatalities were there from crashes for which that emphasis area was a contributing factor, by county?* Reducing fatalities is the federal focus and is reported on here; data for crashes and injuries by emphasis area is in Appendix B.

▶ *What percentage of all the fatalities from crashes in a county had a specific emphasis area as a contributing factor?* The answers to these two questions are presented in a single figure to assist the reader in drawing conclusions. The number of fatalities for which the given emphasis area was a contributing factor is shown as a bar for each county.

The dot above the county represents the percentage of all crash fatalities in that county to which the emphasis area was a contributing factor. A county might have relatively few fatalities in a given emphasis area compared to other counties, but the percentage of fatalities where that emphasis area was a contributing factor may be very high, identifying that emphasis area as an issue of concern for that county. What this tells us is that it would be effective to apply strategies in that county to address that emphasis area.

► *How are the numbers changing over time?* Eight years of data are provided in the accompanying tables for historical context.

Emphasis Area 1: Curb Aggressive Driving

Aggressive driving was a contributing factor in **48** percent of the annual traffic fatalities in the Delaware Valley, on average, for the period 2010 to 2012. **This is the most significant emphasis area to address to improve safety.**

The highest number of fatalities in which aggressive driving was a factor occurred in Philadelphia, where 51 people died per year on average from 2010 to 2012. In Chester County, 21 people died per year in crashes where aggressive driving was a factor, which was over 62 percent of all traffic fatalities in that county. This suggests that more focus on reducing aggressive driving might be especially effective in Chester County, as well as in Philadelphia. Pennsylvania and New Jersey are both interested in changing their definitions of aggressive driving to the National Highway Traffic Safety Administration definition; each state currently uses a different definition. See Appendix A for more information.

Figure 9: Importance of Curbing Aggressive Driving by County

Average Number of Fatalities in Which Aggressive Driving was a Factor, 2010-2012

Percent of All Road Fatalities in that County in which Aggressive Driving was a Factor
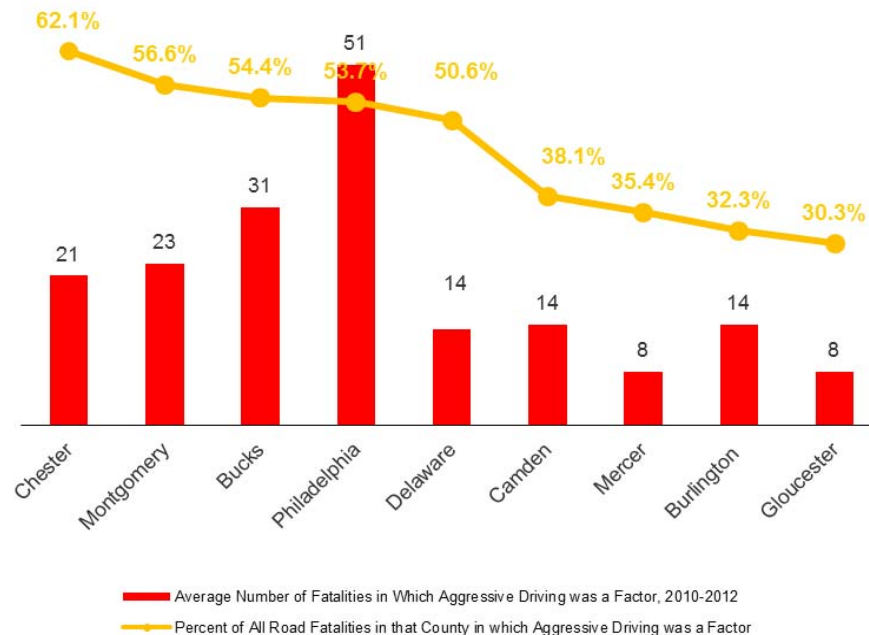
Aggressive driving is a combination of dangerous, deliberate, and hostile behaviors or actions by a motor vehicle operator that endanger others and disregard public safety, including: excessive speeding, frequent lane changes without signaling, following too closely, driving on shoulders to pass, and other reckless behaviors and actions.

See the *2014 Transportation Safety Action Plan* for the Delaware Valley for how to reduce aggressive driving.

Source: DVRPC.

Table 4 provides background about the changes over time in fatalities where aggressive driving was a contributing factor. Three-year averages were used in Figure 9 to account for annual variations. Also see "Numbers and Rates of Crashes" in Chapter 1 regarding characteristics of counties and the road network.

Table 4: Trend in Fatalities Where Aggressive Driving Was a Factor

County	2005	2006	2007	2008	2009	2010	2011	2012
Philadelphia	41	55	67	47	54	57	45	52
Bucks	49	44	43	32	41	23	33	37
Montgomery	28	34	31	29	21	23	25	21
Chester	36	35	33	25	23	20	25	19
Delaware	21	18	16	13	13	13	14	14
PA Counties	175	186	190	146	152	136	142	143
Burlington	13	21	28	16	15	11	17	15
Gloucester	12	16	23	12	7	3	11	9
Camden	17	21	21	14	18	14	21	8
Mercer	11	15	9	6	7	8	8	7
NJ Counties	53	73	81	48	47	36	57	39
Regional Total	228	259	271	194	199	172	199	182

Source: DVRPC.

Emphasis Area 2: Keep Vehicles on the Roadway and Minimize the Consequences of Leaving the Roadway

In more than a third (**38 percent**) of the crashes that resulted in fatalities, one or more vehicles left the roadway. This is the average annual number for the Delaware Valley for the period 2010 to 2012. The figure below depicts data for fatalities that resulted from vehicles leaving the roadway. A related emphasis area is minimizing the consequences of leaving the road. Combined, these two emphasis areas refer to many of the same crashes, but the strategies for each will be somewhat different in the *2014 Transportation Safety Action Plan*. Definition queries can be found in Appendix A.

The highest number of fatalities, per average year, in which a vehicle leaving the roadway was a factor, was in Philadelphia, which represents just less than a third of total fatalities in this county. Comparatively, in Chester County only 18 people died in such crashes but represented over 52 percent of total traffic fatalities in the county. As shown in Figure 10, both the total killed and the percentage of fatalities that involved a vehicle leaving the roadway was high in Montgomery and Bucks counties. Strategies that keep vehicles on the roadway would be useful in these counties also.

Figure 10: Importance of Reducing Roadway Departure Crashes by County

Average Number of Fatalities in Which Roadway Departure was a Factor, 2010-2012

Percent of All Road Fatalities in that County in which Roadway Departure was a Factor
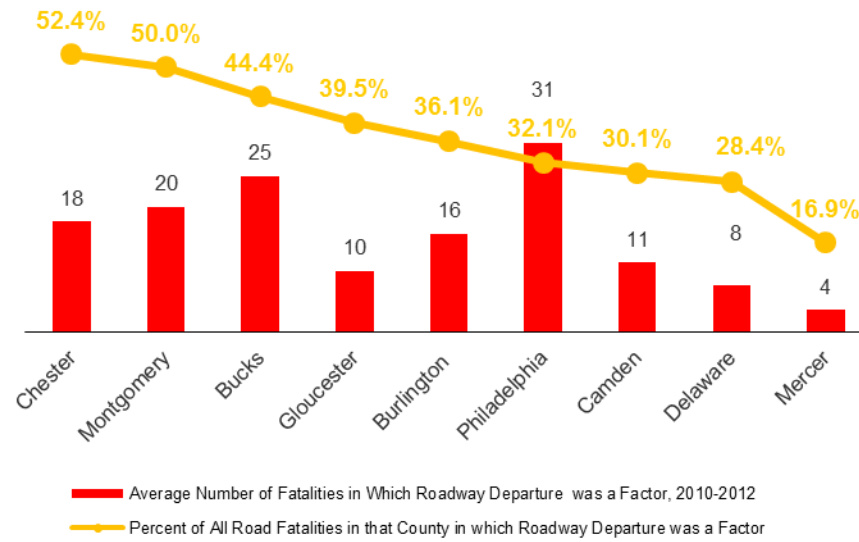
Source: DVRPC.

Keeping vehicles on the roadway helps reduce crashes in which vehicles hit fixed objects, overturn, and/or roll. Roadway departure crashes are often deadly.

See the *2014 Transportation Safety Action Plan* for the Delaware Valley for strategies to reduce roadway departure crashes.

