DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

Traffic Crash Analysis of the Delaware Valley

September 2009

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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

Each year an average of 474 people lost their lives in crashes on the roads of the Delaware Valley between 2005 and 2007. Over 50,000 people were injured each year.

The initial data for 2008 shows decreases in crashes and fatalities. Even if this positive trend continues, the loss of life and limb remains high. This memorandum focuses on understanding the data to help make effective decisions that can improve safety. It complements the Safety Action Plan for the Delaware Valley (Publication Number 09032) which provides specific strategies for action.

If we all work together on just seven safety emphasis areas, we could significantly improve travel safety. Based on analysis of 2005-2007 data, seven emphasis areas were contributing factors for 96% of the crashes that resulted in fatalities. The highlights of what the analysis suggests would reduce the number of people being killed are:

- Curb aggressive driving, which is a factor in over half the crashes that resulted in deaths. Focus on Philadelphia, Bucks, and Delaware counties. In Delaware and Bucks, it was a factor in almost 70% of traffic fatalities.
- Reduce impaired driving, focusing on the Pennsylvania counties. Impaired driving was a contributing factor in 39% of fatalities in these five counties.
- Reduce roadway departure crashes, especially in Montgomery and Burlington counties where leaving the road was a factor in over 50% of crash fatalities.
- Sustain safe senior mobility, especially in Mercer, Delaware, Gloucester, and Bucks counties.
- Increase seat belt usage, especially in Delaware, Chester, Montgomery, and Bucks counties where it is a factor in 40% or more of road fatalities.
- Improve intersections, and also make it safer to walk and cross streets. It would be efficient to focus work in Philadelphia because the numbers of deaths are significantly higher here for both of these emphasis areas. Improvements benefit people who live or work in the City and benefit the region in terms of reducing unexpected traffic jams from crashes that can affect the broader transportation network.

CHAPTER 1

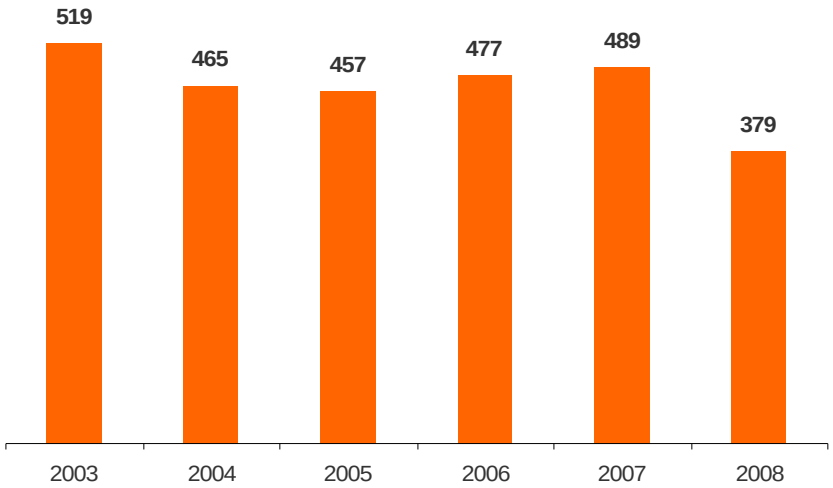
Transportation Safety Overview

Numbers and Rates of Crashes

Are fewer people losing their lives due to crashes?

Perhaps the most meaningful question to ask of efforts to improve transportation safety is whether they result in fewer loved ones and neighbors dying in transportation crashes in the nine-county Delaware Valley. While much effort has been put into reducing fatalities, this has not resulted in a steady downward trend. The number is down for 2008 but it is not yet known if this is related to people driving fewer miles when gas prices spiked higher.

Figure 1: Road Crash Fatalities in the Delaware Valley



Source: NJDOT and PennDOT data, analyzed in Regional fatalities with 2008.xls

Crash analysis is interesting in that a great deal of data is available, but it can also be confusing. Here are two basic concepts that help explain Table 1:

- Data is reported in two ways: crashes and number of people affected by the crash.
- The total number of crashes is the sum of crashes that resulted in injuries, fatalities, and property damage. The numbers are based on reportable crashes. In Pennsylvania, this is any crash that results in an injury (or death), and/or the vehicle must be towed from the scene. In New Jersey the definition is any crash resulting in $500 or more of property damage. However, the two states track fatalities the same way.

Table 1: Average Crashes per Year in the Delaware Valley, 2005-2007

	Crashes that caused:			***People who were:***	
County	**Injuries**	**Fatalities**	**Property Damage**	**Injured**	**Killed**
Bucks	3,424	64	3,133	4,943	69
Chester	2,032	50	2,492	2,856	54
Delaware	2,444	25	2,149	3,509	27
Montgomery	4,771	49	4,536	6,662	52
Philadelphia	9,426	105	1,993	13,972	109
PA 5 County Average	**22,097**	**293**	**14,303**	**31,942**	**311**
Burlington	3,243	47	10,083	4,547	49
Camden	4,616	41	12,540	6,577	43
Gloucester	2,143	35	5,700	3,112	38
Mercer	3,077	31	11,209	4,242	34
NJ 4 County Average	**13,079**	**155**	**39,533**	**18,478**	**164**
9 County Region Average	**35,176**	**448**	**53,835**	**50,419**	**474**

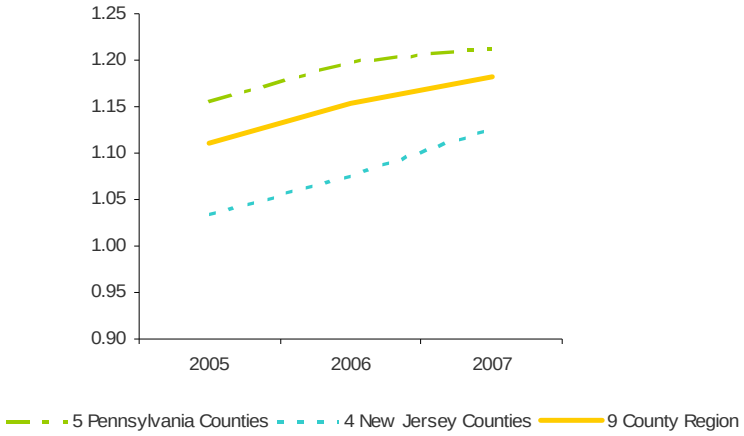
Source: NJDOT and PennDOT data, analyzed in Regional Crashes by Fatal_Inj_Property.xls

There were close to 90,000 crashes per year on average in the Delaware Valley between 2005 and 2007. Over 35,000 people were injured in crashes per year in this period. To put these numbers in context, you could restate these numbers in the following ways:

- The number of crashes in an average year is a third greater than if every fan at a sold-out Eagles game crashed a vehicle on their way home. Lincoln Financial Field holds 66,000 fans.
- The number of people who get injured in crashes each year is greater than the total population of most of the townships or boroughs in the Delaware Valley. Ninety-four percent of municipalities in the region have a population of 35,000 or less according to the 2000 Census.

