Urban and Suburban Arterial Safety Performance Functions: Final Report

WA-RD 857.1

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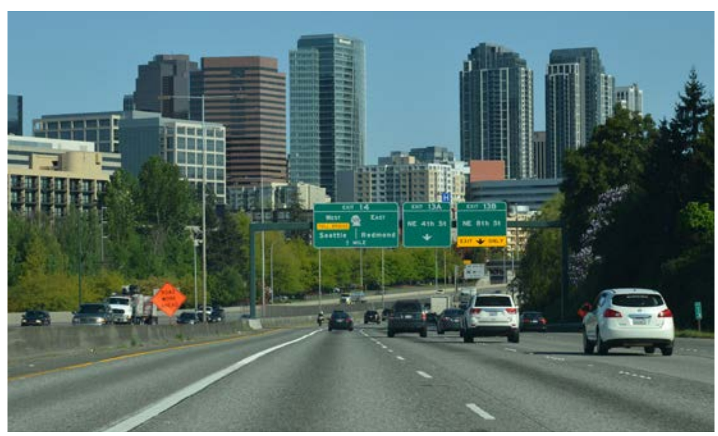
June 2016



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Urban and Suburban Arterial Safety Performance Functions

Final Report

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16. Abstract

This report documents findings from a comprehensive set of safety performance functions developed for the entire urban-suburban arterial road segment system on the state highway system in Washington. Conventional urban suburban safety performance functions on the basis of cross sectional classifications were developed using random parameter negative binomial models. Total crashes, as well as crashes by severity type were modeled. It was found that out of 20 statistically significant variables, number of lanes, roadway width, shoulder width, point of vertical tangent grade (PVT), vertical curve point of vertical curve grade (PVC) horizontal curve maximum super elevation (e), curve central angle (delta), horizontal curve radius (R) were found to be random parameters. In addition, derived measures such as degree of curve, absolute vertical grade difference (A), and rate of vertical curvature (K) were also found to be random. The majority of the statistically significant effects were geometric. In addition, functional class indicators such as minor arterial indicator were also found to be random. Roadside information was not fully evaluated due to inconsistencies in matching roadside inventories for all homogeneous segments. An alternative classification of the safety performance functions on the basis of ADT-population thresholds was also considered. Similar patterns of parameter randomness were found. In the absence of roadside and land use information, it appears from the 173 advanced random parameter models that were developed, that the treatment of geometric parameters as random is justified, due to significant unobserved heterogeneity in the urban-suburban arterial crash context.

17. Key Words Urban-suburban arterials; Safety Performance Functions; random parameter models	**18. Distribution Statement** No restrictions. This document is available to the public through the National Technical Information Service, Springfield, VA 22616

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Under 23 U.S. Code section 148 and 23 U.S. Code section 409, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

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1.0 Introduction

The scope of this study is to provide a detailed analysis of all Washington State highway crashes from 2010 to 2012 with specific attention focused on addressing the manner in which urban-suburban functional classes are assigned to highway segments or various stretches of roadway within the Washington State highway network. The conventional method of assigning highway functional class type in transportation applications is to base the functional classifications on surrounding land-use definitions that include such factors as census information, population density, and property boundaries. Efforts by the Washington State Department of Transportation (WSDOT) have aimed to establish a more detailed methodology for assigning highway functional classifications that are based on the afore mentioned metrics as illustrated by the Detailed Functional Classification Criteria document (prior to October 2013) and the more recent release of WSDOT's report on Guidelines for Amending Functional Classification in Washington State (October 2013).

These existing methods of highway functional classification incorporate additional metrics that are not necessarily conducive to highway safety analysis. Multiple factors that influence highway segment functional class or geographic class misrepresent how highway crashes should be evaluated because of the way in which the roadway is defined. In transportation safety analysis, Annual Average Daily Traffic (AADT) is a crucial component in safety modeling. By utilizing AADT as a means for determining highway functional class, it is hypothesized that such a classification system would result in more robust crash prediction with respect to functional class and geographic class type. This report will compare two core methodologies of highway geographic classification: 1) land-use population estimates and 2) AADT counts. The two methods of classification will be compared and the differences in approach will be explained. The intent of this report and the resulting SPF methodology is to offer clarity and assist WSDOT in their efforts for establishing a standard safety protocol for developing SPFs for various urban-suburban classifications.

1.1 Overview of Study Area

The study area for this research focuses on all highways in Washington State, which totals 187 routes. The following figure displays all state routes for Washington as shown in an available state highway map downloaded from the WSDOT Highway Map webpage.

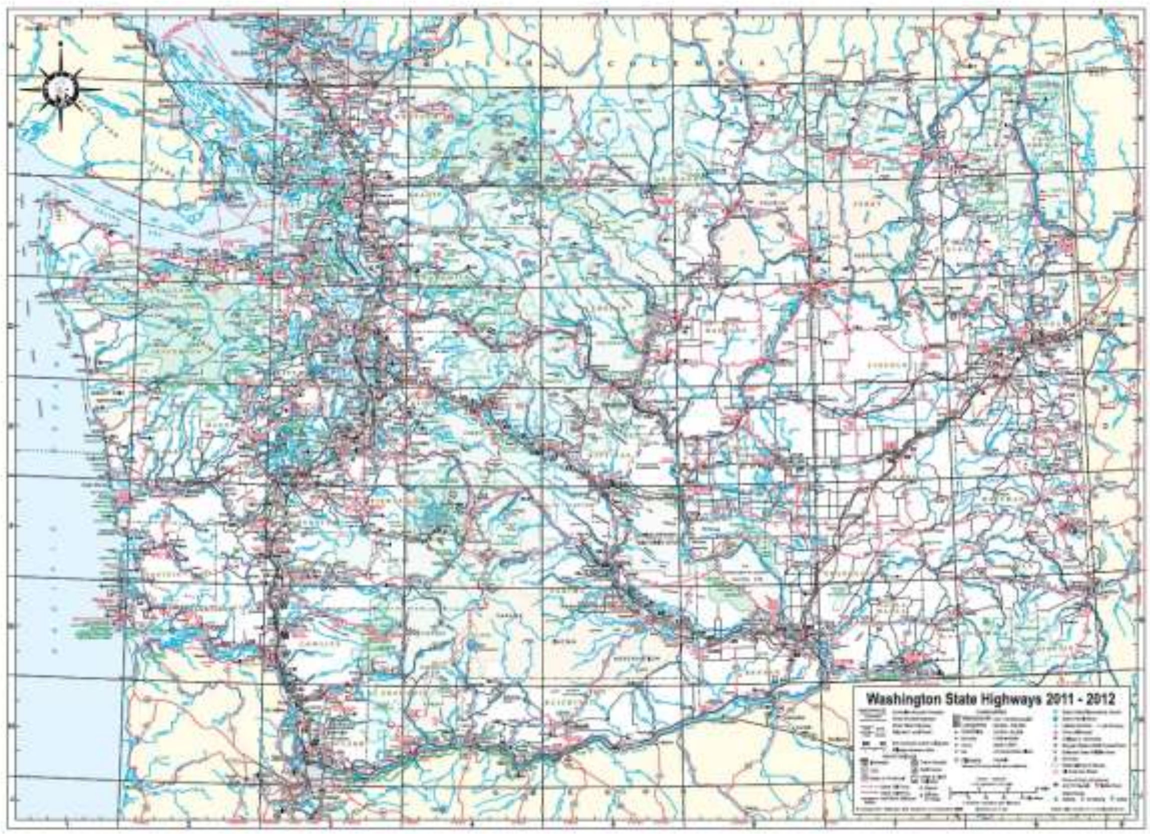

Figure 1.1: Washington State Highway Map 2011-2012.