Table 5 provides background about the changes over time in fatalities where vehicles leaving the roadway was a contributing factor. Figure 10 used three-year averages to account for annual variations. Also see "Numbers and Rates of Crashes" in Chapter 1 regarding characteristics of counties and the road network.

Table 5: Trend in Fatalities Where Vehicles Leaving the Roadway Was a Factor

County	2005	2006	2007	2008	2009	2010	2011	2012
Philadelphia	36	26	37	20	35	25	34	33
Bucks	35	29	34	25	22	16	27	33
Montgomery	27	34	29	26	23	19	21	21
Chester	22	20	27	16	8	19	17	18
Delaware	14	10	6	13	10	5	8	10
PA Counties	134	119	133	100	98	84	107	115
Burlington	17	24	23	17	14	13	21	14
Gloucester	7	10	24	12	12	8	10	12
Camden	5	11	10	10	14	17	11	6
Mercer	11	14	1	7	2	2	4	5
NJ Counties	40	59	58	46	42	40	46	37
Regional Total	174	178	191	146	140	124	153	152

Source: DVRPC.

Emphasis Area 3: Improve the Design and Operation of Intersections

Intersections were a contributing factor for **29** percent of the annual traffic fatalities in the Delaware Valley, on average, for the period 2010 to 2012. Note that these numbers include drivers, passengers, pedestrians, bicyclists, and others.

As shown in Figure 11, Philadelphia had both the highest total number and highest percentage of total fatalities where intersections were a contributing factor: 40 people died per year on average, accounting for approximately 43 percent of total crash fatalities in the county. It is especially productive to focus attention on improvements where both number and percentage of fatalities related to an emphasis area are high. The data indicates it would be effective for Philadelphia to continue to enhance efforts that improve the design and operation of intersections. It should be noted that Philadelphia has by far the highest number of intersections in the region and highest concentration of pedestrians. This suggests that intersection improvements should always account for safe pedestrian movements.

Figure 11: Importance of Making Intersections Safer by County

Average Number of Fatalities in which Intersections were a Factor, 2010-2012

Percent of All Road Fatalities in that County in which Intersections were a Factor
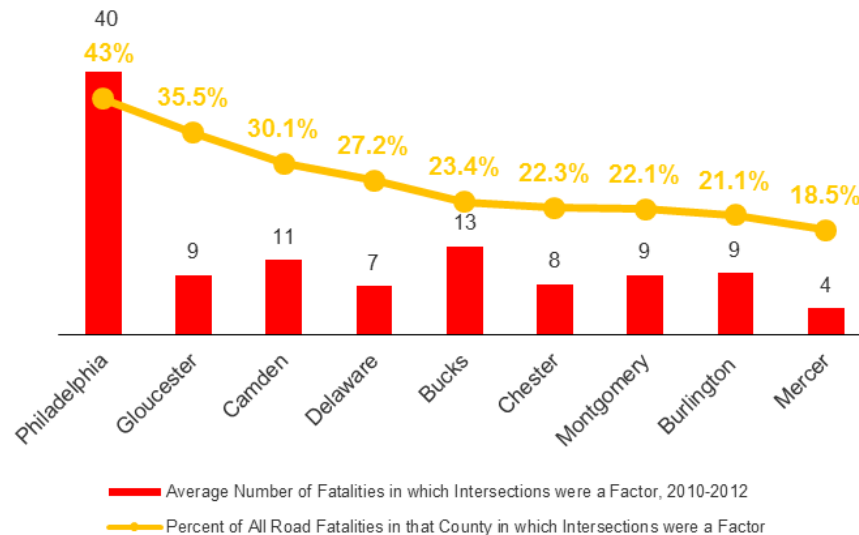
Improving the design and operation of intersections means reducing crashes at both signalized and unsignalized intersections. In locations with pedestrians and bicyclists, it is important to also address their need to cross intersections.

See the *2014 Transportation Safety Action Plan* for the Delaware Valley for strategies to improve intersection safety.

Source: DVRPC.

Table 6 provides background about the changes over time in fatalities where intersections were a contributing factor. Figure 11 used three-year averages to account for annual variations. Also see "Numbers and Rates of Crashes" in Chapter 1 regarding characteristics of counties and the road network.

Table 6: Trend in Fatalities at Intersections

County	2005	2006	2007	2008	2009	2010	2011	2012
Philadelphia	34	47	50	42	38	41	35	43
Montgomery	14	21	18	8	8	9	3	15
Bucks	23	29	14	18	18	10	16	14
Delaware	9	13	7	6	3	7	8	7
Chester	9	12	8	7	10	3	13	7
PA Counties	89	122	97	81	77	70	75	86
Gloucester	10	11	13	8	4	9	6	12
Burlington	12	2	12	12	11	6	12	10
Camden	7	7	10	15	8	11	16	7
Mercer	8	9	8	6	7	3	5	4
NJ Counties	37	29	43	41	30	29	39	33
Regional Total	126	151	140	122	107	99	114	119

Source: DVRPC.

Emphasis Area 4: Increase Seat Belt Usage

Not using seat belts was a contributing factor for **29** percent of the annual traffic fatalities in the Delaware Valley, on average, for the period 2010 to 2012. This counts crashes where any person in any involved vehicle was not wearing a seat belt.

Figure 12 shows that the highest total number of fatalities in which not using a seat belt was a factor occurred in Philadelphia, where 21 people died per year on average. This represented 22 percent of traffic fatalities in Philadelphia County. Montgomery and Bucks were next highest with 19 deaths each: 47 percent and 33 percent of overall traffic fatalities, respectively. In Chester County, however, the 17 seat-belt-related fatalities were almost 50 percent of total traffic fatalities in the county. This suggests that more focus on increasing seat belt usage might have a big effect in these four counties. Because of these percentages, Figure 12 identifies Chester and Montgomery as counties where strategies to increase seat belt use would be most effective.

Figure 12: Importance of Increasing Seat Belt Use by County

Average Number of Fatalities in which Seat Belt Usage was a Factor, 2010-2012

Percent of All Road Fatalities in that County in which Seat Belt Usage was a Factor
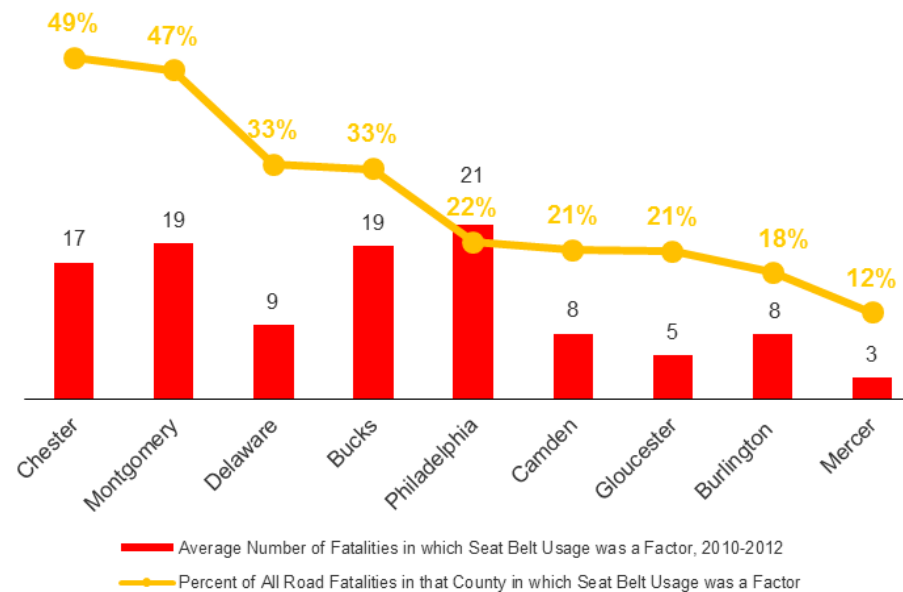
Source: DVRPC.

Increasing seat belt usage is highly effective for preventing crash fatalities. All occupants of a vehicle should wear seat belts. Children's safety equipment is often installed incorrectly and should be checked periodically.

See the *2014 Transportation Safety Action Plan* for the Delaware Valley for strategies to increase seat belt usage.

Table 7 provides background about the changes over time in fatalities for which not wearing a seat belt was a contributing factor. The highest number of crash fatalities in 2012 in which not using a seat belt was a contributing factor occurred in Bucks and Philadelphia counties in Pennsylvania, and Burlington County in New Jersey. Figure 12 used three-year averages to account for annual variations. Also see "Numbers and Rates of Crashes" in Chapter 1 regarding characteristics of counties and the road network.