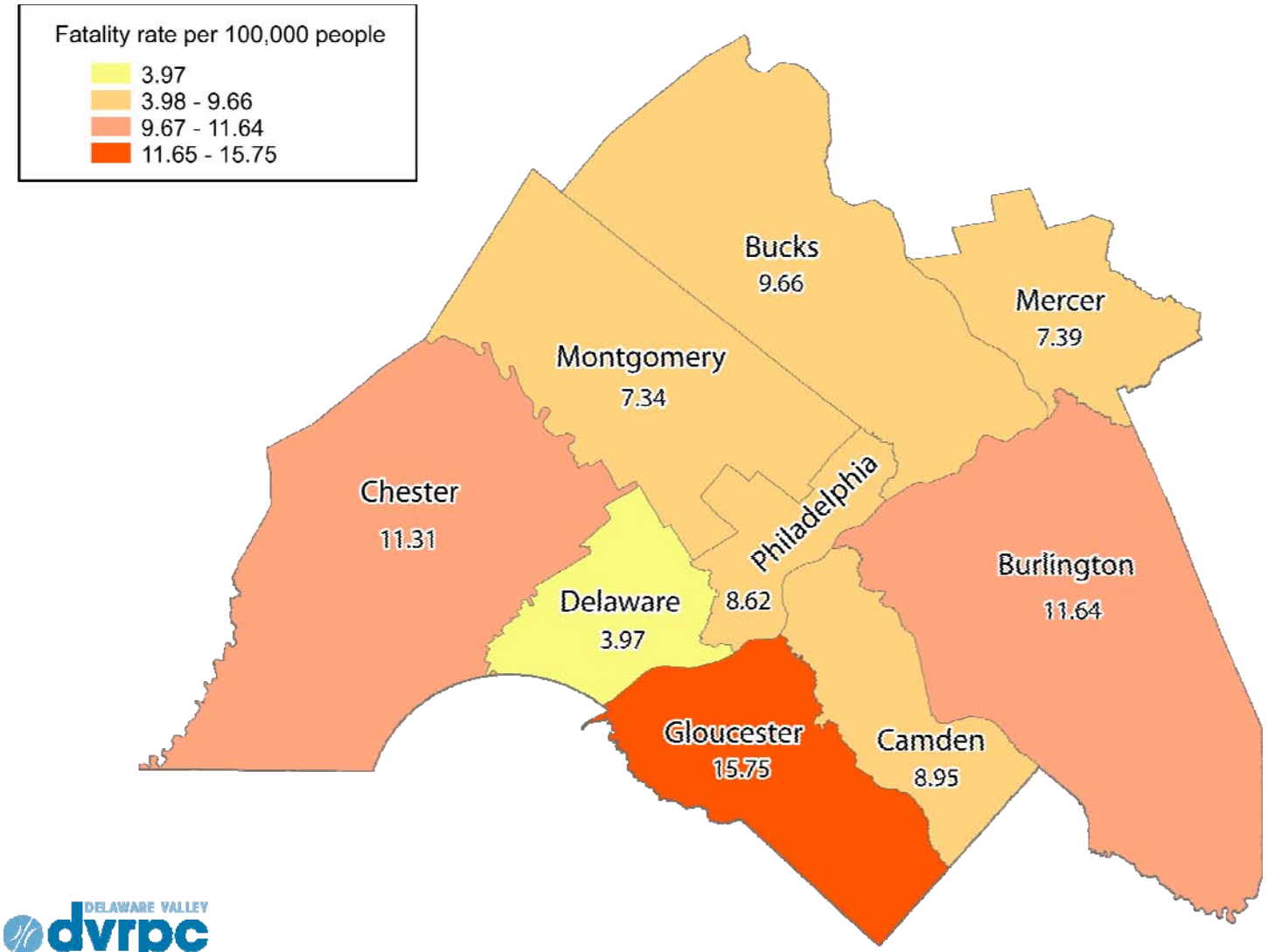
Another way to think about safety data is crash rate. An example of a crash rate is the number of crashes per hundred million vehicle miles traveled (VMT) in a county. This allows for uniform comparisons among counties or states. Several ways to look at rates follow.

Figure 2: Crash Fatalities Rate per Hundred Million VMT



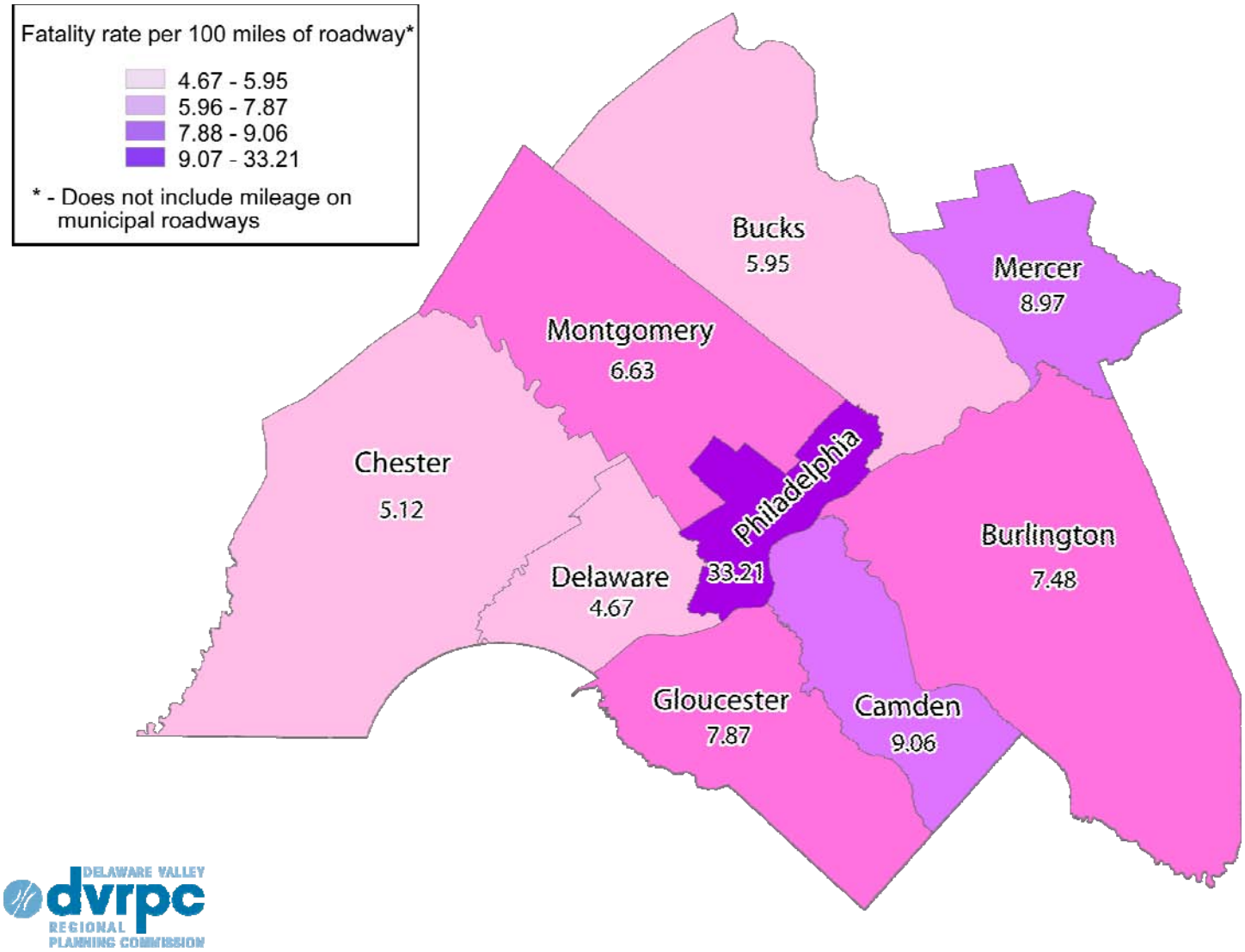
Source: Crash Data from NJDOT and PennDOT analyzed in Regional Crash Rates 2005-2007.xls

Figure 3: Fatality Rate by Population, 2007



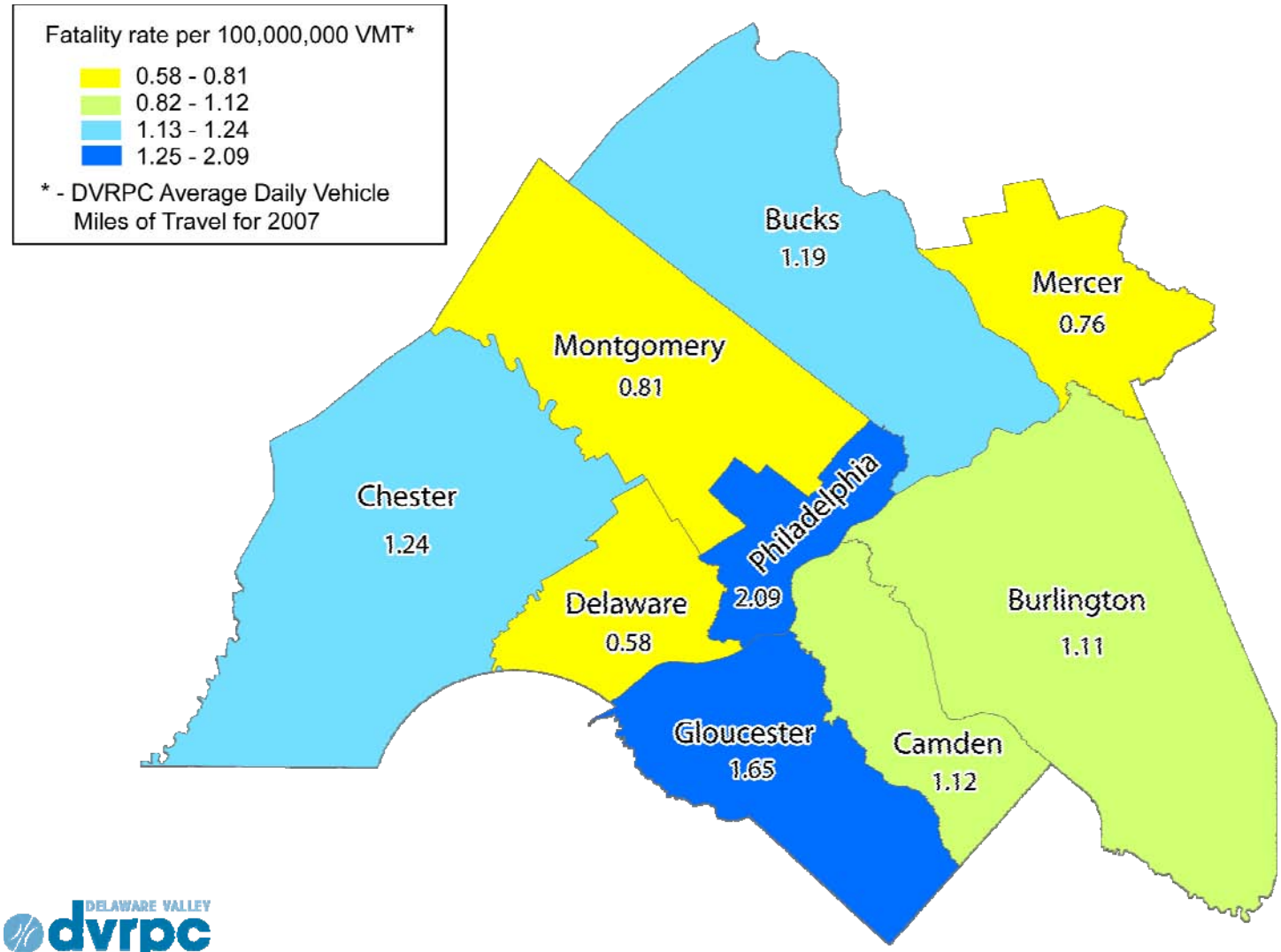
Source: Crash Data from PennDOT and NJDOT, US Census estimated 2007 population. Documented in U:\FY2007\Transportation\CrashDataMemo