The next three tables list all of the routes from Washington State that are included in the study from 2010, 2011, and 2012. The routes are listed by number with their associated route mileage shown in parentheses. The tables show consistent mileage for all state routes across the three-year time span and minimal changes in total mileage, with a total centerline mileage of 6,867.68 miles for 2010, 6,864.38 miles for 2011, and 6,864.30 miles for 2012.

From 2010 to 2011, there was a recorded reduction of 3.0 centerline miles across the state highway network, of which 2.63 miles were reduced for State Route 527. From 2011 to 2012, the reduction in centerline miles across the Washington State highway network totaled 0.08 miles, with State Route 7 reducing 0.07 miles between 2011 and 2012.

Table 1.1: 2010 Washington State Routes and Total Mileage.

State Route # (Mileage)-2010				
2(322.72 miles)	106(20.07 miles)	174(40.52 miles)	291(23.35 miles)	523(1.61 miles)
3(59.82 miles)	107(7.83 miles)	181(5.96 miles)	292(5.89 miles)	524(14.61 miles)
4(62.24 miles)	108(11.92 miles)	182(15.04 miles)	300(3.31 miles)	525(30.47 miles)
5(276.58 miles)	109(40.18 miles)	193(2.11 miles)	302(16.75 miles)	526(4.47 miles)
6(51.36 miles)	110(3.3 miles)	194(13.98 miles)	303(9.19 miles)	527(9.21 miles)
7(58.25 miles)	112(61.24 miles)	195(93.26 miles)	304(3.02 miles)	528(3.25 miles)
8(20.66 miles)	113(9.58 miles)	197(2.48 miles)	305(13.31 miles)	529(7.7 miles)
9(91.58 miles)	115(2.24 miles)	202(30.47 miles)	307(5.19 miles)	530(50.32 miles)
10(16.09 miles)	116(5.91 miles)	203(24.24 miles)	308(3.38 miles)	531(9.84 miles)
11(21.23 miles)	117(1.36 miles)	204(2.34 miles)	310(1.85 miles)	532(10.02 miles)
12(324.4 miles)	119(9.28 miles)	205(10.55 miles)	395(186.42 miles)	534(4.92 miles)
14(179.97 miles)	121(7.62 miles)	206(15.28 miles)	397(22.15 miles)	536(5.22 miles)
16(27.06 miles)	122(7.71 miles)	207(4.32 miles)	401(12.1 miles)	538(3.48 miles)
17(135.02 miles)	123(16.33 miles)	211(15.13 miles)	405(30.18 miles)	539(14.91 miles)
18(28.29 miles)	124(44.61 miles)	213(.22 miles)	409(3.77 miles)	542(57.16 miles)
19(12.53 miles)	125(23.63 miles)	215(6.19 miles)	410(107.07 miles)	543(1.05 miles)
20(395.16 miles)	127(26.87 miles)	221(25.92 miles)	411(13.28 miles)	544(8.89 miles)
21(179.26 miles)	128(.51 miles)	223(3.69 miles)	432(10.23 miles)	546(7.78 miles)
22(35.76 miles)	129(42.48 miles)	224(9.98 miles)	433(.87 miles)	547(9.53 miles)
23(65.91 miles)	131(1.99 miles)	225(11.31 miles)	500(22.15 miles)	548(13.78 miles)
24(78.71 miles)	141(25.99 miles)	231(72.07 miles)	501(13.82 miles)	599(1.73 miles)
25(121.13 miles)	142(35.2 miles)	240(40.05 miles)	502(7.57 miles)	702(9.19 miles)
26(133.59 miles)	150(10.91 miles)	241(25.08 miles)	503(53.05 miles)	704(.61 miles)
27(89.85 miles)	153(30.76 miles)	243(28.21 miles)	504(51.7 miles)	705(1.48 miles)
28(135.23 miles)	155(78.31 miles)	260(37.97 miles)	505(19.28 miles)	706(13.63 miles)
31(26.74 miles)	160(7.45 miles)	261(56.12 miles)	506(11.49 miles)	730(5.99 miles)
41(.31 miles)	161(32.2 miles)	262(20.04 miles)	507(43.42 miles)	821(25.09 miles)
82(132.5 miles)	162(17.34 miles)	263(9.11 miles)	508(32.74 miles)	823(5.14 miles)
90(297.5 miles)	163(3.33 miles)	270(9.84 miles)	509(29.24 miles)	900(15.28 miles)
92(7.96 miles)	164(14.59 miles)	271(8.37 miles)	510(13.05 miles)	902(12.28 miles)
96(6.68 miles)	165(20.25 miles)	272(18.91 miles)	512(12.04 miles)	903(10.02 miles)
97(250.59 miles)	166(4.93 miles)	274(1.89 miles)	513(3.33 miles)	904(16.9 miles)
99(49.09 miles)	167(28.53 miles)	278(2.76 miles)	515(7.73 miles)	906(2.64 miles)
100(4.54 miles)	169(25.22 miles)	281(10.2 miles)	516(16.47 miles)	970(10.14 miles)
101(365.47 miles)	170(3.57 miles)	282(4.9 miles)	518(3.4 miles)	971(10.37 miles)
103(16.48 miles)	171(3.75 miles)	283(14.52 miles)	519(.79 miles)	**Total Length (Mainline Only)**
104(31.55 miles)	172(34.93 miles)	285(5.03 miles)	520(12.73 miles)	
105(48.54 miles)	173(11.51 miles)	290(17.7 miles)	522(24.31 miles)	**6867.683 miles**

Table 1.2: 2011 Washington State Routes and Total Mileage.