Table 7: Trend in Fatalities Where Seat Belts Were Not Used

County	2005	2006	2007	2008	2009	2010	2011	2012
Philadelphia	21	18	26	18	14	19	21	24
Bucks	39	23	26	20	21	14	18	24
Montgomery	26	20	24	13	22	16	19	22
Chester	21	30	29	21	10	19	17	14
Delaware	13	15	13	10	5	7	10	10
PA Counties	120	106	118	82	72	75	85	94
Burlington	20	21	12	17	13	6	7	11
Gloucester	10	12	20	17	6	7	4	5
Camden	10	18	21	16	13	13	7	4
Mercer	12	12	16	7	6	4	1	3
NJ Counties	52	63	69	57	38	30	19	23
Regional Total	172	169	187	139	110	117	104	117

Source: DVRPC.

Emphasis Area 5: Reduce Impaired and Distracted Driving

Impaired driving, walking, or bicycling due to alcohol, substance abuse, or drowsiness was a contributing factor for **27** percent of the annual traffic fatalities in the Delaware Valley, on average, for the period 2010 to 2012. Distracted driving, walking, or bicycling, resulting from using a mobile device, is harder to record accurately when compared to other contributing factors. Although data related to distracted driving is not reflected in this analysis, it is discussed with impaired driving because several strategies are similar between the two emphasis areas, particularly regarding educational and enforcement efforts.

The highest number of fatalities in which impaired driving was a factor occurred in Philadelphia, where 22 people died per year on average, as shown in Figure 13. This represents only over 23 percent of Philadelphia County's total fatalities. The highest percentage of fatalities per county, 34 percent, occurred in Chester County. The data suggests that reducing impaired driving would be especially effective in Chester County, and very important in all Pennsylvania counties.

Figure 13: Importance of Reducing Impaired Driving by County

Legend:
- Average Number of Fatalities in Which Impaired Driving was a Factor, 2010-2012
- Percent of All Road Fatalities in that County in which Impaired Driving was a Factor
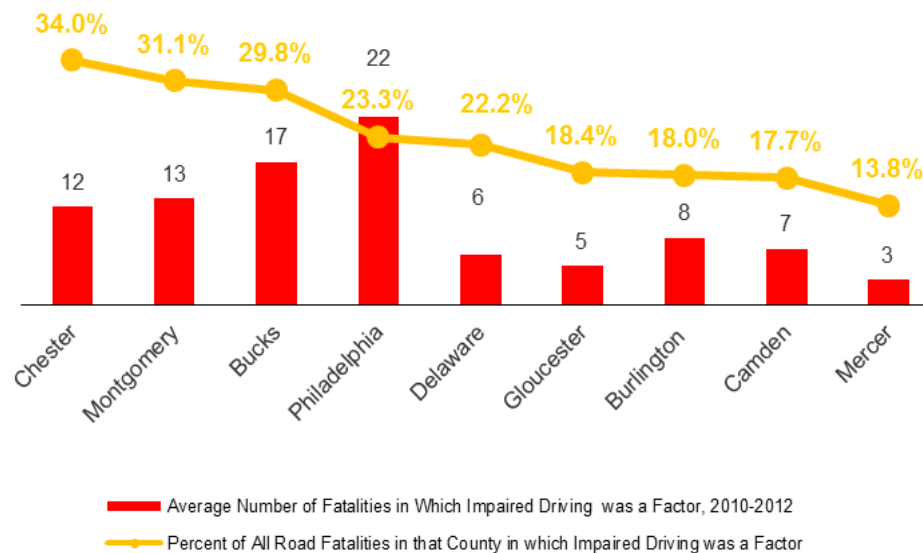
Impaired driving refers to driving under the influence of alcohol in this analysis. It also refers to driving while drug impaired or sleep deprived, but the data for these is less reliable and complete than alcohol-related crash data.

See the *2014 Transportation Safety Action Plan* for the Delaware Valley for strategies to reduce impaired and distracted driving.

Source: DVRPC.

Table 8 provides background about the changes over time in fatalities where impaired driving was a contributing factor. Three-year averages were used in Figure 13 to account for annual variations. Although the regional total has trended downward since the high of 157 in 2007, 2012 shows an increase back to the 2009 total of 107. Also see "Numbers and Rates of Crashes" in Chapter 1 regarding characteristics of counties and the road network.

Table 8: Trend in Fatalities Where Impaired Driving Was a Factor

County	2005	2006	2007	2008	2009	2010	2011	2012
Philadelphia	27	23	40	27	34	17	19	31
Bucks	23	27	24	18	21	12	18	21
Montgomery	16	23	23	14	17	9	11	18
Chester	16	20	25	20	8	12	11	12
Delaware	13	9	8	7	7	8	4	6
PA Counties	95	102	120	86	87	58	63	88
Burlington	9	9	7	8	5	6	6	12
Gloucester	2	6	4	4	1	5	5	4
Camden	10	6	14	10	10	12	6	2
Mercer	3	3	12	3	4	7	1	1
NJ Counties	24	24	37	25	20	30	18	19
Regional Total	119	126	157	111	107	99	81	107

Source: DVRPC.

Emphasis Area 6: Ensuring Pedestrian Safety

Crashes involving pedestrians were a contributing factor for **23** percent of the traffic fatalities per year in the Delaware Valley, on average, from 2010 to 2012. While the majority of people who died were pedestrians, these numbers include drivers, passengers, and others. Everyone is a pedestrian at some point during a trip, including walking to or from a car or transit stop. Pedestrian safety is especially important in the region because both New Jersey and Pennsylvania are designated Pedestrian Safety Focus States by the FHWA. Safety for bicyclists is a related concern, though bicyclist safety was not a key emphasis area based on the data analysis. The *2014 Transportation Safety Action Plan* will provide strategies primarily for pedestrian safety but also include strategies that benefit bicyclists.

The highest number of fatalities that involved pedestrians occurred in Philadelphia, where 32 people died per year on average, contributing to over 33 percent of the city's crash fatalities (Figure 14). It is especially productive to focus attention on improvements in counties where an emphasis area is high in both number of fatalities and percentage. Note that Philadelphia has by far the highest level of pedestrian activity of any of the nine counties in the region.

Figure 14: Importance of Ensuring Pedestrian Safety by County

Legend:
- Average Number of Fatalities in which Pedestrians were Included, 2010-2012
- Percent of All Road Fatalities in that County in which Pedestrians Were Included
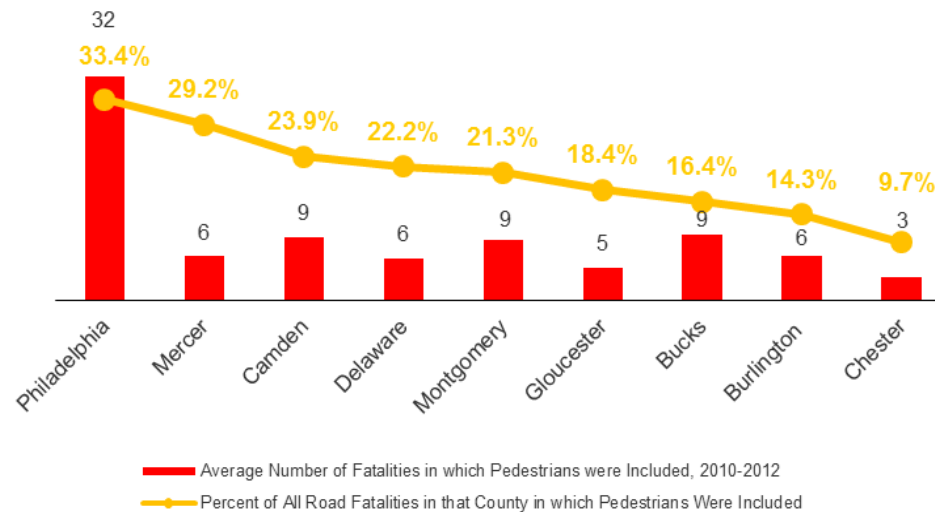
Ensuring pedestrian safety involves improving the design and availability of pedestrian facilities on and near roadways, as well as increasing awareness of the risks and responsibilities both drivers and pedestrians must consider during their interactions.

See the *2014 Transportation Safety Action Plan* for the Delaware Valley for strategies to improve pedestrian safety.