Figure 4: Fatality Rate by Roadway Miles, 2007



Source: Crash and Road Data from PennDOT and NJDOT. Documentation is in U:\FY2007\Transportation\CrashDataMemo.

Figure 5: Fatality Rate by VMT, 2007



Source: Crash Data from PennDOT and NJDOT, VMT from DVRPC. Documentation is in U:\FY2007\Transportation\CrashDataMemo.

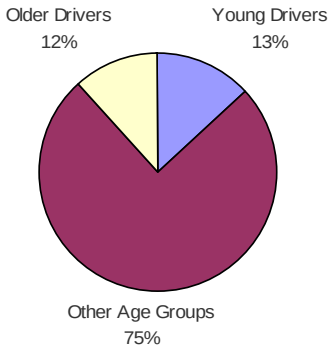
Drivers in Crashes

So far this memorandum has focused on the fatalities resulting from crashes, which includes drivers, passengers, pedestrians, bicyclists, and others. The analysis presented in this section is only about drivers. Further, just one attribute of drivers is the focus here and that is age. This attribute provides background in making choices raised in the Safety Action Plan for the Delaware Valley. In the Safety Action Plan (and many other places) there is discussion of special needs of younger drivers and older drivers, including strategies to make mobility safer for older drivers. The Safety Action Plan also discusses the needs of younger drivers, but concludes that they are helped by strategies in most all the safety emphasis areas.

In crash data there is no indication of who was responsible for the crash. For example, if one driver was sitting at a red light and another driver rear-ended him or her, there would be data on two drivers for that crash. Another detail is that New Jersey and Pennsylvania do not use the same definitions in reporting crash data. In Pennsylvania, a young driver is age 16 or 17. In New Jersey, young drivers are 16 to 20 years old. Older drivers for both states are 65 or older.

Figure 6 provides the big picture of age groups of drivers in crashes in the Delaware Valley between 2005 and 2007.

Figure 6: Summary of Age Groups of Drivers in Crashes



Source: Crash Data from PennDOT and NJDOT prepared in Regional Crash Data 2005-7 as of 6-2.xls – Age Groups Summarized

Figure 6 clarifies that while we may hear more about crashes involving young or older drivers, approximately 75% of crashes involve people who are in neither of those age groups. With that said, there are two important points that come through on analysis of young and older drivers.

Young drivers make up approximately 4% of the population of the Delaware Valley but are over-represented in crashes. In the four New Jersey counties, drivers who are 16-20 years of age are 7% of the population but are part of 20% of crashes. As noted previously the driver may have had a role in the crash or just been in the vehicle that was hit.

Table 2: Young Drivers in the Delaware Valley

Geography	Group of Drivers	Percent of All Crashes in Region, 2005-2007	Percent of Population in Region, 2000	Percent of Licensed Drivers in State, 2000
PA 5 Counties	Young Drivers (16/17)	6%	3%	1%
NJ 4 Counties	Young Drivers (16-20)	20%	7%	6%
9 County Region	Young Driver	13%	4%	N/A

Source: NJDOT and PennDOT data, US Census, and Licensed Drivers from FHWA Form DL-22 analyzed in Regional Crash Data 2005-7 as of 8-31.xls.
Licensed driver data only found at state level. Keep in mind that Pennsylvania and New Jersey use different definitions of young drivers.

Older drivers make up another relatively small percent of the population, approximately 13% of residents of the Delaware Valley. The percent of older drivers in crashes is very similar to their representation in the population.

Table 3: Older Drivers in the Delaware Valley

Geography	Group of Drivers	Percent of All Crashes in Region, 2005-2007	Percent of Population in Region, 2000	Percent of Licensed Drivers in State, 2000
PA 5 Counties	Older Drivers (65+)	12%	14%	17%
NJ 4 Counties	Older Drivers (65+)	13%	12%	15%
9 County Region	Older Driver (65+)	12%	13%	N/A

Source: NJDOT and PennDOT data, US Census, and Licensed Drivers from FHWA Form DL-22 analyzed in Regional Crash Data 2005-7 as of 8-31.xls.
Note licensed driver data only found at state level.

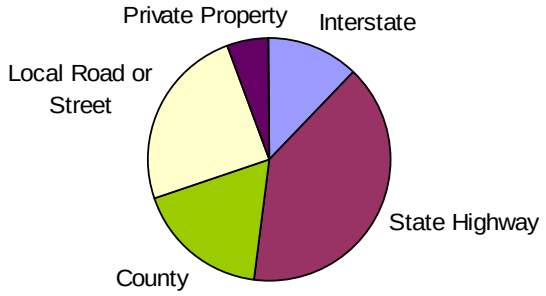
Roadway Type

The number of crashes varies significantly by roadway type. Roadway type refers to whether a road is an interstate highway, a state or county road, a local road or street, or if the crash occurred on private property such as in a parking lot. Understanding how crashes vary by roadway type is a factor in considering where to invest effort and what type of strategies to use in different situations.

There are important differences in approaches to road types between Pennsylvania and New Jersey. Very briefly, the state is responsible for many more miles of the road system in Pennsylvania than in New Jersey, so more crashes occur on state roads in Pennsylvania. In New Jersey, counties play a larger role in responsibility for roads than in Pennsylvania.

It can also be helpful to review miles of each type of road or severity of the crashes. Another useful way to analyze the data is the crash rate per million vehicle miles traveled by road type—it shows that the crash rate is much lower on interstate highways than on other road types.

Figure 7: Crashes by Type of Road in the Delaware Valley

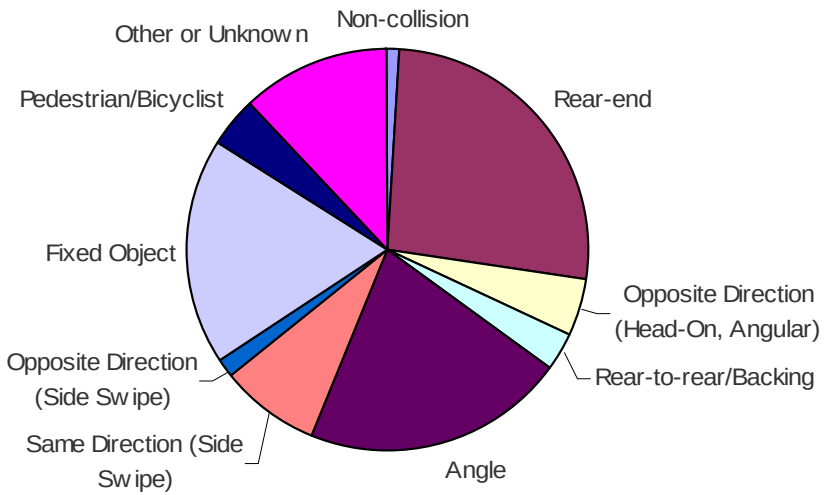


Source: Crash Data from PennDOT and NJDOT prepared in Regional Crash Data 2005-7 as of 6-2.xls – Road Type

Types of Crashes

A variety of types of vehicular crashes are tracked. A sample of types include rear-end collisions, head-on collisions, hit a fixed object, and hit a pedestrian or bicyclist. These different types of crashes call for different strategies to improve safety. The pie chart suggests that it would be effective to focus efforts on reducing rear-end crashes and angle crashes which frequently occur at intersections. Hitting a fixed object is often associated with leaving the roadway. Reducing roadway departure crashes is one of the emphasis areas in the Safety Action Plan.