State Route # (Mileage)-2011				
2(322.72 miles)	106(20.07 miles)	174(40.52 miles)	291(23.35 miles)	523(1.61 miles)
3(59.82 miles)	107(7.83 miles)	181(5.96 miles)	292(5.89 miles)	524(14.61 miles)
4(62.24 miles)	108(11.92 miles)	182(15.04 miles)	300(3.31 miles)	525(30.47 miles)
5(276.58 miles)	109(40.18 miles)	193(2.11 miles)	302(16.75 miles)	526(4.47 miles)
6(51.36 miles)	110(3.3 miles)	194(13.98 miles)	303(9.19 miles)	527(6.58 miles)
7(58.25 miles)	112(61.24 miles)	195(93.26 miles)	304(3.02 miles)	528(3.25 miles)
8(20.66 miles)	113(9.58 miles)	197(2.48 miles)	305(13.31 miles)	529(7.7 miles)
9(91.58 miles)	115(2.24 miles)	202(30.47 miles)	307(5.19 miles)	530(50.25 miles)
10(16.09 miles)	116(5.91 miles)	203(24.24 miles)	308(3.38 miles)	531(9.84 miles)
11(21.23 miles)	117(1.36 miles)	204(2.34 miles)	310(1.85 miles)	532(10.02 miles)
12(324.43 miles)	119(9.28 miles)	205(10.55 miles)	395(186.42 miles)	534(4.92 miles)
14(179.97 miles)	121(7.62 miles)	206(15.28 miles)	397(22.15 miles)	536(5.22 miles)
16(27.21 miles)	122(7.71 miles)	207(4.32 miles)	401(12.1 miles)	538(3.48 miles)
17(135.02 miles)	123(16.33 miles)	211(15.13 miles)	405(30.18 miles)	539(14.91 miles)
18(28.29 miles)	124(44.61 miles)	213(.22 miles)	409(3.77 miles)	542(57.16 miles)
19(12.53 miles)	125(23.63 miles)	215(6.19 miles)	410(107.07 miles)	543(1.05 miles)
20(395.16 miles)	127(26.87 miles)	221(25.92 miles)	411(13.28 miles)	544(8.89 miles)
21(179.26 miles)	128(.51 miles)	223(3.69 miles)	432(10.23 miles)	546(7.78 miles)
22(35.76 miles)	129(42.48 miles)	224(9.98 miles)	433(.87 miles)	547(9.53 miles)
23(65.91 miles)	131(1.99 miles)	225(11.31 miles)	500(22.15 miles)	548(13.78 miles)
24(78.71 miles)	141(25.99 miles)	231(72.07 miles)	501(13.82 miles)	599(1.73 miles)
25(121.13 miles)	142(35.2 miles)	240(40.05 miles)	502(7.57 miles)	702(9.19 miles)
26(133.59 miles)	150(10.91 miles)	241(25.08 miles)	503(53.05 miles)	704(.61 miles)
27(89.85 miles)	153(30.76 miles)	243(28.21 miles)	504(51.7 miles)	705(1.48 miles)
28(135.23 miles)	155(78.31 miles)	260(37.97 miles)	505(19.28 miles)	706(13.63 miles)
31(26.74 miles)	160(7.45 miles)	261(56.12 miles)	506(11.49 miles)	730(5.99 miles)
41(.31 miles)	161(32.2 miles)	262(20.04 miles)	507(43.42 miles)	821(25.09 miles)
82(132.5 miles)	162(17.34 miles)	263(9.11 miles)	508(32.74 miles)	823(5.08 miles)
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96(6.68 miles)	165(20.25 miles)	272(18.91 miles)	512(12.04 miles)	903(10.02 miles)
97(250.59 miles)	166(4.93 miles)	274(1.89 miles)	513(3.33 miles)	904(16.9 miles)
99(48.39 miles)	167(28.53 miles)	278(2.76 miles)	515(7.73 miles)	906(2.64 miles)
100(4.54 miles)	169(25.22 miles)	281(10.2 miles)	516(16.47 miles)	970(10.14 miles)
101(365.47 miles)	170(3.57 miles)	282(4.9 miles)	518(3.4 miles)	971(10.37 miles)
103(16.48 miles)	171(3.75 miles)	283(14.52 miles)	519(.79 miles)	**Total Length (Mainline Only)**
104(31.55 miles)	172(34.93 miles)	285(5.03 miles)	520(12.73 miles)	
105(48.54 miles)	173(11.51 miles)	290(17.7 miles)	522(24.31 miles)	**6864.38 miles**

Table 1.3: 2012 Washington State Routes and Total Mileage.

State Route # (Mileage)-2012				
2(322.72 miles)	106(20.07 miles)	174(40.52 miles)	291(23.35 miles)	523(1.61 miles)
3(59.82 miles)	107(7.83 miles)	181(5.96 miles)	292(5.89 miles)	524(14.61 miles)
4(62.24 miles)	108(11.92 miles)	182(15.04 miles)	300(3.31 miles)	525(30.47 miles)
5(276.58 miles)	109(40.18 miles)	193(2.11 miles)	302(16.75 miles)	526(4.47 miles)
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11(21.23 miles)	117(1.36 miles)	204(2.34 miles)	310(1.85 miles)	532(10.02 miles)
12(324.43 miles)	119(9.28 miles)	205(10.55 miles)	395(186.39 miles)	534(4.92 miles)
14(179.95 miles)	121(7.62 miles)	206(15.28 miles)	397(22.15 miles)	536(5.22 miles)
16(27.21 miles)	122(7.71 miles)	207(4.32 miles)	401(12.1 miles)	538(3.48 miles)
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96(6.68 miles)	165(20.25 miles)	272(18.91 miles)	512(12.04 miles)	903(10.02 miles)
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105(48.54 miles)	173(11.51 miles)	290(17.7 miles)	522(24.31 miles)	**(6864.30 miles)**

1.2 WSDOT Functional Classification Methodology

The *Federal Highway Administration (FHWA) Directive 23 CFR 470* dictates that state transportation agencies maintain the primary responsibility for determining statewide highway functional classifications in rural and urban areas. At the state level, the Washington State Legislature in *RCW 47.05.021* dictates WSDOT to "analyze the entire state highway system to 'subdivide', classify, and sub-classify all designated state highways according to their function and importance. These two directives serve as the driver for WSDOT's functional classification initiative, as described on the *WSDOT Functional Classification* webpage. Within recent years, WSDOT has updated their methodology for determining highway functional class. Here, a brief history will be presented on how WSDOT developed their methodology for assigning functional class designations and what standards they currently follow.

Prior to October 2013, WSDOT outlined their protocol for assigning functional classifications through their *Detailed Functional Classification Criteria* document. This document lists the criteria for establishing functional classes that WSDOT adheres according to:

- Type and magnitude of travel generators.
- Route feasibility and directness of travel.
- Traffic characteristics and trip length.
- Spacing between types of functional classes.
- Continuity of various functional classes.
- Multiple service capability (accommodation of other modes of transportation).
- Relationships of functional classes to transportation plan(s).
- Miles and travel classification control values.
- Integration of classification of adjoining jurisdictions.

The criteria related to type and magnitude of travel generators are referenced to the generators that concern: travel, population, recreational/cultural, industrial, commercial, and governmental. Each type of travel generator describes the thresholds for classifying a particular functional class within the framework of principal arterial, minor arterial, major collector, or minor collector, respectively, in either the rural or urban type setting. Feasibility of route and directness of travel are considered where a choice of routes between areas has less than a 10% difference in distance. Traffic characteristics relate to trip purpose and type of travel service the route is intended to provide: interstate and statewide, interregional, interregional and intercounty, and intracounty. Spacing is another element that serves as a qualifier for accomplishment of service, where travel setting affects the manner in which traffic flow is accommodated to travel generators. System continuity impacts the functional classification for principal and minor arterials, with ending termini at a junction with an equal or higher functionally classified facility. Multiple service capability weighs the impact that other transportation modes have on normal traffic flow. Relationship of route to transportation plan is only considered in situations in the classification evaluation process where transportation plans have been developed. Classification controls deal with miles by functional class and travel by functional class within rural and urban systems; these controls are more directly tied to incorporated zonal limits and area boundaries. System integration represents the final step in the classification process which reviews the classifications of individual roadways, within the larger context of areas and regions, involving interagency collaborations to present a statewide classification of roadways.