Source: DVRPC.

Table 9 provides background about the changes over time in fatalities where people walking or crossing streets was a contributing factor. Looking at both states, the highest number of crash fatalities in which people walking or crossing streets was a contributing factor in 2012 occurred in Philadelphia. The other Pennsylvania counties, and also the New Jersey counties, had much lower totals. The fewest deaths overall occurred in Chester County. Figure 14 used three-year averages to account for annual variations. Also see "Numbers and Rates of Crashes" in Chapter 1 regarding characteristics of counties and the road network.

Table 9: Trend in Fatalities Involving Pedestrians

County	2005	2006	2007	2008	2009	2010	2011	2012
Philadelphia	31	37	36	33	33	30	32	34
Montgomery	5	5	9	5	8	3	12	11
Bucks	10	13	9	9	15	8	10	10
Delaware	7	8	2	3	6	4	4	10
Chester	3	4	7	2	2	1	7	2
PA Counties	56	67	63	52	64	46	65	67
Burlington	13	6	12	12	7	5	3	11
Mercer	8	6	3	4	9	3	7	9
Camden	5	9	11	13	9	10	10	7
Gloucester	6	8	4	4	3	8	1	5
NJ Counties	32	29	30	33	28	26	21	32
Regional Total	88	96	93	85	92	72	86	99

Source: DVRPC.

Emphasis Area 7: Sustain Safe Senior Mobility

Drivers 65 years of age and older were involved in crashes that led to **18** percent of traffic fatalities per year in the Delaware Valley, on average, for the period 2010 to 2012. This number does not indicate whether the senior driver was at fault or was killed, but more specifically when a senior driver was involved in a crash. People aged 65 or older make up about 13.5 percent of the total population of the Delaware Valley (Source: American Community Survey, 2009). Data for licensed drivers by age is not available by county. Senior driver data was also discussed further in Chapter 1.

As shown in Figure 15, the highest number of fatalities in crashes involving a senior driver per average year occurred in Burlington County, where the 13 fatalities were over 28 percent of the total traffic fatalities. The number and percentage of fatalities were both relatively high in Bucks County, with 12 fatalities equaling 20.5 percent of their total fatalities. The second highest percentage of fatalities, 22.2 percent (six fatalities) was in Delaware County. More focus on improving senior mobility might be especially effective in these counties.

Figure 15: Importance of Sustaining Safe Senior Mobility by County

Average Number of Fatalities in which Safe Senior Mobility was a Factor, 2010-2012

Percent of All Road Fatalities in that County in which Safe Senior Mobility was a Factor
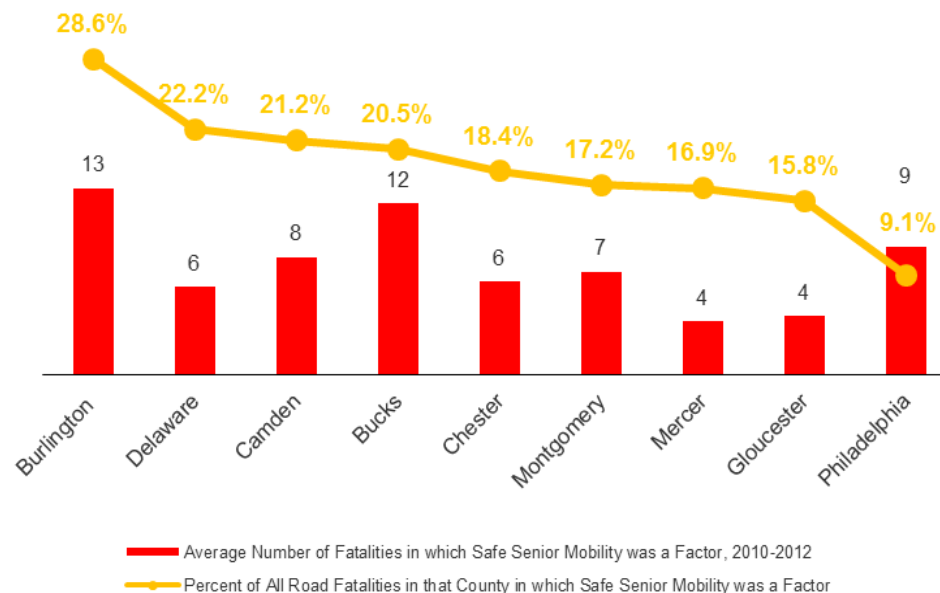
Source: DVRPC.

Sustaining safe senior mobility includes recognizing that although many older drivers are still capable, aging may have negative effects on the safe driving abilities of some seniors. It is important to address the range of mobility alternatives in addition to driver safety issues of seniors.

See the *2014 Transportation Safety Action* Plan for the Delaware Valley for strategies to sustain safe senior mobility.

Table 10 provides background about the changes over time in crash fatalities involving a drivers aged 65 and older. Looking at both states, the highest number of crash fatalities involving a senior driver in 2012 occurred in Bucks and Burlington counties. Delaware County showed a sharp decrease in these crashes in 2012 compared to the previous two years though not compared to years before. In 2012 Camden County also showed a sharp decrease from 2011. Figure 15 used three-year averages to account for annual variations. Also see "Numbers and Rates of Crashes" in Chapter 1 regarding characteristics of counties and the road network.

Table 10: Trend in Crash Fatalities for Drivers Aged 65 and Over

County	2005	2006	2007	2008	2009	2010	2011	2012
Bucks	19	13	11	5	21	12	11	12
Philadelphia	17	10	15	6	8	10	8	8
Montgomery	13	6	7	6	9	7	7	7
Chester	11	5	9	7	6	6	6	7
Delaware	6	10	7	3	2	9	6	3
PA Counties	66	44	49	27	46	44	38	37
Burlington	2	7	8	7	18	8	16	14
Mercer	6	6	12	3	8	1	6	4
Camden	4	5	7	10	11	8	13	3
Gloucester	7	11	9	4	5	3	7	2
NJ Counties	19	29	36	24	42	20	42	23
Regional Total	85	73	85	51	88	64	80	60

Source: DVRPC.

Emphasis Area 8: Ensuring Young Driver Safety

Drivers aged 16 to 20 years were involved in crashes that led to **14** percent of traffic fatalities per year in the Delaware Valley, on average, for the period 2010 to 2012. This number does not indicate that the young driver was at fault or was killed. As with each emphasis area, these fatalities include people of all ages. According to the American Community Survey (2009), people 16 to 20 years of age are almost 9 percent of the total population of the Delaware Valley. Data for licensed drivers by age is not available by county. Teen driver data was discussed further in Chapter 1.

As shown in Figure 16, the highest number of fatalities in crashes involving a teen driver per average year occurred in Montgomery and Chester counties, accounting for 19 percent of each county's total traffic fatalities. The percentage of young driver fatalities was comparatively high in Burlington County (17 percent). More focus on improving outreach and strategies targeted to teens will be especially effective in these counties. Figure 16 shows Montgomery and Chester counties first to focus on effective improvements.

Figure 16: Importance of Ensuring Young Driver Safety by County

Legend:
- Average Number of Fatalities in which Young Driver Safety was a Factor, 2010-2012
- Percent of All Road Fatalities in that County in which Young Driver Safety was a Factor
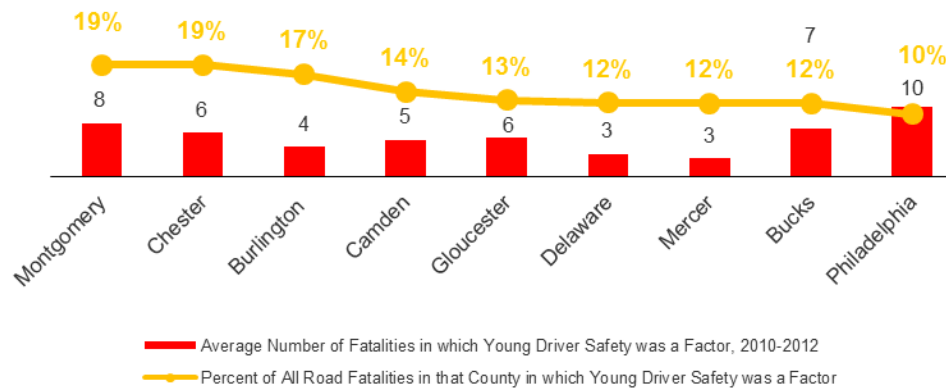
Source: DVRPC.