Figure 8: Crash Types in the Delaware Valley



Source: Crash Data from PennDOT and NJDOT prepared in Regional Crash Data 2005-7 as of 6-2.xls – Crash Type

Additional Kinds of Analysis

This memorandum has provided information about crashes by type of road (such as interstate, county, and local roads) and about types of crashes (such as head-on or rear-end). People figuring out projects to improve safety may be interested in more in-depth analysis such as types of crashes by road type. These analyses are all steps in thinking about what to do to make transportation safer. Additional analysis requests are coordinated with PennDOT and NJDOT. Extensive requests for specific in-depth analysis will require a funding source.

DVRPC also maintains a crash data management system. It focuses more on analysis of crash data for specific roads and using that knowledge as a factor in selecting and focusing projects.

The analysis covered so far has focused on drivers and passengers in vehicles although if anyone else was injured or killed in the crash that is included in the fatality totals. Later in this document, Emphasis Area Seven goes into more analysis of pedestrian safety. The Safety Action Plan for the Delaware Valley also briefly addresses safety of transit passengers. The DVRPC safety program coordinates with the transit, bicyclist and pedestrian, and freight programs within the agency. Data is shared with these programs for their projects and more analysis of the range of modes may be incorporated in future versions of this document.

CHAPTER 2

Transportation Safety Emphasis Areas

Safety Emphasis Areas Overview

If we all work together to make progress on just seven emphasis areas, we could significantly improve safety in the Delaware Valley. Based on analysis of 2005-2007 data, seven emphasis areas were contributing factors for 96% of crash fatalities. DVRPC worked with its Regional Safety Task Force to select the seven most important emphasis areas for the region from the national set (see Appendix A). The Safety Action Plan includes the methodology and strategies for action.

Any one crash can have multiple contributing factors. For example, a crash in which an intoxicated driver ran over a pedestrian before the car hit a house would show up in analysis for reducing impaired driving, ensuring pedestrian safety, and reducing roadway departure crashes. Actions in one or more of these emphasis areas could improve safety.

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

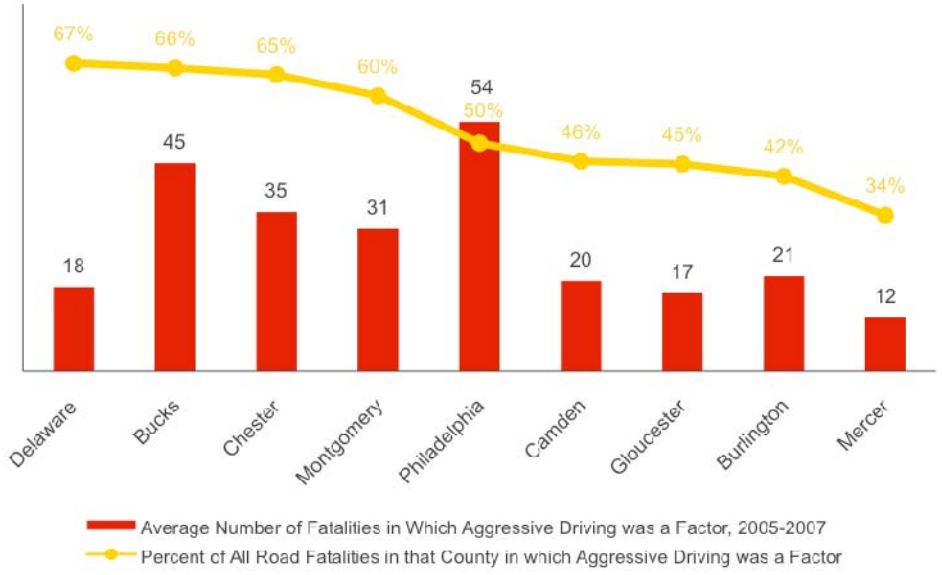
- *How many people died in crashes for which that emphasis area was a contributing factor, by county?* Reducing fatalities is the federal focus and is reported on here, though data is also available for crashes and injuries.
- *What percent of all the fatalities from crashes in that county had that emphasis area as a contributing factor?* The answers to these first two questions are presented in one 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 percent that represents of all the crash fatalities in that county is shown as a line. A county might have relatively few fatalities compared to other counties, but a high percent might have one emphasis area as a contributing factor, so it would be effective to apply strategies in that county to address that emphasis area.
- *How are the numbers changing over time?* Five years of data are provided for the number of crash fatalities by county. It is more usual to analyze five years of data in Pennsylvania and to analyze three years of data in New Jersey. With low numbers, it is important to look at actual change as well as percent change; going from two to four fatalities over a range of years could be reported as a 100% increase but may not be a meaningful change.

Emphasis Area 1: Curb Aggressive Driving

Aggressive driving was a contributing factor for 53% of the annual traffic fatalities in the Delaware Valley, on average, for the period 2005 to 2007. **This is the most significant emphasis area to address in order to improve safety.**

The highest number of fatalities in which aggressive driving was a factor occurred in Philadelphia, where 54 people died per year on average from 2005 to 2007. In Delaware County, 18 people died per year in crashes where aggressive driving was a factor, but that was over 65% of the total traffic fatalities in that County. The percentage of fatalities that involved aggressive driving was also very high in Bucks County, and there it affected even more people. This suggests that more focus on reducing aggressive driving might be especially effective in Delaware and Bucks counties, and also in Philadelphia. Figure 9 shows those two counties first to help focus on effective safety improvements.

Figure 9: Importance of Curbing Aggressive Driving by County



Source: NJDOT and PennDOT data, analyzed in Regional Fatalities by Emphasis Area.xls

Aggressive driving is a combination of dangerous, deliberate, and hostile behaviors or actions by a motor vehicle operator that endanger other persons and disregard public safety. This can include excessive speeding, frequent lane changes without signaling, following too closely, driving on shoulders to pass, and other reckless behaviors and actions.

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

Table 4 provides background about the changes over time in fatalities where aggressive driving was a contributing factor. The numbers have significant variability, so data for a longer period (five years rather than three) is provided. In Pennsylvania it is more usual for state transportation planners to look at five years of data and in New Jersey it is more usual to use three.

Looking at both states, the highest number of crash fatalities in which aggressive driving was a contributing factor in 2007 occurred in Philadelphia and Burlington counties. The second highest numbers were in Bucks and Gloucester counties. 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	2003	2004	2005	2006	2007
Philadelphia	58	45	41	55	67
Bucks	45	29	49	44	43
Chester	24	35	36	35	33
Montgomery	51	35	28	34	31
Delaware	18	29	21	18	16
PA 5 Counties	**196**	**173**	**175**	**186**	**190**
Burlington	20	13	13	21	28
Gloucester	16	16	12	16	23
Camden	16	15	17	21	21
Mercer	14	11	11	15	9
NJ 4 Counties	**66**	**55**	**53**	**73**	**81**
9 County Region	**262**	**228**	**228**	**259**	**271**

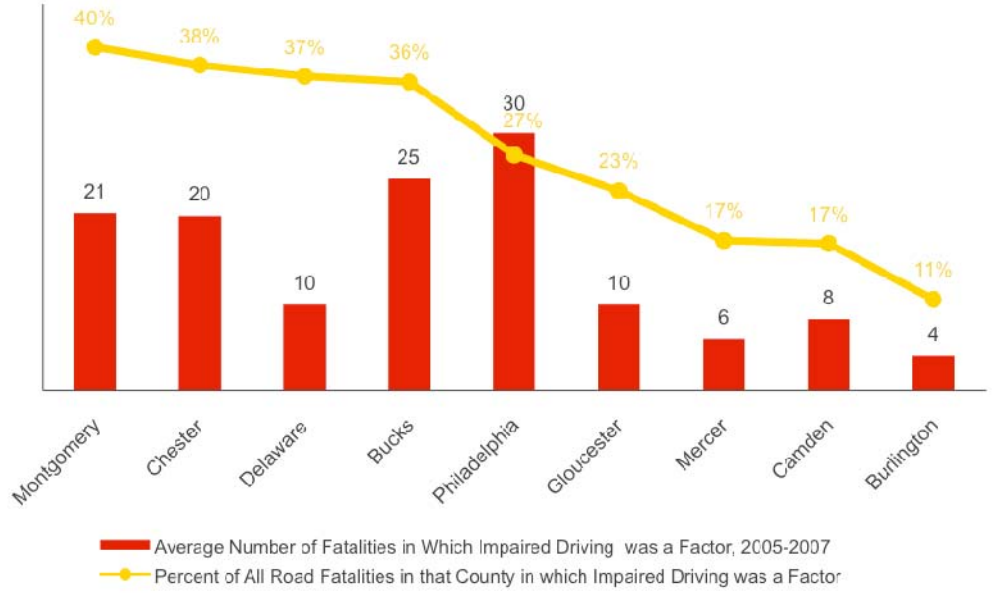
Source: NJDOT and PennDOT data, analyzed in Regional Fatalities by Emphasis Area.xls

Emphasis Area 2: Reduce Impaired Driving

Impaired driving was a contributing factor for 28% of the annual traffic fatalities in the Delaware Valley, on average, for the period 2005 to 2007. While the percentages for most emphasis areas are similar across the region, impaired driving is different; it is a factor in 39% of fatalities in the region's Pennsylvania counties and 14% in the New Jersey counties. See the Safety Action Plan for further discussion of this difference.