In 2013, WSDOT, in cooperation with the FHWA, implemented procedures for adjusting the Urban Area (UA) boundaries due in part to the 2010 Census. Thus, the *2010 Census Adjusted Urban Area (AUA) Boundaries* program recognizes the impact that changes in boundary determination will have on defining breaks between rural and urban areas. In response to these changes, WSDOT provides various guides that define the requirements and procedures for local agencies and Metropolitan Planning Organizations (MPOs) for requesting changes to the UA boundaries on the *2010 Census Adjusted AUA Boundaries* webpage. As a result of the 2010 Census, WSDOT released the *2010 Census Urbanized Areas and Urban Clusters Map* that highlights urban areas according to information provided by the US Census Bureau.

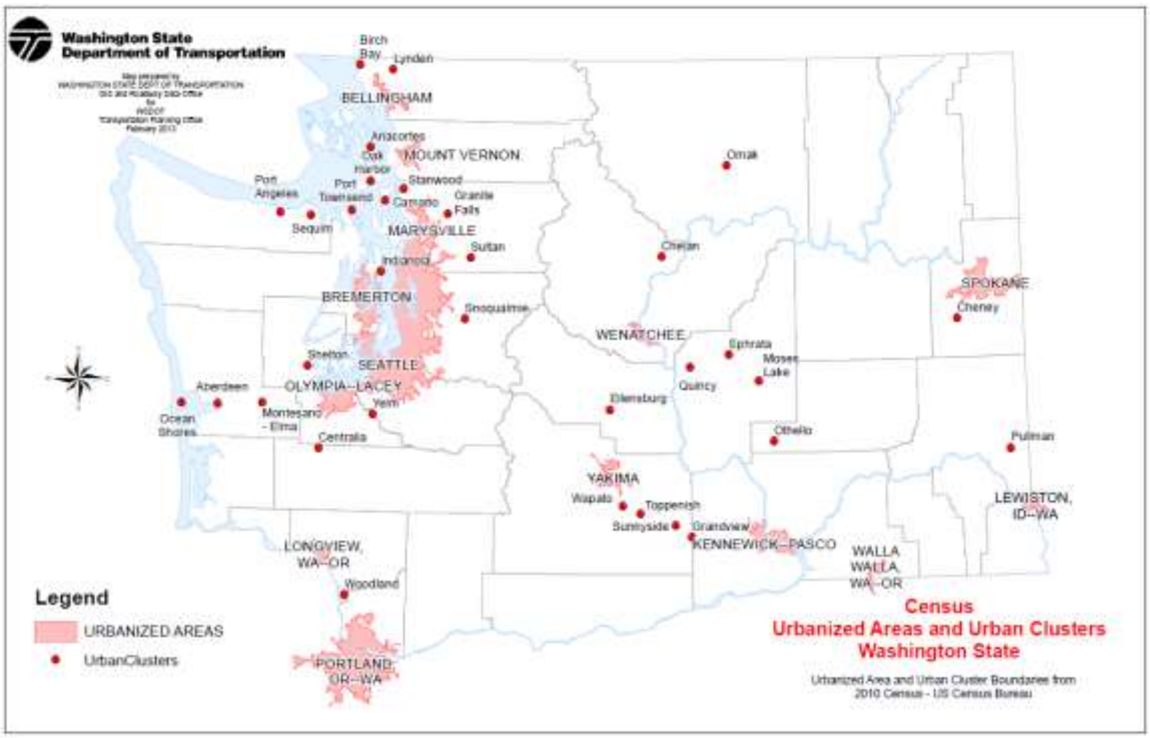

Figure 1.2: WSDOT Census Urbanized Areas and Urban Clusters Map.

As outlined by WSDOT's *Guidance for Urban Area Boundary Adjustment in Washington State*, UA boundary adjustments are negotiated among MPOs, local officials, and WSDOT before being submitted for approval by the FHWA. As defined by the US Census for population size, Urban Area Types are defined as 'Urban Clusters' for populations of 2,500 – 49,999 and 'Urban Areas' as 50,000+. The FHWA defines Urban Area Types as 'Small Urban Area' for populations of 5,000 – 49,999 and 'Urbanized Area (UZA)' for populations 50,000+. Most importantly, the UA boundary adjustment procedure must be completed before any functional classification adjustments can be made.

The Boundary Review Team is responsible for reviewing boundary adjustment proposals from MPOs and local regional planning agencies, and coordinating adjustment decisions to the various stakeholders involved in the boundary determination process before submitting AUA recommendations for FHWA approval. In the summer of 2013, the FHWA approved the resulting Highway Urban Area (HUA) boundaries as a result of the AUA process. Subsequently, all counties and MPOs affected by the HUA boundary changes had been asked to review their roads on August 13, 2013 and October 16, 2013, respectively. Figure 1.3 illustrates the basic steps required in the functional classification change request process.