Ensuring Young Driver Safety means recognizing that although many younger drivers are capable, their relative lack of experience can have negative effects on safe driving. It is important to address the range of teen-specific alternatives in addition to driver safety issues of the general driving population.

See the *2014 Transportation Safety Action Plan* for the Delaware Valley for strategies to ensure young driver safety.

Table 11 shows the trends in fatalities in crashes where a young driver (aged 16 to 20) was involved. The most fatalities occurred in Philadelphia, Pennsylvania, and in Burlington County, New Jersey. These totals do not follow a consistent up or down trend, though the regional total was at its highest in 2006 with 90 and at its lowest in 2012 with 45. In recent years both sides of the river have been mostly trending downward.

Table 11: Trend in Crash Fatalities Involving Young Drivers

County	2005	2006	2007	2008	2009	2010	2011	2012
Philadelphia	17	17	22	5	13	7	12	11
Bucks	15	11	11	9	8	8	4	9
Montgomery	6	9	7	7	7	7	11	5
Delaware	1	3	5	1	3	2	6	2
Chester	11	23	12	6	10	7	11	1
PA Counties	50	63	57	28	41	31	44	28
Camden	4	12	3	8	2	6	2	8
Burlington	2	3	12	10	8	8	4	5
Gloucester	7	5	4	7	3	5	5	3
Mercer	6	7	2	5	1	2	5	1
NJ Counties	19	27	21	30	14	21	16	17
Regional Total	69	90	78	58	55	52	60	45

Source: DVRPC.

Detailed Regional Analysis by Emphasis Areas

▶ List of AASHTO Emphasis Areas

▶ Regional Analysis by Emphasis Area, 2010–2012 Average

▶ How DVRPC Analyzed Emphasis Areas in Pennsylvania

▶ How DVRPC Analyzed Emphasis Areas in New Jersey

Detailed Regional Analysis by Emphasis Areas

The Delaware Valley Regional Planning Commission (DVRPC) started analysis for the *2014 Transportation Safety Action Plan* by reviewing the previous analysis for the 2012 version. Each edition of the plan has been prepared in close coordination with the Regional Safety Task Force and especially with the safety staff of the Pennsylvania Department of Transportation (PennDOT) and New Jersey Department of Transportation (NJDOT). DVRPC staff continues to participate in the development of each state's Strategic Highway Safety Plan (SHSP), and in turn the states have coordinated closely with DVRPC in developing our bi-state plan; DVRPC strives to be consistent with each state's approach to the analysis.

Table A-1 lists the full range of American Association of State Highway and Transportation Officials (AASHTO) emphasis areas. Analysis of fatalities by these emphasis areas is the required starting point in developing an SHSP and is reflected in DVRPC's work. This analysis is summarized in Table A-2, which is sorted by number of fatalities in descending order. Some additional information on crashes and people injured is also included in this table. Tables A-3 and A-4 shift to a regional and sub-regional analysis that separate total crashes from those that caused injury and those that caused fatalities. Each analysis table covers all emphasis areas for which data is available. How each query was performed is covered in the remaining tables of Appendix A, Tables A-5 (Pennsylvania criteria) and A-6 (New Jersey criteria).

List of AASHTO Emphasis Areas

Table A-1: AASHTO Safety Emphasis Areas

AASHTO #	AASHTO Emphasis Area
1	Instituting Graduated Licensing for Young Drivers
2	Ensuring Drivers Are Fully Licensed and Competent
3	Sustaining Proficiency in Older Drivers
4	Curbing Aggressive Driving
5	Reducing Impaired Driving
6	Keeping Drivers Alert (Reduce Distracted Driving)
7	Increasing Driver Safety Awareness
8	Increasing Seat Belt Usage and Improving Air Bag Effectiveness
9	Making Walking and Street Crossing Safer
10	Ensuring Safer Bicycle Travel
11	Improving Motorcycle Safety and Increasing Motorcycle Awareness
12	Making Truck Travel Safer
13	Increasing Safety Enhancements in Vehicles
14	Reducing Vehicle–Train Crashes
15	Keeping Vehicles on the Roadway
16	Minimizing the Consequences of Leaving the Road
17	Improving the Design and Operation of Highway Intersections
18	Reducing Head-On and Across-Median Crashes
19	Designing Safer Work Zones
20	Enhancing Emergency Medical Capabilities to Increase Survivability
21	Improving Information and Decision Support Systems
22	Creating More Effective Processes and Safety Management Systems

Source: *AASHTO Strategic Highway Safety Plan* (AASHTO; Washington DC, 2004), http://safety.transportation.org/plan.aspx.

Regional Analysis by Emphasis Area, 2010–2012 Average

Table A-2: Comparison of Emphasis Area Order by Safety Action Plan and People Killed, 2010–2012 Average

AASHTO #	Emphasis Area	Crashes	People Who Were:		Order in 2009 Safety Action Plan	Order in 2011 Safety Action Plan	Order in 2014 Safety Action Plan
			Injured	Killed*			
4	Curb Aggressive Driving	34,485	22,999	**184**	1	1	1
15	Keep Vehicles on the Roadway	13,102	7,106	**143**	3	2	2
16	Minimize Consequences of Leaving Roadway	15,295	6,626	**126**	3	2	2
17	Improve Design/Operation of Intersections	26,367	20,039	**111**	6	3	3
8	Increase Seat Belt Use/Air Bag Effectiveness	4,848	5,284	**109**	5	5	4
5	Reduce Impaired Driving	4,493	3,049	**104**	2	4	5
9	Make Walking/Street Crossing Easier	3,026	3,050	**86**	7	6	6
3	Sustain Proficiency in Older Drivers	12,098	7,171	**68**	4	7	7
11	Improve Motorcycle Safety	1,416	1,382	**60**			
6	Keep Drivers Alert (Distracted Driving)	27,811	11,425	**57**	2	4	5
1	Institute a Graduated Driver's License	14,638	8,028	**52**			8
12	Make Truck Travel Safer	4,667	1,782	**36**			
18	Reduce Head-On/Across-Median Crashes	2,113	2,143	**28**			
19	Design Safer Work Zones	2,099	876	**11**			
10	Ensure Safer Bicycle Travel	1,081	1,036	**9**			
2	Ensure Drivers Licensed/Competent	1,348	894	**5**			

Source: DVRPC.
Note: *This table is sorted by total fatalities, which was the starting point for selecting emphasis areas. This table includes only emphasis areas for which data is available for both states. In the last two columns, if three emphasis areas have the same number, it is because they were addressed together.

Table A-3: Regional Crash Severity by Emphasis Area, 2010–2012 Average

AASHTO #	Emphasis Area	Crashes	Crashes that Caused:		% of Crashes that Caused Injuries	% of Crashes that Caused Fatalities
			Injury	Fatality		
4	Curb Aggressive Driving	34,485	15,394	167	45%	0.5%
15	Keep Vehicles on the Roadway	13,102	5,594	133	43%	1.0%
16	Minimize Consequences of Leaving Roadway	15,295	5,410	117	35%	0.8%
17	Improve Design/Operation of Intersections	26,367	13,564	102	51%	0.4%
8	Increase Seat Belt Use/Air Bag Effectiveness	4,848	3,243	96	67%	2.0%
5	Reduce Impaired Driving	4,493	2,155	94	48%	2.1%
9	Make Walking/Street Crossing Easier	3,026	2,840	85	94%	2.8%
3	Sustain Proficiency in Older Drivers	12,098	4,852	65	40%	0.5%
11	Improve Motorcycle Safety	1,416	1,203	57	85%	4.0%
6	Keep Drivers Alert (Distracted Driving)	27,811	8,106	54	29%	0.2%
1	Institute a Graduated Driver's License	14,638	5,333	44	36%	0.3%
12	Make Truck Travel Safer	4,667	1,259	33	27%	0.7%
18	Reduce Head-On/Across-Median Crashes	2,114	1,241	23	59%	1.1%
19	Design Safer Work Zones	2,099	609	10	29%	0.5%
10	Ensure Safer Bicycle Travel	1,081	1,008	8	93%	0.8%
2	Ensure Drivers Licensed/Competent	1,348	567	5	42%	0.4%
14	Reduce Vehicle–Train Crashes	39	33	0	85%	0.0%

Source: DVRPC.
Note: The third possible outcome of a crash is Property Damage Only, which means no person was injured or killed. This least-severe outcome is not shown in the table.