The highest number of fatalities in which impaired driving was a factor occurred in Philadelphia, where 30 people died per year on average. In Montgomery and Chester counties, approximately 20 people died per year in crashes where impaired driving was a factor, but that was over 35% of their traffic fatalities. This suggests that reducing impaired driving might be especially effective in Montgomery and Chester counties, and also in Philadelphia.

Figure 10: Importance of Reducing Impaired Driving by County



Impaired driving refers to driving under the influence of alcohol in this analysis. It can also refer to driving while drug-impaired, sleep-deprived, or distracted.

See the Safety Action Plan for the Delaware Valley for strategies to reduce impaired driving.

Source: NJDOT and PennDOT data, analyzed in Regional Fatalities by Emphasis Area.xls

Table 5 provides background about the changes over time in fatalities where impaired driving was a contributing factor. The numbers have significant variability, so data for a longer period (five years rather than three) is provided. In Pennsylvania it is more usual for state transportation planners to look at five years of data and in New Jersey it is more usual to use three.

Looking at both states, the highest number of crash fatalities in which impaired driving was a contributing factor in 2007 occurred in Philadelphia and Camden counties. These results were different, however, in 2006, when the highest number of fatalities was in Bucks and Burlington counties. Three-year averages were used in the figure on the previous page 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 Impaired Driving was a Factor

County	2003	2004	2005	2006	2007
Philadelphia	31	42	27	23	40
Chester	27	16	16	20	25
Bucks	25	17	23	27	24
Montgomery	24	20	16	23	23
Delaware	19	13	13	9	8
PA 5 Counties	**126**	**108**	**95**	**102**	**120**
Camden	6	5	10	6	14
Mercer	9	4	3	3	12
Burlington	4	4	9	9	7
Gloucester	6	2	2	6	4
NJ 4 Counties	**25**	**15**	**24**	**24**	**37**
9 County Region	**151**	**123**	**119**	**126**	**157**

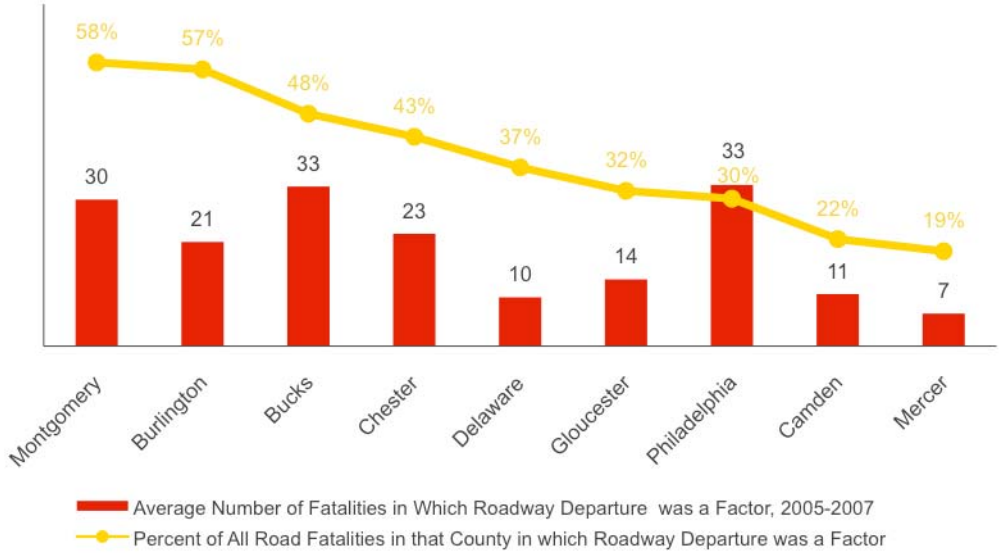
Source: NJDOT and PennDOT data, analyzed in Regional Fatalities by Emphasis Area.xls

Emphasis Area 3: Keep Vehicles on the Roadway

In 41% 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 2005 to 2007.

The highest numbers of fatalities, per average year, in which a vehicle leaving the roadway was a factor occurred in Bucks and Philadelphia counties. In Montgomery and Burlington counties, somewhat fewer people died in crashes where vehicles left the roadway, but they represented over 50% of the total traffic fatalities in each of those two counties. The percent of fatalities that involved leaving the roadway was also high in Bucks County. This suggests that safety strategies that help keep vehicles on the roadway may be especially effective in these counties.

Figure 11: Importance of Reducing Roadway Departure Crashes by County



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 Safety Action Plan for the Delaware Valley for strategies to reduce roadway departure crashes.

Source: NJDOT and PennDOT data, analyzed in Regional Fatalities by Emphasis Area.xls

Table 6 provides background about the changes over time in fatalities where leaving the roadway was a contributing factor. The numbers have significant variability, so data for a longer period (five years rather than three) is provided. In Pennsylvania it is more usual for state transportation planners to look at five years of data and in New Jersey it is more usual to use three.

Looking at both states, the highest number of crash fatalities in which leaving the roadway was a contributing factor in 2007 occurred in Philadelphia and Gloucester counties. Close behind were Bucks and Burlington counties. Gloucester County showed a sharp increase in these crashes in 2007. The figure on the previous page 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 Where Roadway Departure Crashes were a Factor

County	2003	2004	2005	2006	2007
Philadelphia	40	42	36	26	37
Bucks	41	24	35	29	34
Montgomery	36	27	27	34	29
Chester	31	20	22	20	27
Delaware	23	15	14	10	6
PA 5 Counties	**171**	**128**	**134**	**119**	**133**
Gloucester	17	5	7	10	24
Burlington	13	21	17	24	23
Mercer	3	11	11	11	10
Camden	11	10	5	14	1
NJ 4 Counties	**44**	**47**	**40**	**59**	**58**
9 County Region	**215**	**175**	**174**	**178**	**191**

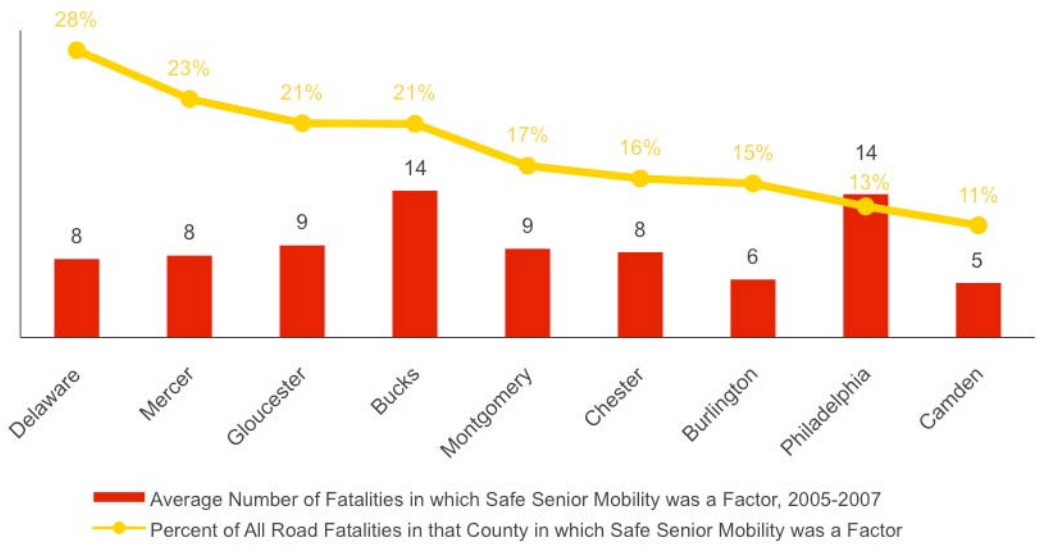
Source: NJDOT and PennDOT data, analyzed in Regional Fatalities by Emphasis Area.xls

Emphasis Area 4: Sustain Safe Senior Mobility

People over 65 years of age made up 17% of traffic fatalities per year in the Delaware Valley, on average, for the period 2005 to 2007. This includes drivers who had a role in crashes, drivers whose vehicles were hit, and people hit by vehicles. People 65 or older make up 13% of the total population of the Delaware Valley region. See Table 3 for further analysis of crashes that involved older drivers.

The highest number of senior fatalities per average year occurred in Bucks and Philadelphia counties (14 in each). In Delaware, Mercer, and Gloucester counties, fewer seniors died in crashes but that was over 20% of traffic fatalities. The number and percent of fatalities were both relatively high in Bucks County. More focus on improving senior mobility might be especially effective in these counties. Figure 12 shows these two counties first to focus on effective improvements.