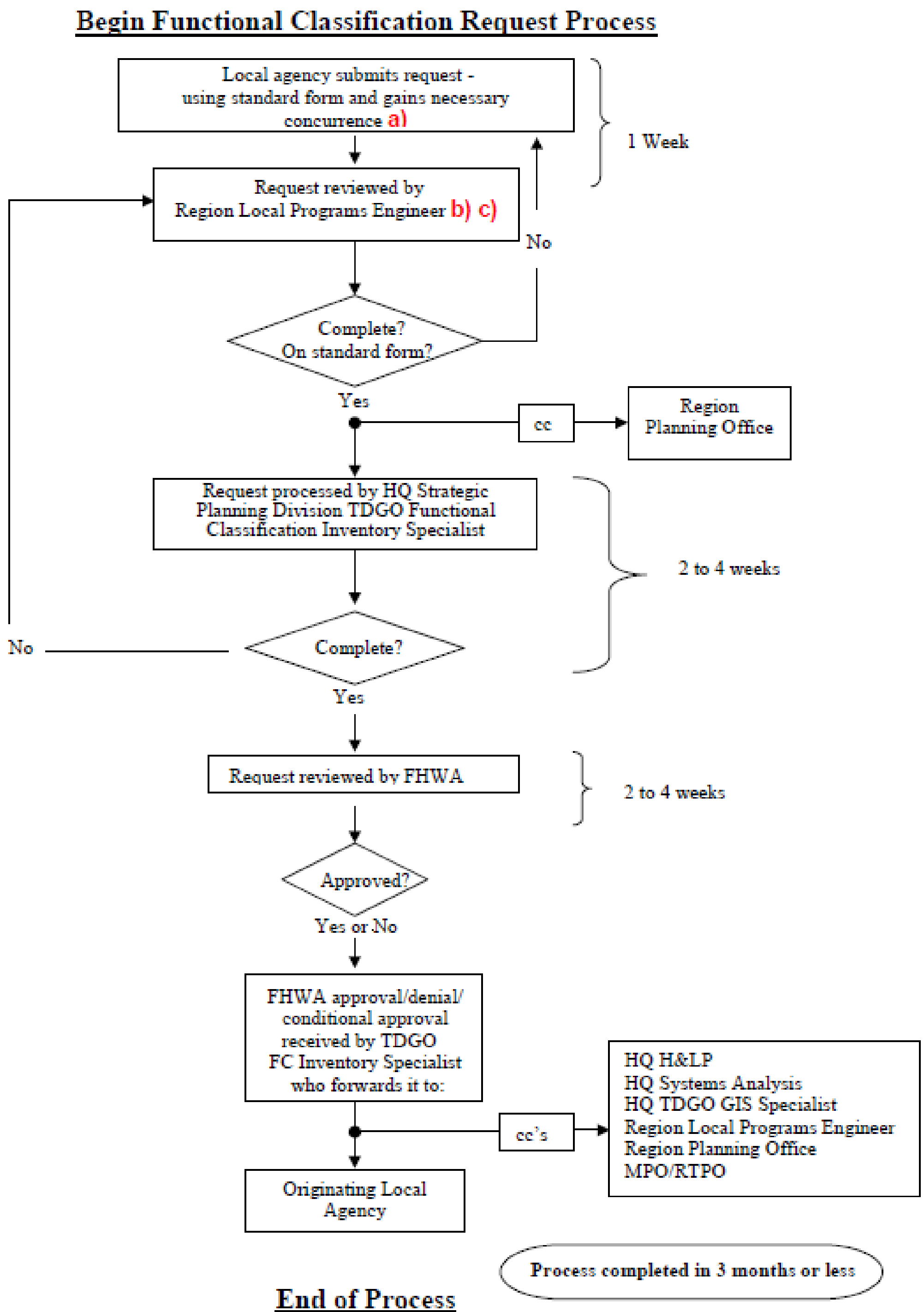

Figure 1.3: WSDOT Functional Classification Request Flow Chart.

The functional classification process was scheduled to occur from July 3, 2013 to December 31, 2013 where arterial or collector changes in classification were to be submitted to WSDOT for approval and input into WSDOT systems.

WSDOT released the *Guidelines for Amending Functional Classification in Washington State* document in October 2013 to assist state authorities in the functional classification process. This document builds upon the *Highway Functional Classification: Concepts, Criteria and Procedures, 2013 Edition* by providing additional details and clarification to the methods and considerations involved in the process. This comprehensive guidance document explains the critical concepts and criteria while also providing some real-world examples of applying the functional classification methodology throughout the procedure. Some key changes covered in the *Guidelines for Amending Functional Classification in Washington State* document includes:

- Upgrading the functional classification of rural/urban should predominantly be driven by an actual change in function, as opposed to the location of an urban/rural boundary.
- All available classification categories now exist in both urban and rural areas, rather than different codes systems for rural and urban areas that existed in the previous Highway Performance Monitoring System (HPMA).
- For Washington State, the Functional Class (FC) numbering system is clarified by the FHWA by including additional subdivisions to ensure the symmetry in the categories for urban and rural classifications: Urban Collector subdivision included in Major and Minor Collector; Rural Other Principal Arterial subdivision into Other Freeway/Expressway and Other Principal Arterial.

The functional classification concepts are discussed to outline the role that the roadway segment plays in accommodating traffic flow in the network. Among the considerations that are referenced in in the *Guidelines for Amending Functional Classification in Washington State*, roadway access and mobility, efficiency of travel, collectors, access points, speed limit, route spacing, usage in terms of AADT volumes and Vehicle Miles of Travel (VMT), number of travel lanes, regional and statewide significance, and system continuity. The criteria that govern functional classification are presented in the different types of roadway functional class:

- Interstates – the highest classification of arterials offering high levels of mobility.
- Other Freeways and Expressways – similar to interstates, but with separated directional travel lanes, limited on- and off-ramp locations, and very limited at-grade intersections.
- Other Principal Arterials – provides high degree of mobility while also directly serving abutting land uses in major centers of metropolitan areas.
- Minor Arterials – offers connectivity to higher arterial systems while also providing intra-community continuity; typically provides high overall travel speeds in rural areas.
- Major and Minor Collectors – in general, major collector routes are longer in length with lower connecting driveway densities, higher speed limits, greater space intervals, higher AADT, and more travel lanes than minor collectors.
- Local Roads – accounts for the greatest mileage of all roadways; are not intended for long distance travel aside, from the origin/destination terminal of a trip, because of direct access to abutting land.

The decision process for assigning functional classifications stems from the characterization of the travel service provided by the roadway. The overall decision process in the functional classification system, as shown in the *Guidelines for Amending Functional Classification in Washington State*, is displayed in Figure 1.4.

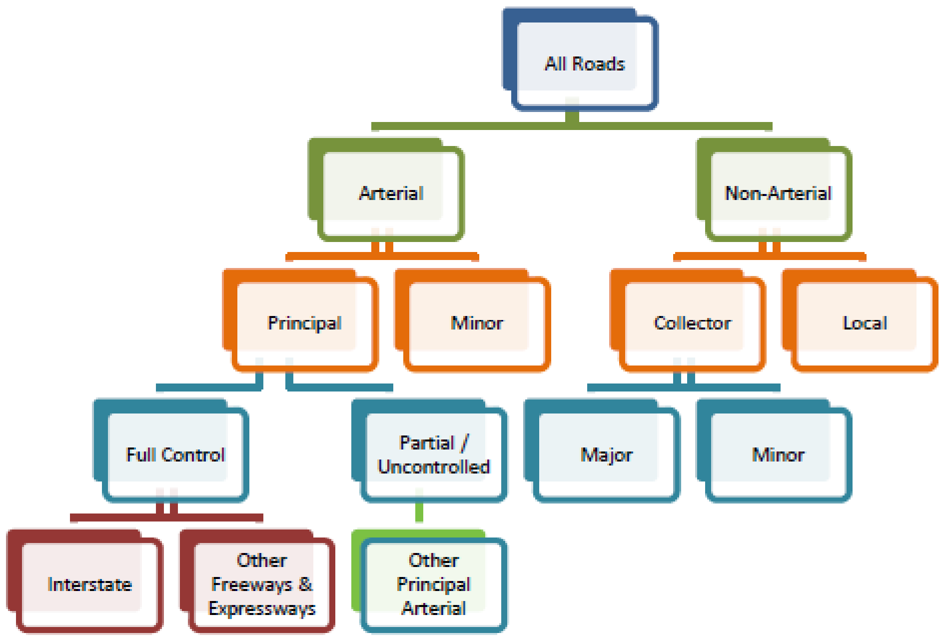

Figure 1.4: Federal Functional Classification Decision Tree (FHWA).

It is important to note the emphasis on roadway function and service over the urban/rural distinction. While land development patterns are considered in the peripheral of the functional classification process, the determination should be explicitly based on actual functional criteria rather than the location of the roadway within an urban or rural context. On December 31, 2013 WSDOT submitted the boundaries and functional classification changes to the FHWA for approval, with the resulting data to be reported by June 15, 2014.