Table A-4: Crash Severity by State by Emphasis Area, 2010–2012 Average

AASHTO #	Emphasis Area	Pennsylvania					New Jersey				
		Crashes	Crashes that caused:		% of Crashes that Caused Injuries	% of Crashes that Caused Fatalities	Crashes	Crashes that caused:		% of Crashes that Caused Injuries	% of Crashes that Caused Fatalities
			Injury	Fatality				Injury	Fatality		
1	Institute a Graduated Driver's License	5,995	3,024	29	50%	0.5%	8,643	2,309	16	27%	0.2%
2	Ensure Drivers Licensed/Competent	415	247	3	59%	0.6%	933	321	2	34%	0.3%
3	Sustain Proficiency in Older Drivers	4,733	2,888	39	61%	0.8%	7,365	1,964	26	27%	0.4%
4	Curb Aggressive Driving	19,305	10,747	126	56%	0.7%	15,180	4,647	40	31%	0.3%
5	Reduce Impaired Driving	2,669	1,420	73	53%	2.7%	1,824	735	21	40%	1.1%
6	Keep Drivers Alert (Distracted Driving)	3,806	2,004	11	53%	0.3%	24,005	6,102	42	25%	0.2%
7	Increase Driver Safety Awareness										
8	Increase Seat Belt Use/Air Bag Effectiveness	3,783	2,712	74	72%	2%	1,064	532	22	50%	2.1%
9	Make Walking/Street Crossing Easier	2,320	2,257	58	97%	3%	706	583	27	83%	3.8%
10	Ensure Safer Bicycle Travel	717	552	5	77%	0.74%	364	298	3	82%	0.8%
11	Improve Motorcycle Safety	907	821	43	90%	5%	509	382	14	75%	2.8%
12	Make Truck Travel Safer	1,293	676	17	52%	1.31%	3,374	582	16	17%	0.5%

AASHTO #	Emphasis Area	Pennsylvania					New Jersey				
		Crashes	Crashes that caused:		% of Crashes that Caused Injuries	% of Crashes that Caused Fatalities	Crashes	Crashes that caused:		% of Crashes that Caused Injuries	% of Crashes that Caused Fatalities
			Injury	Fatality				Injury	Fatality		
13	Increase Safety Enhancements in Vehicles										
14	Reducing Vehicle–Train Crashes	39	33	0	85%	0%					
15	Keep Vehicles on the Roadway	8,550	3,720	94	45%	1%	3,897	1,487	39	38%	1.0%
16	Minimize Consequences of Leaving Roadway	8,746	3,272	752	37%	9%	7,266	1,910	35	26%	0.5%
17	Improve Design/Operation of Intersections	15,732	9,910	71	63%	0.45%	10,635	3,654	32	34%	0.3%
18	Reduce Head-On Crashes/Across-Median Crashes	2,963	1,931	44	65%	1%	901	409	12	45%	1.3%
19	Design Safer Work Zones	398	204	4	51%	1%	1,701	404	6	24%	0.3%
20	Enhance EMS to Increase Survivability										
21	Improve Data/Decision Support Systems										
22	Create More Effective Processes/Safety Management Systems										

Source: DVRPC.
Note: This table includes only emphasis areas for which data is available for both states.

How DVRPC Analyzed Emphasis Areas in Pennsylvania

Table A-5: Query Formats for Pennsylvania Crash Data

AASHTO #	Emphasis Area	Criteria	Pennsylvania Database Query	Notes
1	Instituting Graduated Licensing for Young Drivers	Drivers Aged 16–17	(FLAG.DRIVER_16YR=1 OR FLAG.DRIVER_17YR=1)	
1	Instituting Graduated Licensing for Young Drivers	Driver Aged 16–20	Person. Age between 16 and 20 and Person.PersonType = "driver" and Vehicle. VEH_TYPE <> 20 or 21	Query out all drivers who are aged between 16 and 20; exclude drivers who are driving a Bicycle or Pedalcycle.
2	Ensuring Drivers Are Fully Licensed and Competent	Unlicensed Driver	FLAG.UNLICENSED=1	
3	Sustaining Proficiency in Older Drivers	Drivers Aged >65	(FLAG.DRIVER_65_74YR=1 OR FLAG.DRIVER_75_PLUS=1)	
4	Curbing Aggressive Driving	See notes following this table	FLAG.AGGRESSIVE DRIVING=1	
5	Reducing Impaired Driving	Impairment Due to Alcohol	FLAG.ALCOHOL_RELATED=1	
5	Reducing Impaired Driving	Drinking Driver Only	FLAG. DRINKING_DRIVER=1	Drinking Driver is a subset of Alcohol Related
6	Keeping Drivers Alert (Reduce Distracted Driving)	Driver Inattention	FLAG.DISTRACTED=1	
8	Increasing Seat Belt Use and Improving Air Bag Effectiveness	Unbelted	FLAG.UNBELTED=1	
9	Making Walking and Street Crossing Safer	Pedestrian	FLAG.PEDESTRIAN=1	
10	Ensuring Safer Bicycle Travel	Bicycle	FLAG.BICYCLE=1	
11	Improving Motorcycle Safety and Increasing Motorcycle Awareness	Motorcyclist	FLAG.MOTORCYCLE=1	
12	Making Truck Travel Safer	Heavy Truck Related	FLAG.HEY_TRUCK_RELATED =1	
14	Reducing Vehicle–Train Crashes	Train and Trolley Crashes	FLAG.TRAIN_TROLLEY=1	
15	Keeping Vehicles on the Roadway	Run Off Road	FLAG.SV_RUN_OFF_RD=1	

AASHTO #	Emphasis Area	Criteria	Pennsylvania Database Query	Notes
16	Minimizing the Consequences of Leaving the Road	Fixed Object	FLAG.HIT_FIXED_OBJECT=1	
		Overturn	FLAG.OVERTURNED=1	
17	Improving the Design and Operation of Highway Intersections	Crash at Intersection	FLAG.INTERSECTION=1	
18	Reducing Head-On and Across-Median Crashes	Head-On	CRASH.COLLISION_TYPE="2"	
		Across-Median Collision	FLAG.CROSS_MEDIAN=1	
		Head-On and Across-Median Collision	FLAG.CROSS_MEDIAN=1 Or CRASH.COLLISION_TYPE="2"	
19	Designing Safer Work Zones	Work Zone	FLAG.WORK_ZONE=1	

Source: AASHTO and PennDOT guidance and PennDOT crash data.

Note: Not all AASHTO emphasis areas are able to be queried in current databases.

The definition of aggressive driving that PennDOT has used for many years is a crash with any one of the contributing circumstances:
- making illegal U-turn;
- making improper or careless turn;
- turning from wrong lane;
- proceeding without clearance after stop;
- running stop sign;
- running red light
- failure to respond to Traffic Control Device (TCD);
- tailgating;
- sudden slowing or stopping;
- careless passing or lane change;
- passing in no-passing zone;
- making improper entrance to highway;
- making improper exit from highway;
- speeding;
- driving too fast for conditions; and
- driver fleeing police (police chase).

PennDOT also started calculating the newer National Highway Traffic Safety Administration (NHTSA) definition of *aggressive driving* in 2009. That definition is "the operation of a motor vehicle involving two or more moving violations as part of a single continuous sequence of driving acts, which is likely to endanger any person or property." This more stringent definition results in a much lower number.