Figure 12: Importance of Sustaining Safe Senior Mobility by County



Source: NJDOT and PennDOT data, analyzed in Regional Fatalities by Emphasis Area.xls

Sustaining safe senior mobility includes recognizing that although many older drivers are still capable, the effects of aging 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 Safety Action Plan for the Delaware Valley for strategies to sustain safe senior mobility.

Table 7 provides background about the changes over time in crash fatalities for people over 65. The numbers have significant variability, so data for a longer period (five years rather than three) is provided. In Pennsylvania it is more usual for state transportation planners to look at five years of data and in New Jersey it is more usual to use three.

Looking at both states, the highest number of senior crash fatalities in 2007 occurred in Philadelphia and Mercer counties. Mercer County shows a sharp increase in these crashes in 2007. The figure on the previous page 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 Crash Fatalities for People Over 65

County	2003	2004	2005	2006	2007
Philadelphia	7	12	17	10	15
Bucks	14	12	19	13	11
Chester	9	16	11	5	9
Delaware	15	8	6	10	7
Montgomery	17	13	13	6	7
PA 5 Counties	**62**	**61**	**66**	**44**	**49**
Mercer	6	6	6	6	12
Gloucester	10	8	7	11	9
Burlington	9	14	2	7	8
Camden	9	6	4	5	7
NJ 4 Counties	**34**	**34**	**19**	**29**	**36**
9 County Region	**96**	**95**	**85**	**73**	**85**

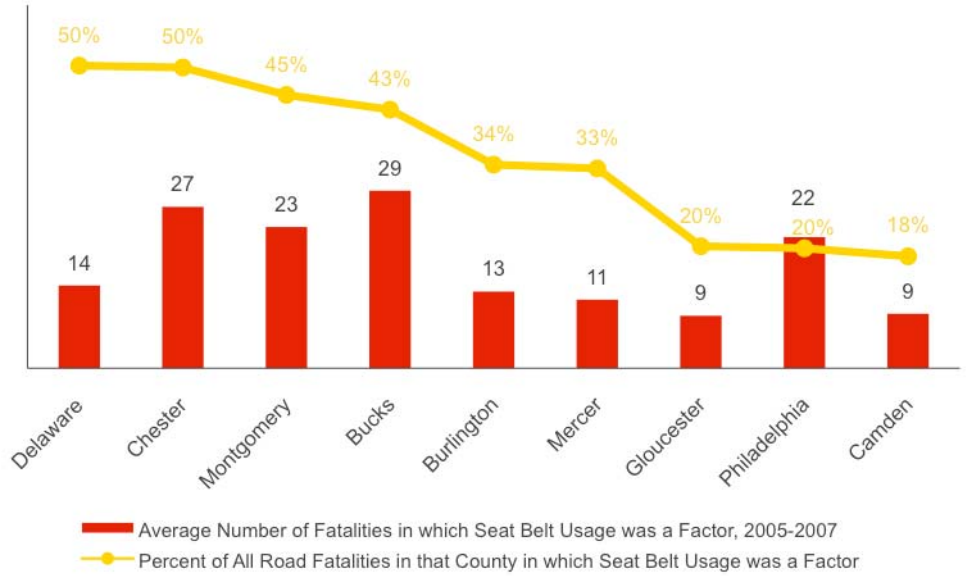
Source: NJDOT and PennDOT data, analyzed in Regional Fatalities by Emphasis Area.xls

Emphasis Area 5: Increase Seat Belt Usage

Not using seat belts was a contributing factor for 33% of the annual traffic fatalities in the Delaware Valley, on average, for the period 2005 to 2007.

The highest number of fatalities in which not using a seat belt was a factor occurred in Bucks County, where 29 people died per year on average. For most emphasis areas, Philadelphia has the highest number of fatalities because it has the highest population, but this is not the case with unbelted fatalities. In Delaware and Chester counties fewer people died in crashes where not wearing a seat belt was a factor, but those fatalities were approximately 50% of the total traffic fatalities. This suggests that more focus on increasing seat belt usage might have a big effect in Delaware and Chester counties, as well as Bucks. Figure 13 has these counties first to highlight the need to plan effective safety measures.

Figure 13: Importance of Increasing Seat Belt Use by County



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

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

Source: NJDOT and PennDOT data, analyzed in Regional Fatalities by Emphasis Area.xls

Table 8 provides background about the changes over time in fatalities where not wearing a seatbelt was a contributing factor. The numbers have significant variability, so data for a longer period (five years rather than three) is provided. In Pennsylvania it is more usual for state transportation planners to look at five years of data and in New Jersey it is more usual to use three.

In 2007, the highest number of crash fatalities in which not wearing seat belts was a contributing factor in 2007 occurred in Chester County, Pennsylvania. In New Jersey, Gloucester and Mercer counties each had 14 and Camden had 13 in 2007. In previous years Burlington County's fatalities had tended to be higher than any of the other New Jersey counties. The figure on the previous page 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 8: Trend in Fatalities Where Seat Belts Were Not Used

County	2003	2004	2005	2006	2007
Chester	28	32	21	30	29
Bucks	42	20	39	23	26
Philadelphia	29	27	21	18	26
Montgomery	39	29	26	20	24
Delaware	19	19	13	15	13
PA 5 Counties	**157**	**127**	**120**	**106**	**118**
Gloucester	7	12	4	8	14
Mercer	9	13	10	10	14
Camden	15	8	3	11	13
Burlington	17	17	16	15	7
NJ 4 Counties	**48**	**50**	**33**	**44**	**48**
9 County Region	205	177	153	150	166

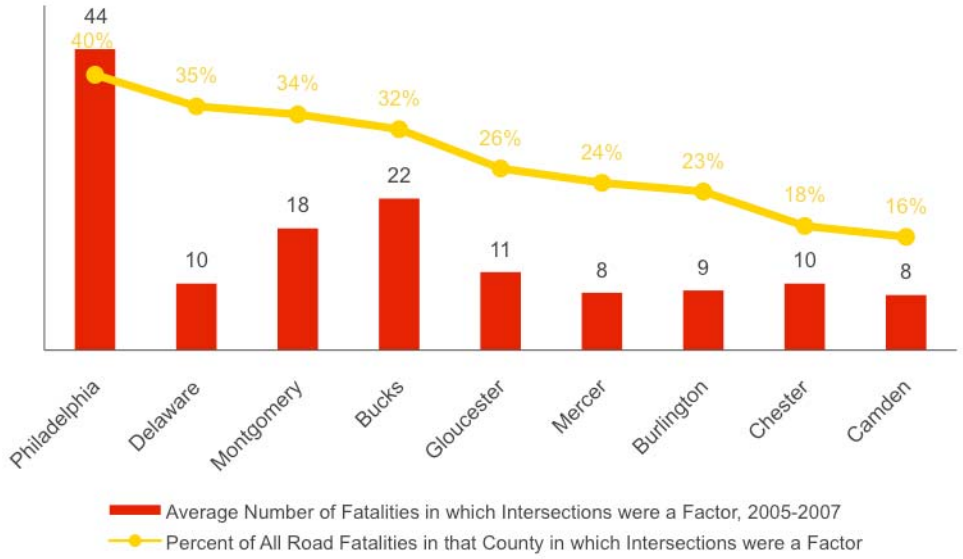
Source: NJDOT and PennDOT data, analyzed in Regional Fatalities by Emphasis Area.xls

Emphasis Area 6: Improve the Design and Operation of Intersections

Intersections were a contributing factor for 29% of the annual traffic fatalities in the Delaware Valley, on average, for the period 2005 to 2007. Note that these numbers include drivers, passengers, pedestrians, bicyclists, and others.

The highest number of crash fatalities in which intersections were a factor occurred in Philadelphia, where 44 people died per year on average. In addition, intersection issues were a factor in approximately 40% of crash fatalities in Philadelphia. It is especially productive to focus attention on improvements where both numbers of fatalities and percent related to an emphasis area are high. The data indicates it would be effective in improving safety for Philadelphia to continue and enhance efforts that improve the design and operation of intersections.

Figure 14: Importance of Making Intersections Safer by County



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 Safety Action Plan for the Delaware Valley for strategies to improve intersection safety.

Source: NJDOT and PennDOT data, analyzed in Regional Fatalities by Emphasis Area.xls

Table 9 provides background about the changes over time in fatalities where intersections were a contributing factor. The numbers have significant variability, so data for a longer period (five years rather than three) is provided. In Pennsylvania it is more usual for state transportation planners to look at five years of data and in New Jersey it is more usual to use three.