The methodology employed by WSDOT and FHWA incorporates various elements in the determination of roadway functional class. The many concepts and considerations in the evaluation process make the task of assigning functional classifications complex. If the functional classifications were to be limited to key elements, the task of assigning functional classifications will become simplified. This report will present two methods of assigning functional class: by population and by AADT. The motivation of isolating functional classifications to a single qualifier is two-fold: 1) to demonstrate a simplistic, efficient and effective methodology for assigning functional class and 2) illustrate the impact that functional classifications may have on safety modeling with the two methods of functional class determination. The ramifications of such a method would have wide ranging policy implications concerning WSDOT and FHWA functional class determination. That is, if this demonstration of assigning functional class proves to be both efficient and effective, then the various planning organizations and governing bodies may be able to consolidate their efforts to focus on the single-determining factor of functional class assignment. This would essentially streamline the request and review process that local, MPO, regional, and state agencies must undergo in order to classify/reclassify roadway functional class to satisfy the directives set forth by the FHWA.

1.3 Organization of Report

The report is organized in the following manner:

Data Description – the four data sources of accident, roadway geometrics, AADT, and functional class will be described in their source formats as they were obtained from WSDOT. The final database, expressed in the format of homogeneous roadway segments, will be explained and the parameters within the dataset will be presented.

Functional Classification (Centerline Miles) – geographical classifications of Rural, Small Urban, Small Urbanized, Large Urbanized, and Metropolitan will be described and the manner in which they are assigned according to population and AADT based metrics will be introduced. The method for validating the functional class centerline miles with the WS Highway Log centerline miles will be discussed. Comparison tables between the population and AADT based methods will be presented in several matrices in units of centerline miles.

Functional Classification (Segments) – the population and AADT comparison matrices will be expressed in counts of homogeneous roadway segments based on WSDOT's definition of function class: Interstate, Principal Arterial, Minor Arterial, and Collector roadways. The matrices will evaluate segments of all functional class types as well as each functional class individually. The chapter will conclude by examining the comparison matrices for all Non-Interstate related homogeneous roadway segments.

Crash Summary – the report will conclude with crash summaries being shown for the crash descriptors of total crash count, impact location, collision severity, number of vehicles involved, and collision type. The tables will be presented in the first section on the basis of roadway functional class, followed by roadway geographic class in the second section. The functional classification tables will show the four functional class types disaggregated by Urban and Rural area. The geographic classification crash tables will compare and contrast the differences in the crash counts between the AADT and population based methods of assignment.

2.0 Data Description

All data has been provided by or obtained from WSDOT sources. The crash data analysis centers on the accident records for three years of raw crash data, 2010 to 2012, for all highways in Washington State. Roadway geometric data includes information pertaining to horizontal and vertical alignment, as well as lane and roadway and shoulder configurations. AADT information was extracted from the ArcGIS metadata files downloaded from WSDOT's GeoData Distribution Catalog webpage; the final crash database utilizes the AADT obtained from Traffic Section counts. Similarly, State Route Functional Class data was also extracted from the ArcGIS metadata file from the same GeoData webpage. This data file provides both the federal functional class description and the state functional class description on a segmentation basis. Both the AADT counts and the State Route Functional Class data were cross-referenced with Washington State Highway Logs to account for and ensure consistency across all recorded highway segments. These four sources of data have been combined and integrated to create a homogeneous segments crash database segmented according to roadway geometric features. Of particular interest with the final crash database is the manner of assigning functional class designations by AADT and population counts. This chapter will describe the source data obtained from WSDOT, introduce the AADT and population based functional classification assignments, and will conclude with presentation of the complete three-year crash database.

2.1 Source Accident Data

The accident data, which is the most extensive of all WSDOT provided data, is presented in one single dataset that encompasses years 2010-2012. The accident data was requested from the WSDOT Transportation Data and GIS Office (TDGO), formally known as STCDO. This dataset includes 794,914 recorded observations for the 2010-2012 time frame with 210 columns. The extensive nature of the accident data encompasses information pertaining to collision identification, date and time, locational data, facility type, collision specific information, driver and passenger information, environmental conditions, and vehicle description. A portion of the crash descriptors refer to internal codes used by WSDOT and other agencies involved with crash investigation, however, most of the parameters thoroughly describe related factors that may have contributed or influenced the accident. This section will focus on the most pertinent crash related parameters while also briefly describe the general nature of the data recorded in the WSDOT source accident data. Table 2.1 on the subsequent pages lists all of the available parameters, in order of accident record, catalogued in the WSDOT source accident dataset.

Table 2.1: WSDOT Source Accident Dataset Parameters.

Parameter	
Collision Report Number	City Secondary Trafficway 1
State Reportable Indicator	City Secondary Trafficway 2
Intentional	State Route ID
Legal Intervention	State Route Mile Post
Medically Caused	State Route Mile Post Ahead_Back Indicator
County Name	State Route Accumulated Route Milepost or ARM
City Name	State Route Number
Collision Report Type	State Route Related Roadway Type
Date	State Route Related Roadway Qualifier
Year	State Route History_Suspense Indicator
Yearmo	State Route Region Name
Month Name	State Route_State Functional Class Code
Month Number	State Route Urban Rural
Day Of Week	State Route Urban Rural Code
Quarter Number	State Route Federal Functional Class Name
Full Time	State Route Federal Functional Class Number
Full Time 24	State Route Vehicle 1 Compass Direction Description
Hour 24	State Route Vehicle 1 Compass Direction Code
Number Of Fatalities	State Route Vehicle 1 Movement Description
Number Of Injuries	State Route Vehicle 1 Movement Code
Number Of Pedal Cyclists Involved	State Route Vehicle 1 Milepost Direction Description
Number Of Pedestrians Involved	State Route Vehicle 1 Milepost Direction Code
Number Of Motor Vehicles Involved	State Route Diagram Collision Type Description
City Primary Trafficway	State Route Diagram Collision Type Code
City Block Number	State Route Vehicle 2 Compass Direction Description
City Intersecting Trafficway	State Route Vehicle 2 Compass Direction Code
City Distance From Reference Point	State Route Vehicle 2 Movement Description
City Reference Point Miles_Feet Indicator	State Route Vehicle 2 Movement Code
City Compass Direction From Reference Point	State Route Vehicle 2 Milepost Direction Description
City Reference Point Name	State Route Vehicle 2 Milepost Direction Code

Table 2.1 (continued): WSDOT Source Accident Dataset Parameters.