How DVRPC Analyzed Emphasis Areas in New Jersey

Table A-6: Query Formats for New Jersey Crash Data

AASHTO #	Emphasis Area	Criteria	Criteria Details	New Jersey Database Criteria	Notes
1	Instituting Graduated Licensing for Young Drivers	Drivers Aged 16–20	Occupants.Position In/On vehicle = "01" and Age between 16 and 20	Flag.YOUNGDRIVER = Yes	Using age from Occupants table provides better data for young drivers.
2	Ensuring Drivers Are Fully Licensed and Competent	Unlicensed Driver or Suspended or Revoked License	Charge = 39:3-10 (unlicensed driver); 39:3-40 (suspended or revoked license)	Flag.UNLICENSED = Yes	
3	Sustaining Proficiency in Older Drivers	Drivers Aged 65+	Drivers.Driver DOB	Flag.OLDERDRIVER = Yes	Using DOB from Driver table has better data for older drivers.
4	Curbing Aggressive Driving	Aggressive Driving (unsafe speed, failed to obey traffic control device, failed to yield right of way to vehicle/pedestrian, improper passing, improper lane change, following too closely)	Contributing circumstance = unsafe speed, failed to obey traffic control device, failed to yield right of way to vehicle/pedestrian, improper passing, improper lane change, following too closely	Flag.AGGRESSIVE_DRIVING = Yes	Any one of these contributing circumstances. See further notes at end of table.
5	Reducing Impaired Driving	Impairment Due to Alcohol	Alcohol Involved Crash = yes	Flag.ALCOHOL_RELATED = Yes	
6	Keeping Drivers Alert (Reduce Distracted Driving)	Driver Inattention	Contributing circumstance = driver inattention	Flag.DRIVERINATTENTION = Yes	
7	Increasing Driver Safety Awareness	Increase Driver Safety Awareness	None		
8	Increasing Seat Belt Usage and Improving Air Bag Effectiveness	No Safety Equipment Used	Occupants.safety equipment used = none	Flag. NoSaftyEqpt= Yes	This query checks all occupants for seat belt use.
9	Making Walking and Street Crossing Easier	Pedestrian	Collision w/MV code = Pedestrian	Flag.PEDESTRIAN = Yes	
10	Ensuring Safer Bicycle Travel	Bicyclist (pedalcycle)	Collision w/MV code = Pedalcycle	Flag.BICYCLE = Yes	
11	Improving Motorcycle Safety and Increasing Motorcycle Awareness	Motorcyclist	Vehicle Type = Motor Cycle	Flag.MOTORCYCLE = Yes	

AASHTO #	Emphasis Area	Criteria	Criteria Details	New Jersey Database Criteria	Notes
12	Making Truck Travel Safer	Truck-Related	Vehicle type = truck/trailer, truck/trailer (bobtail), tractor/semi-trailer, tractor/doubles, tractor/triples, heavy truck other	Flag.TRUCK_RELATED = Yes	
13	Increasing Safety Enhancements in Vehicles	Increase Safety Enhancements in Vehicles	None		
14	Reducing Vehicle–Train Crashes[1]	Highway Rail incidents	Highway Rail Incidents		
		Trespasser Incidents	Trespasser Incidents		
15	Keeping Vehicles on the Roadway	Ran Off Road	Sequence of Events (1 = Ran off Road, or 1 = MV in Transport and 2 = Ran Off Road)	Flag.RUNOFFROAD = Yes	
16	Minimizing the Consequences of Leaving the Road	Hit-Fixed-Object	Collision w/MV code = Fixed Object	Flag.HIT_FIXED_OBJECT = Yes	
		Overturned	Collision w/MV code = Overturn	Flag.OVERTURNED = Yes	
17	Improving the Design and Operation of Highway Intersections	Crash at Intersection	Intersection = at intersection	Flag.INTERSECTION = Yes	
18	Reducing Head-On and Across-Median Crashes	Head-On Collision	Collision w/MV code = Head on	Flag.HEADON = Yes	.
19	Designing Safer Work Zones	Work Zone	TemporaryTrafficControlZone = Construction Zone, Maintenance Zone, Utility Zone, Incident Zone	Flag.WORKZONE = Yes	

Source: AASHTO and NJDOT guidance and NJDOT crash data.

Note: Not all AASHTO emphasis areas are able to be queried in current databases. NJDOT does some additional analysis beyond the AASHTO emphasis areas; they are marked N/A in the AASHTO number field.

NJDOT has been using a definition of *aggressive driving* that involves any one of the list of contributing circumstances. They are interested in shifting to the newer NHTSA definition, which is "the operation of a motor vehicle involving two or more moving violations as part of a single continuous sequence of driving acts, which is likely to endanger any person or property." This more stringent definition inherently results in a much lower number. Also, initial reviews indicate issues with the data for the second contributing circumstance as of 2010.

In original work between NJDOT and DVRPC on safety planning, the seat belt query was whether no safety equipment was used, meaning no seat belt or no air bag. This query was still used in the current analysis, but future editions will change to only whether no seat belt was used to be consistent with Pennsylvania and because increasing seat belt use is an actionable item. Coordination is underway with NJDOT to update this query.

Crashes and Injuries by Emphasis Area

▶ Crash and Injury Data for Eight Emphasis Areas

Crashes and Injuries by Emphasis Area

Fatalities are the saddest and most reported-upon result of crashes; however, it is also useful to analyze total crashes and number of people injured. Fatalities can be somewhat random, while the higher number of crashes may make this data a more reliable source for locations in need of improvement. Analysis of where people were injured helps filter out fender-benders, which are less important to reduce than injuries and fatalities. A closer look at injuries as a second criterion to fatalities is what led to the addition of Ensuring Young Driver Safety as the eighth emphasis area for this edition of the report. Note that five years of data are shown in the tables that follow to be consistent with the Pennsylvania Department of Transportation's standard analysis period. The New Jersey Department of Transportation more commonly uses three years.

Crash and Injury Data for Eight Emphasis Areas

Table B-1: Crashes and Injuries Where Aggressive Driving Was a Factor

County	Total Crashes					Total Injuries				
	2008	2009	2010	2011	2012	2008	2009	2010	2011	2012
Bucks	3,723	3,989	3,592	3,655	3,584	2,770	2,931	2,646	2,696	2,596
Chester	2,868	2,730	2,511	2,722	2,652	1,591	1,540	1,499	1,591	1,602
Delaware	2,695	2,535	2,533	2,671	2,649	2,031	1,871	1,996	2,063	2,082
Montgomery	5,113	5,121	5,059	5,081	5,125	3,488	3,659	3,686	3,754	3,682
Philadelphia	4,689	4,973	5,498	5,353	5,230	5,362	6,009	6,484	6,319	5,827
PA Counties	19,088	19,348	19,193	19,482	19,240	15,242	16,010	16,311	16,423	15,789
Burlington	3,463	3,729	3,799	3,748	3,606	1,521	1,650	1,728	1,603	1,665
Camden	5,389	5,840	5,378	5,530	5,399	2,624	2,726	2,471	2,695	2,569
Gloucester	2,570	2,805	2,603	2,454	2,144	1,284	1,384	1,224	1,162	1,021
Mercer	3,671	3,721	3,618	3,848	3,414	1,508	1,418	1,418	1,527	1,392
NJ Counties	15,093	16,095	15,398	15,580	14,563	6,937	7,178	6,841	6,987	6,647
Regional Total	34,181	35,443	34,591	35,062	33,803	22,179	23,188	23,152	23,410	22,436

Source: DVRPC.

Table B-2: Crashes and Injuries Where Leaving the Roadway Was a Factor

County	Total Crashes					Total Injuries				
	2008	2009	2010	2011	2012	2008	2009	2010	2011	2012
Bucks	2,196	2,201	1,895	2,028	1,822	1,155	1,100	931	985	935
Chester	2,003	1,857	1,643	1,773	1,656	910	808	747	787	787
Delaware	1,368	1,277	1,093	1,251	1,255	713	638	579	685	609
Montgomery	2,594	2,568	2,433	2,551	2,421	1,267	1,271	1,235	1,249	1,175
Philadelphia	1,941	1,874	1,864	1,966	1,963	1,498	1,446	1,524	1,534	1,489
PA Counties	10,102	9,777	8,928	9,569	9,117	5,543	5,263	5,016	5,240	4,995
Burlington	1,455	1,510	1,334	1,433	1,181	792	794	729	752	656
Camden	1,214	1,139	973	961	940	634	603	521	475	453
Gloucester	1,129	1,162	1,032	1,083	899	623	635	622	544	484
Mercer	617	689	656	582	617	287	294	288	261	283
NJ Counties	4,415	4,500	3,995	4,059	3,637	2,336	2,326	2,160	2,032	1,876
Regional Total	14,517	14,277	12,923	13,628	12,754	7,879	7,589	7,176	7,272	6,871

Source: DVRPC.