Looking at both states, the highest number of crash fatalities in which intersections were a contributing factor in 2007 occurred in Philadelphia (clearly the highest numbers) and Gloucester counties. In New Jersey the numbers relating to intersections are much lower and closer among the counties than in Pennsylvania. The figure on the previous page 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 at Intersections

County	2003	2004	2005	2006	2007
Philadelphia	57	58	34	47	50
Montgomery	22	18	14	21	18
Bucks	16	14	23	29	14
Chester	10	9	9	12	8
Delaware	15	12	9	13	7
PA 5 Counties	120	111	89	122	97
Gloucester	11	12	10	11	13
Burlington	14	11	12	2	12
Camden	9	9	7	7	10
Mercer	9	7	8	9	8
NJ 4 Counties	**43**	**39**	**37**	**29**	**43**
9 County Region	**163**	**150**	**126**	**151**	**140**

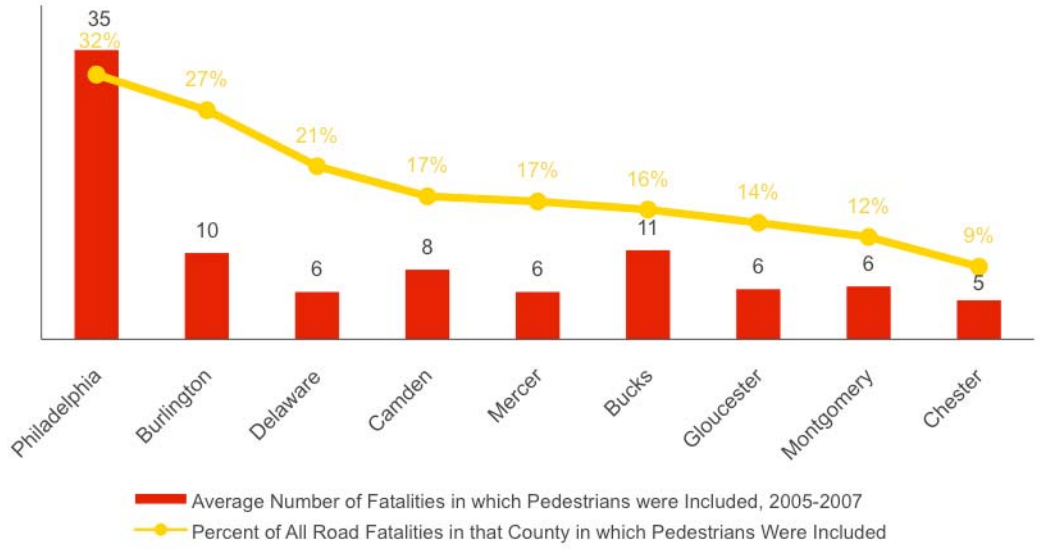
Source: NJDOT and PennDOT data, analyzed in Regional Fatalities by Emphasis Area.xls

Emphasis Area 7: Ensuring Pedestrian Safety

Crashes involving pedestrians were a contributing factor for 20% of the traffic fatalities per year in the Delaware Valley, on average, for the period 2005 to 2007. These numbers include drivers, passengers, pedestrians, bicyclists, and others.

The highest number of fatalities in which people walking or crossing streets was a factor occurred in Philadelphia, where 35 people died per year on average. In addition, the interaction of pedestrians and vehicles was a factor in over 30% of crash fatalities in Philadelphia. It is especially productive to focus attention on improvements in cases where an emphasis area is high in both number of fatalities and percent. The data indicates it would be effective in improving transportation safety for Philadelphia to continue and enhance efforts that improve safe interaction of pedestrians and vehicles. Also see the related analysis for intersection fatalities.

Figure 15: Importance of Ensuring Pedestrian Safety by County



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 Safety Action Plan for the Delaware Valley for strategies to improve pedestrian safety.

Source: NJDOT and PennDOT data, analyzed in Regional Fatalities by Emphasis Area.xls

Table 10 provides background about the changes over time in fatalities where people walking or crossing streets was a contributing factor. The numbers have significant variability, so data for a longer period (five years rather than three) is provided. In Pennsylvania it is more usual for state transportation planners to look at five years of data and in New Jersey it is more usual to use three.

Looking at both states, the highest number of crash fatalities in which people walking or crossing streets was a contributing factor in 2007 occurred in Philadelphia and (in much lower numbers) Burlington counties. Camden County was a close second in New Jersey. The figure on the previous page 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 Fatalities Involving Pedestrians

County	2003	2004	2005	2006	2007
Philadelphia	34	42	31	37	36
Bucks	9	8	10	13	9
Montgomery	14	8	5	5	9
Chester	3	1	3	4	7
Delaware	13	3	7	8	2
PA 5 Counties	**73**	**62**	**56**	**67**	**63**
Burlington	1	4	13	6	12
Camden	11	5	5	9	11
Gloucester	1	2	6	8	4
Mercer	7	5	8	6	3
NJ 4 Counties	**20**	**16**	**32**	**29**	**30**
9 County Region	**93**	**78**	**88**	**96**	**93**

Source: NJDOT and PennDOT data, analyzed in Regional Fatalities by Emphasis Area.xls

CHAPTER 3

Next Steps

This memorandum is a partner document with the 2009 Safety Action Plan for the Delaware Valley. It provided input to selecting the emphasis areas and to the implementation table in that document.

The analysis also found that many fatalities occur on local roads—approximately 100 per year in the 2005-2007 period. These are roads maintained by counties or municipalities where staff members are often busy with wide-ranging responsibilities. Local roads can be considered as an emphasis area; however they are not something that can be changed relatively easily like driving without a seatbelt. DVRPC will do further research on the causes of fatalities and suggest strategies tailored to local roads and especially high risk rural roads. This research will be summarized in an outreach newsletter.

The data in this memorandum was the most recent available at the time of analysis. The analysis will be refreshed as new data becomes available and in ways useful for improving safety coordinated with a wide range of partners. It takes everyone understanding the problems and then acting on that knowledge if the high number of people injured or killed in road crashes in the Delaware Valley is to be reduced.

APPENDIX A

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Analysis of Emphasis Areas

List of AASHTO Emphasis Areas

DVRPC started analysis for the Safety Action Plan for the Delaware Valley by reviewing the previous analysis for the 2006 DVRPC Regional Safety Action Plan. That Plan was prepared in close coordination with the Regional Safety Task Force and especially the safety staff of PennDOT and NJDOT. There was extensive follow-up with each state to understand details and changes since then. DVRPC staff continues to participate in the development of each state's strategic highway safety plan and appreciate the help from the states in developing this bi-state Delaware Valley plan. Wherever reasonable, DVRPC's work is consistent with how each state does their analysis. In some cases, a middle ground is necessary. How each query was performed is covered in the next sections of this Appendix. The table on the next page lists the full range of AASHTO emphasis areas.

Table 11: 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
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)
Available at http://safety.transportation.org/plan.aspx

How DVRPC Analyzed Emphasis Areas in Pennsylvania

Table 12: Query Formats for Pennsylvania Crash Data

AASHTO #	Emphasis Area	Pennsylvania Database Criteria	Criteria Definition
1	Instituting Graduated Drivers License	(FLAG.DRIVER_16YR=1 OR FLAG.DRIVER_17YR=1) AND CRASH.FATAL_COUNT>0	Drivers Age 16-17
2	Ensuring Drivers Licensed/Competent	FLAG.UNLICENSED=1 AND CRASH.FATAL_COUNT>0	Unlicensed Driver
3	Sustaining Proficiency in Older Drivers	(FLAG.DRIVER_65_74YR=1 OR FLAG.DRIVER_75_PLUS=1) AND CRASH.FATAL_COUNT>0	Drivers age >65
4	Curbing Aggressive Driving	FLAG.AGGRESSIVING DRIVING<>0 AND CRASH.FATAL_COUNT>0	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)
5	Reducing Impaired Driving	FLAG.ALCOHOL_RELATED=1 AND CRASH.FATAL_COUNT>0	Alcohol Involved Crash
6	Keeping Drivers Alert	FLAG.DISTRACTED=1 AND CRASH.FATAL_COUNT>0	Driver Inattention
8	Increasing Seat Belt Use/Air Bag Effectiveness	FLAG.UNBELTED=1 AND CRASH.FATAL_COUNT>0	Unbelted