Parameter	
First Impact Location__Effective Date 1_1_10 for City_County and Misc Traf	Most Severe Sobriety Type Code
First Impact Location Code__Effective Date 1_1_10 for City_County and Misc Traf	First Collision Type
Second Impact Location__Effective Date 1_1_10 for City_County and Misc Traf	First Collision Type Code
Second Impact Position Code__Effective Date 1_1/_10 for City_County and Misc Traf	First Object Struck
County Road Number	First Object Struck Code
County Road Milepost	Second Collision Type
County Road Mile Post Ahead_Back Indicator	Second Collision Type Code
County_Intersecting County Road Number	Second Object Struck
County_Intersecting County Road Milepost	Second Object Struck Code
County_Intersecting County Road Mile Post Ahead_Back Indicator	Junction Relationship
County_Federal Functional Class Name	Junction Relationship Code
Miscellaneous Trafficway Type	Weather
Miscellaneous Trafficway Primary Trafficway	Weather Code
Miscellaneous Trafficway Block Number	Roadway Surface Condition
Miscellaneous Trafficway Intersecting Trafficway	Roadway Surface Condition Code
Miscellaneous Trafficway Distance From Reference Point	Lighting Condition
Miscellaneous Trafficway Reference Point Miles_Feet Indicator	Lighting Condition Code
Miscellaneous Trafficway Compass Direction	Location Characteristics
Miscellaneous Trafficway Reference Name	Location Characteristics Code
Miscellaneous Trafficway Number	Roadway Characteristic
Miscellaneous Trafficway Mile Post	Roadway Characteristic Code
Miscellaneous Trafficway Secondary Trafficway 1	Workzone
Miscellaneous Trafficway Secondary Trafficway 2	Workzone Code
Most Severe Injury Type	Work Zone Construction Type Description
Most Severe Injury Type Code	Working Vehicle Ownership Desc
Collision Severity	Working Vehicle Ownership Code
Collision Severity Code	Investigative Agency
Most Severe Sobriety Type	Investigative Agency Code

Table 2.1 (continued): WSDOT Source Accident Dataset Parameters.

Parameter	
Ori #	Contributing Circumstance 3
Reporting Agency Long Name	Contributing Circumstance Code 3
Reporting Agency Short Name	MV Driver Miscellaneous Action 1
Hazardous Material	MV Driver Miscellaneous Action Code 1
Hazardous Material Code	MV Driver Miscellaneous Action 2
Fire	MV Driver Miscellaneous Action Code 2
Stolen	MV Driver Miscellaneous Action 3
Hit And Run	MV Driver Miscellaneous Action Code 3
Unit Number	Vehicle Type
Unit Type Description	Vehicle Type Code
Damage Threshold Met Indicator	Towed Indicator
Involved Person Type	Government Owned Indicator
Age	Vehicle Make
Gender	Vehicle Model
Air Bag Type	Vehicle Style
Ejection Status	Vehicle Year
Restraining System Type	Traffic Control Type Description
Helmet Use	Posted Speed Limit
Injury Type	Roadway Type Description
Seat Position	Roadway Type Code
Sobriety Level	Vehicle Classification
Alcohol Test Result	Vehicle Use
Dre Assessment Description 1	Registered State
Dre Assessment Code 1	Vehicle Action 1
Dre Assessment Description 2	Vehicle Condition 1
Dre Assessment Code 2	Vehicle Condition Code 1
Liability Insurance	Vehicle Condition 2
Unlicensed Driver	Vehicle Condition Code 2
On Duty Indicator	Vehicle Condition 3
Pedestrian_Pedalcyclist Clothing Visibility Type	Vehicle Condition Code 3
Pedestrian Pedacyclist Was Using	Sequence Of Event 1
Pedestrian Pedacyclist Type	Sequence Of Event Code 1
Pedacyclist Actions	Sequence Of Event 2
Pedestrian Actions	Sequence Of Event Code 2
Contributing Circumstance 1	Sequence Of Event 3
Contributing Circumstance Code 1	Sequence Of Event Code 3
Contributing Circumstance 2	Sequence Of Event 4
Contributing Circumstance Code 2	Sequence Of Event Code 4

Table 2.1 (continued): WSDOT Source Accident Dataset Parameters.

Parameter	
Compass Direction From	Gvwr
Compass Direction To	Hazardous Material Name
Commercial Carrier Address	Interstate Intrastate
Commercial Carrier City Name	Number Of Axles
Commercial Carrier State Code	Placard Number
Commercial Carrier Zip Code	Placard Suffix Type Code
Commercial Vehicle Cargo Body Type	Usdot Number
Commercial Vehicle Class	State Plane X
Commercial Vehicle Name Source	State Plane Y

The WSDOT identification parameters are based on unique identifiers assigned to each crash observation, reflected by such descriptors as: Collision Report Number, State Reportable Indicator, and Collision Report Type. The Collision Report Number serves as the identification number to distinguish each observation. As such, repeated Collision Report Numbers corresponds to multiple persons or vehicles involved in a single crash. Additional information related to the type of Collision Report is described in location-related identifiers such as County and City name. All observations in the three-year crash dataset are listed as having Collision Report type of City Street, County Road, Miscellaneous Trafficway, or State Route.

Date and Time information listed for each observation is extensive in that the date and time descriptors are expressed in various ways. For example, the Date of the accident is also further described by separate columns such as Month, Day of Week, and Quarter Number, which is more indicative of the time of year to imply seasonal considerations.

Location related information is of particular importance for matters related to assigning crash counts to the correct corresponding roadway segment within the proper milepost limits. Each recorded crash is assigned milepost markers and route identifiers. The milepost parameters include State Route Mile Post, State Route Mile Post Ahead/Back Indicator, and State Route ARM. In relation to the final crash database, the State Route ARM is the basis that the segments are disaggregated. Additionally, XY coordinate information is also available for some crash observations that provide a point location for the accident.

Roadway facility type data is expressed in attributes that describe the roadway or refer to the classification of the roadway where the accident occurred. State Route Related Roadway Type (RRT) and State Route Related Roadway Qualifier (RRQ) classify the roadway facility based on the identifying acronyms established by WSDOT. Perhaps most relevant for the purposes of this study, the functional class codes that describe the roadway are listed in the columns for State Route State Functional Class Code, State Route Urban Rural, State Route Federal Functional Class Name, and State Route Federal Functional Class Number. The State Functional Class Code consists of a two-character identification code with the prefix of R or U signifying rural or urban arterial classification. The numerical value associated with the R/U prefix is predicated on the classification code consistent with WSDOT and FHWA guidelines. The Urban Rural column simply lists whether the facility is considered as an urban or rural arterial, while the Federal Functional Class Name uses the FHWA standards for naming the facility (see FHWA Directive 23 CFR 470).

The category that contains the most extensive amount of information is the data describing the collision. This information will serve as the basis for the inputting crash severity, number of vehicles involved, and collision type attributes in the final homogeneous segments crash database. The crash severity data is captured in the columns of Collision Severity (Fatal, injury, or Property Damage Only (PDO)) and Injury Type (Dead at Scene, Dead on Arrival, Died in Hospital, Evident Injury, No Injury, Possible Injury, Serious Injury, or Unknown). The number of vehicles involved in the accident is captured in the vehicle prefix descriptors; in some cases, like hit-fixed-object crashes, the Vehicle 2 prefix in not applicable. Collision type information is presented in the column for First Collision Type (Same Direction Rear End, One Park One Moving, Entering at Angle, Same Direction Sideswipe, etc.). The WSDOT source data also provides other columns to describe the accident in more detail with parameters such as: Contributing Circumstance 1, MV Driver Miscellaneous Action 1, and State Route Diagram Collision Type Description.

Data determined to be related to driver information includes role of the individual (passenger, driver, pedestrian) in the accident identified in the column Involved Person Type, as well as some basic demographic related data (Age, Gender). Some driver/vehicle related crash outcomes are also described in relation to deployment of airbag, ejection status of occupant, and most importantly, the resulting Injury Type to the individual involved in the crash. Crash contributing factors are described by Sobriety Level, Alcohol Test Result, Restraining System Type, and Seat Position. For pedestrians and bicyclists, the source data presents columns to describe those nonmotorized travelers with Pedestrian/Pedacyclist Clothing Visibility Type, Pedestrian Pedacyclist Type, Pedacyclist Actions, and Pedestrian Actions.