Table B-3: Crashes and Injuries at Intersections

County	Total Crashes					Total Injuries				
	2008	2009	2010	2011	2012	2008	2009	2010	2011	2012
Bucks	2,601	2,610	2,603	2,664	2,549	2,021	2,009	1,993	1,931	1,879
Chester	1,796	1,657	1,581	1,578	1,601	1,069	1,032	1,015	1,018	1,027
Delaware	2,063	1,918	1,980	2,163	2,197	1,672	1,645	1,695	1,737	1,777
Montgomery	3,553	3,528	3,558	3,658	3,727	2,688	2,687	2,682	2,804	2,863
Philadelphia	5,867	5,687	5,679	5,740	5,919	7,276	7,280	6,952	7,171	7,078
PA Counties	15,880	15,400	15,401	15,803	15,993	14,726	14,653	14,337	14,661	14,624
Burlington	2,376	2,325	2,654	2,252	2,129	1,231	1,339	1,432	1,181	1,213
Camden	3,738	3,368	3,317	3,113	2,970	2,109	1,926	1,846	1,952	1,905
Gloucester	1,709	1,938	1,969	1,725	1,568	1,004	1,057	982	859	857
Mercer	3,460	3,423	3,475	3,506	3,227	1,515	1,178	1,408	1,435	1,424
NJ Counties	11,283	11,054	11,415	10,596	9,894	5,859	5,500	5,668	5,427	5,399
Regional Total	27,163	26,454	26,816	26,399	25,887	20,585	20,153	20,005	20,088	20,023

Source: DVRPC.

Analysis of Crashes in the Delaware Valley, 2010–2012

Table B-4: Crashes and Injuries Where Seat Belts Were Not Used

County	Total Crashes					Total Injuries				
	2008	2009	2010	2011	2012	2008	2009	2010	2011	2012
Bucks	724	723	698	716	579	756	762	728	764	621
Chester	483	415	369	443	406	424	347	375	365	392
Delaware	557	505	598	538	566	580	530	660	582	611
Montgomery	831	833	801	839	889	895	910	889	938	946
Philadelphia	1,257	1,169	1,152	1,571	1,185	1,585	1,551	1,522	2,056	1,567
PA Counties	3,852	3,645	3,618	4,107	3,625	4,240	4,100	4,174	4,705	4,137
Burlington	331	309	320	259	266	238	254	292	224	234
Camden	498	448	364	367	349	428	421	341	387	326
Gloucester	214	216	209	179	152	193	197	185	152	118
Mercer	276	272	248	279	201	217	168	159	235	183
NJ Counties	1,319	1,245	1,141	1,084	968	3,084	3,049	2,987	3,009	2,873
Regional Total	5,171	4,890	4,759	5,191	4,593	7,324	7,149	7,161	7,714	7,010

Source: DVRPC.
Note: This data represents alcohol-related crashes only.

Table B-5: Crashes and Injuries Where Impaired Driving Was a Factor

County	Total Crashes					Total Injuries				
	2008	2009	2010	2011	2012	2008	2009	2010	2011	2012
Bucks	696	639	554	547	558	530	443	405	392	351
Chester	451	445	396	385	395	279	271	255	244	245
Delaware	375	387	331	392	390	278	314	251	257	266
Montgomery	750	943	677	660	679	495	684	439	439	447
Philadelphia	624	675	644	713	686	648	732	646	696	699
PA Counties	2,896	3,089	2,602	2,697	2,708	2,230	2,444	1,996	2,028	2,008
Burlington	571	516	538	503	491	298	276	330	323	249
Camden	790	689	662	691	617	451	410	392	402	329
Gloucester	394	358	313	339	309	207	203	176	188	182
Mercer	352	337	361	330	319	176	162	198	175	189
NJ Counties	2,107	1,900	1,874	1,863	1,736	1,132	1,051	1,096	1,088	949
Regional Total	5,003	4,989	4,476	4,560	4,444	3,362	3,495	3,092	3,116	2,957

Source: DVRPC.

Analysis of Crashes in the Delaware Valley, 2010−2012

Table B-6: Crashes and Injuries Involving Pedestrians

County	Total Crashes					Total Injuries				
	2008	2009	2010	2011	2012	2008	2009	2010	2011	2012
Bucks	115	119	119	117	121	117	124	116	120	122
Chester	66	56	67	67	53	70	59	70	61	54
Delaware	193	180	184	208	193	198	202	200	223	200
Montgomery	219	197	207	222	228	231	221	221	234	239
Philadelphia	1,773	1,743	1,713	1,724	1,738	1,840	1,833	1,801	1,807	1,807
PA Counties	2,366	2,295	2,290	2,338	2,333	2,456	2,439	2,408	2,445	615
Burlington	139	110	124	141	131	118	93	110	115	113
Camden	328	301	270	274	272	289	277	245	251	250
Gloucester	81	99	106	86	82	72	90	89	74	70
Mercer	170	195	215	218	199	145	151	184	164	164
NJ Counties	718	705	715	719	684	624	611	628	604	597
Regional Total	3,084	3,000	3,005	3,057	3,017	3,080	3,050	3,036	3,049	1,212

Source: DVRPC.

Table B-7: Crashes and Injuries Involving Drivers Aged 65 and Over

County	Total Crashes					Total Injuries				
	2008	2009	2010	2011	2012	2008	2009	2010	2011	2012
Bucks	914	968	964	1,023	964	779	815	778	848	788
Chester	570	557	588	631	568	385	355	400	461	441
Delaware	669	608	704	671	716	586	540	645	572	598
Montgomery	1,184	1,264	1,346	1,380	1,371	977	993	1,114	1,167	1,129
Philadelphia	1,004	990	1,099	1,044	1,131	1,198	1,232	1,284	1,261	1,307
PA Counties	4,341	4,387	4,701	4,749	4,750	3,925	3,935	4,221	4,309	4,263
Burlington	1,999	2,039	2,161	2,113	2,251	810	780	852	813	870
Camden	2,067	2,153	2,021	2,054	2,104	936	949	898	977	902
Gloucester	1,091	1,147	1,200	1,115	1,069	466	461	520	490	452
Mercer	1,801	1,881	1,905	2,103	1,999	672	625	618	676	653
NJ Counties	6,958	7,220	7,287	7,385	7,423	2,884	2,815	2,888	2,956	2,877
Regional Total	11,299	11,607	11,988	12,134	12,173	6,809	6,750	7,109	7,265	7,140

Source: DVRPC.

Analysis of Crashes in the Delaware Valley, 2010–2012

Table B-8: Crashes and Injuries Involving Young Drivers (16 to 20 years of age)

County	Total Crashes					Total Injuries				
	2008	2009	2010	2011	2012	2008	2009	2010	2011	2012
Bucks	1,650	1,692	1,446	1,409	1,272	1,203	1,195	934	983	914
Chester	1,316	1,138	1,059	1,096	1,023	718	662	582	649	606
Delaware	1,029	912	885	872	789	759	647	674	663	605
Montgomery	1,911	1,779	1,639	1,530	1,519	1,311	1,252	1,180	1,015	1,013
Philadelphia	1,422	1,323	1,254	1,105	1,087	1,640	1,671	1,516	1,312	1,203
PA Counties	7,328	6,844	6,283	6,012	5,690	5,631	5,427	4,886	4,622	4,341
Burlington	2,610	2,528	2,543	2,334	2,143	1,050	1,040	1,018	886	835
Camden	3,195	3,117	2,826	2,548	2,354	1,397	1,342	1,233	1,152	1,034
Gloucester	1,977	1,977	1,748	1,650	1,346	881	912	668	664	521
Mercer	2,376	2,381	2,284	2,193	1,960	902	756	795	759	669
NJ Counties	10,158	10,003	9,401	8,725	7,803	4,230	4,050	3,714	3,461	3,059
Regional Total	17,486	16,847	15,684	14,737	13,493	9,861	9,477	8,600	8,083	7,400

Source: DVRPC.

Abstract: Understanding crashes on the roads in the Delaware Valley is an important step in increasing safety. This publication analyzes information about crashes and the eight key safety emphasis areas for the region developed in conjunction with the 2014 update of the *Transportation Safety Action Plan* (DVRPC Publication #15022).

Analysis includes numbers and rates of crashes, as well as information about injuries and fatalities, and where and how the crashes occurred to better understand why. Analysis of national and state emphasis areas, coordinated with the Pennsylvania and New Jersey departments of transportation, resulted in focusing on eight emphasis areas for the Delaware Valley. These eight emphasis areas were contributing factors for over 97 percent of crash fatalities. Information is also provided regarding for which counties these emphasis areas might most efficiently be addressed in order to improve safety. The forthcoming *Transportation Safety Action Plan* will include recommendations for strategies to use for each emphasis area.

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