AASHTO #	Emphasis Area	Pennsylvania Database Criteria	Criteria Definition
9	Making Walking and Street Crossing Safer	FLAG.PEDESTRIAN=1 AND CRASH.FATAL_COUNT>0	Pedestrian
10	Ensuring Safer Bicycle Travel	FLAG.BICYCLE=1 AND CRASH.FATAL_COUNT>0	Bicycle
11	Improving Motorcycle Safety and Increasing Motorcycle Awareness	FLAG.MOTORCYCLE=1 AND CRASH.FATAL_COUNT>0	Motorcyclist
12	Making Truck Travel Safer	FLAG.HEY_TRUCK_RELATED=1 AND CRASH.FATAL_COUNT>0	Heavy Truck Related
14	Reducing Vehicle-Train Crashes	FLAG.TRAIN_TROLLEY=1 AND CRASH.FATAL_COUNT>0	Train and Trolley Crashes
15	Keeping Vehicles on the Roadway	FLAG.SV_RUN_OFF_RD=1 AND CRASH.FATAL_COUNT>0	Ran Off Road
16	Minimizing Consequences of Leaving Roadway	FLAG.HIT_FIXED_OBJECT=1 AND CRASH.FATAL_COUNT>0	Fixed Object
		FLAG.OVERTURNED=1 AND CRASH.FATAL_COUNT>0	Overturn
17	Improving the Design/Operation of Intersections	FLAG.INTERSECTION=1 AND CRASH.FATAL_COUNT>0	Crash at Intersection
18	Reducing Head-On Crashes and Across-Median Crashes	CRASH.COLLISION_TYPE="2" AND CRASH.FATAL_COUNT>0	Head-on
		FLAG.CROSS_MEDIAN=1 AND CRASH.FATAL_COUNT>0	Across Median Collision
		FLAG.CROSS_MEDIAN=1 AND CRASH.COLLISION_TYPE="2" AND CRASH.FATAL_COUNT>0	Head-on and Across Median Collision
			No Duplicates

AASHTO #	Emphasis Area	Pennsylvania Database Criteria	Criteria Definition
19	Designing Safer Work Zones	FLAG.WORK_ZONE=1 AND CRASH.FATAL_COUNT>0	Work Zone

Source: AASHTO and PennDOT guidance and PennDOT crash data analyzed in P:\09-41-030 Transportation Safety\Crash Data Interface\PA\PaCrashData2001-2007-AASHTO.mdb. This summary is file: PA Emphasis Query Notes as of 6-30-09.xls in P:\09-41-030 Transportation Safety\Crash Data Management System\08054 - Plan Crash Data Memo\Data as of 6-2-09\PA

How DVRPC Analyzed Emphasis Areas in New Jersey

Table 13: Query Formats for New Jersey Crash Data

AASHTO #	Emphasis Area	New Jersey Database Criteria	Criteria	Query Name	Notes
1	Institute Graduated Drivers License	Occupants.Position In/On vehicle = "01" and Age between 16 and 20	Drivers age 16-20	qryYoungDriver qryYoungDriverSeverity qryYoungDriverSum	Using age from Occupants table will have better data for young driver.
2	Ensure Drivers Licensed/competent	Charge = 39:3-10 (unlicensed driver); 39:3-40 (suspended or revoked license)	Unlicensed driver or suspended or revoked license	qryUnlicensedDriver qryUnlicensedDriverSum qryUnlicensedDriverSeverity	
3	Sustain Proficiency in Older Drivers	Drivers.Driver DOB	Drivers age 65+	qryOlderDriver2005 qryOlderDriver2006 qryOlderDriver2007 qryOlderDriverTotal qryOlderDriverSeverity qryOlderDriverSum	Using DOB from Driver table will have better data for older driver.
4	Curb Aggressive Driving	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	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)	qryAggressiveDriving qryAggressiveDrivingSeverity qryAggressiveDrivingSum	
5	Reduce Impaired Driving	Alcohol involved Crash = yes	Alcohol involved crash	qryAlcoholCrashSeverity qryAlcoholCrashSum	

AASHTO #	Emphasis Area	New Jersey Database Criteria	Criteria	Query Name	Notes
6	Keep Drivers Alert	Contributing circumstance = driver inattention	Driver inattention	qryDriverInattention qryDriverInattentionSum qryDriverInattentionSeverity	
7	Increase Driver Safety Awareness	None	Increase driver safety awareness	None	
8	Increase Seat Belt Use/Air Bag Effectiveness	Occupants.Safety equipment used = none	No safety equipment used	qrySeatBeltUse qrySeatBeltUseSum qrySeatBeltUseSeverity	This query checks all occupants for Seat Belt Use.
9	Make Walking/Street Crossing Easier	Sequence of Events (1,2,3,4) = Pedestrian	Pedestrian	qryPedestrian qryPedestrianSum qryPedestrianSeverity	This query can also replace with Collision Type
10	Ensure Safer Bicycle Travel	Sequence of Events (1,2,3,4) = Pedalcycle	Pedalcycle	qryPedalcycle qryPedalcycleSum qryPedalcycleSeverity	This query can also replace with Collision Type
11	Improve Motorcycle Safety	Vehicle Type = Motorcycle	Motorcyclist	qryMotorcycle qryMotorcycleSum qryMotorcycleSeverity	
12	Make Truck Travel Safer	Vehicle type = truck/trailer, truck/trailer (bobtail), tractor/semi-trailer, tractor/doubles, tractor/triples, heavy truck other	Truck Related	qryTruck qryTruckSum qryTruckSeverity	The code had changes from the old database. I use code between 20 and 29
13	Increase Safety Enhancements in Vehicles	None	Increase safety enhancements in vehicles	None	
14	Reduce Vehicle Train Crashes[1]	Highway Rail Incidents	Highway rail incidents	None	
		Trespasser Incidents	Trespasser incidents	None	

AASHTO #	Emphasis Area	New Jersey Database Criteria	Criteria	Query Name	Notes
15	Keep Vehicles on the Roadway	Sequence of Events (1 = Ran off Road, or 1 = MV in Transport and 2 = Ran Off Road)	Ran off road	qryRunOffRoad qryRunOffRoadSum qryRunOffRoadSeverity	
16	Minimize Consequences of Leaving Roadway	Collision w/MV code = Fixed Object	Fixed object	qryFixObjectSum qryFixObjectSeverity	With the new database, Fixed Object can be query out from Collision Type. Change query from Sequence of Events to Collision type
		Collision w/MV code = Overturn	Overturn	qryOverturnSum qryOverturnSeverity	With the new database, Overturn can be queried out from Collision Type. Change query from Sequence of Events to Collision type
17	Improve Design/operation of Intersections	Intersection = at intersection	Crash at intersection	qryIntersectionSeverity qryIntersectionSum	
18	Reduce Head-on Crashes	Collision w/MV code = Head-on	Head-on collision	qryHeadOnSum qryHeadOnSeverity	The code had changes from the old database. Still use code 4.
19	Design Safer Work Zones	Road under construction = yes & workers present	Work zone	qryWorkZoneSum qryWorkZoneSeverity	The code had changes from the old database. Still use code between 02 and 05.
20	Enhance EMS to Increase Survivability	None	Enhance EMS to increase survivability	None	

AASHTO #	Emphasis Area	New Jersey Database Criteria	Criteria	Query Name	Notes
21	Improve Data/decision Support Systems	None	Improve data/decision support systems	None	
22	Create More Effective Processes/Safety Management Systems (SMS)	None	Create more effective processes/SMS	None	
	Drive More Safely in Inclement Weather	Weather = rain, snow and more	Rain/Snow weather		Code has changed, use 2,3,4,6,7,8,9
	Drive More Safely in Inclement Road Surface	Surface Condition = Wet, Snowy, Icy, Slush, Water	Wet, snowy, icy, slush, water	qrySurfaceCondSum qrySurfaceCondSeverity	Code has changed, I use 2 to 8
	Reduce Deer/Animal Crashes	Collision w/MV code = Animal	Animal (by collision type)	qryAnimalSeverity qryAnimalSum	Change the query by using Collision Type
	Reduce Crashes on Local Roads	Road system = county or municipal	Local road	qryLocalRoadSum qryLocalRoadSeverity	Based on internal discussion, changed Local Road Definition to 5 or 7
	School Bus Safety	Vehicle type = school bus	School bus related	None	The new vehicle lookup code does not have School Bus
	Speeding	Contributing circumstance = unsafe speed	Unsafe speed	qrySpeeding qrySpeedingSum qrySpeedingSeverity	

Source: AASHTO and NJDOT guidance and NJDOT crash data analyzed in P:\09-41-030 Transportation Safety\Crash Data Interface\NJ\Emphasis Area\NJCrashData2001-2007.mdb. This summary is file: NJ Emphasis Query Notes as of 6-30-09.xls in P:\09-41-030 Transportation Safety\Crash Data Management System\08054 - Plan Crash Data Memo\Data as of 6-2-09\NJ

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Key Words: Crashes, safety, analysis, emphasis areas, aggressive driving, impaired driving, roadway departure, senior mobility, seat belt usage, intersections, walking, pedestrians, Regional Safety Task Force, strategic highway safety plan

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 seven safety emphasis areas for the region developed in conjunction with the update of the Safety Action Plan for the Delaware Valley (publication 09032).

Analysis includes numbers and rates of crashes, as well as information about who was involved, where, and how the crashes occurred to better understand why. The analysis focuses on understanding crashes that resulted in fatalities. Analysis of national and state emphasis areas resulted in focusing on seven emphasis area for the Delaware Valley. One or more of these seven emphasis areas were contributing factors for 96% of the crash fatalities. Information is provided on which counties these emphasis areas might most efficiently be addressed in order to reduce loss of life. The Safety Action Plan recommends strategies to use for each emphasis area.

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