Environmental conditions data depict the physical environment at the time of the reported crash. These environmental descriptors detail the roadway environment, weather conditions, and special circumstances in columns such as Weather, Roadway Surface Condition, and Lighting Condition. Weather succinctly illustrates the climate conditions at the time of the reported crash; the Weather classifications are limited to visibility-related designations. Similarly, the Roadway Surface Condition category identifies the elements on the roadway at the time of the reported crash and are appropriately labeled as dry, ice, oil, other, sand/mud/dirt, snow/slush, standing water, unknown, or wet. Lighting Conditions identifies the source of illumination while loosely implying the time of day by indicating daylight or dark with or without street lights. Location Characteristics highlight unique features (bridge, parking lot, shopping mall, tunnel, etc.) of the arterial that may have some involvement with those particular crashes; for the majority of the observations, this column remains blank. Roadway Characteristic provides a concise description of the geometrics for the arterial; these descriptions simply identify if the roadway was straight or had some type of curve. The Work Zone descriptor is not applicable to all observations as it is contingent on the presence of a work zone at the location of the reported crash.

Vehicle descriptors in the WSDOT source accident data define both personal and commercial vehicles involved in the accident. Of note, commercial carrier and commercial vehicle information only applies if those type of vehicles were involved in the reported accident. The vehicle involved in the crash, regardless of personal or commercial transport classification, is described by Vehicle Type, Vehicle Make, Vehicle Model, Vehicle Style, Vehicle Year, and Registered State. Vehicle Action 1 describes what activity the vehicle was engaged in at the time of the crash, while Vehicle Condition 1 pertains to the operating condition of the vehicle prior to involvement in the crash. For instance, if the vehicle's headlights were not in operating condition prior to the crash, it may be a contributing factor to causing the accident.

2.2 Source Roadway Geometrics Data

The WSDOT TDGO provided the roadway data for horizontal alignment, vertical alignment, number of lanes and roadway width, and shoulder width information. These files compile the geometric data for 2010 and 2011; the 2012 geometric data utilized the same information as 2011 since 2012 geometric data was unavailable at the time of request. The roadway geometric data will be included in the complete crash database that contains elements of horizontal and vertical alignment, number of lanes and roadway width, and shoulder width.

The WSDOT horizontal alignment data lists the main components of each horizontal curve captured in 19 columns. All of the horizontal curves listed progress in the increasing mile post direction expressed in segments by mile post and includes 17,769 observations for the 2010 dataset, and 17,870 observations for 2011, an increase of 101 additional curves in a two year time span. The horizontal curve elements included in this dataset are listed in Table 2.2.

Table 2.2: WSDOT Horizontal Alignment Data.

Horizontal Alignment Attribute	Definition
LRS_Date	Date input into Linear Referencing System
SRID	State Route ID
SR	State Route
RRT	Related Route Type
RRQ	Related Route Qualifier
BegARM	Beginning Accumulated Route Mileage
EndARM	Ending Accumulated Route Mileage
BegMP	Beginning Mile Post
BegAB	Beginning Mile Post Ahead/Back
EndMP	Ending Mile Post
EndAB	Ending Mile Post Ahead/Back
HorizontalCurvePointOfTangencyArm	Horizontal Curve PT Accumulated Route Mileage
HorizontalCurvePointOfCurvatureArm	Horizontal Curve PC Accumulated Route Mileage
HorizontalCurveType	Horizontal Curve or Angle
HorizontalCurveRadius	Radius of Curve (R)
HorizontalCurveMaximum(Super)Elevation	Max Super Elevation (e)
HorizontalCurveLength	Length of Curve (L) in feet
HorizontalCurveDirection	Curve Left or Curve Right
HorizontalCurveCentralAngle	Angle of Deflection (Δ) in degrees

The horizontal curve data is expressed on a segment basis according to accumulated route mileage (ARM) markers. The addition of 101 observations between 2010 and 2011 is reflected in the difference among average values for horizontal alignment characteristics between 2010 and 2011, as shown in Table 2.3 on the next page.

Table 2.3: Average WSDOT Horizontal Alignment Values for 2010 and 2011.

Year	**2010**	**2011**
HorizontalCurvePointOfTangencyArm	69.79	69.42
HorizontalCurvePointOfCurvatureArm	69.68	69.30
HorizontalCurveRadius	2265.28	2274.17
HorizontalCurveMaximum(Super)Elevation	0.01	0.01
HorizontalCurveLength	585.43	584.53
HorizontalCurveCentralAngle	2609.74	2607.78

Between the two databases, the maximum values are consistent from 2010 to 2011 and report the same locations. The maximum curve radius identified is designed at 70,000 feet between ARM 67.02 and 67.32 along SR 82. The maximum super elevation of 0.2 is located along SR 3 between ARM 53.19 and 53.48. The greatest curve length of 12,683 feet is located between ARM 104.63 and 107.03 on SR 82. The largest central angle is located on a horizontal curve that spans from ARM 0.08 to 0.22 on SR 167.

The vertical alignment data includes all pertinent vertical curvature information for all State Routes described in 23 columns. For 2010, there are 34,260 recorded vertical curves while 2011 maintains 34,426 observations, an increase of 226 additional vertical curves over the course of two years. This WSDOT provided vertical alignment data uses different nomenclature to reference all vertical curve attributes to mile post markers. For instance, instead of using the definition of Vertical Point of Curvature (VPC), the raw data references the Beginning Vertical Curve Accumulated Route Mileage. A description of the WSDOT vertical alignment data is displayed in Table 2.4 on the following page.

Table 2.4: WSDOT Vertical Alignment Data.

Vertical Alignment Attribute	Definition
LRS_Date	Date input into Linear Referencing System
SRID	State Route ID
State Route Number	State Route
Related Route Type	Related Route Type Code
Related Route Qualifier	Related Route Qualifier Code
Begin ARM	Beginning Accumulated Route Mileage
End ARM	Ending Accumulated Route Mileage
Begin SRMP	Beginning State Route Mile Post
Begin AB	Beginning Mile Post Ahead/Back
End SRMP	Ending State Route Mile Post
End AB	Ending Mile Post Ahead/Back
Begin SRMP2	Beginning State Route Mile Post (Ahead/Back)
End SRMP2	Ending State Route Mile Post (Ahead/Back)
Related Roadway Type Description	RRT Definition
State Route Description	State Route and Cross Street
RRT_RRQ	RRQ Definition
Vertical Curve Bvc Arm	Beginning Vertical Curve Accumulated Route Mileage
Vertical Curve Vpi Arm	Vertical Point of Intersection Accumulated Route Mileage
Vertical Curve Evc Arm	Ending Vertical Curve Accumulated Route Mileage
Vertical Curve Type	Crest or Sag Curve
Vertical Curve Length	Length of Curve (ft)
Vertical Curve Percent Grade Ahead	Grade (%) ahead of Curve
Vertical Curve Percent Grade Back	Grade (%) back of Curve

Although the recorded number of vertical curves increases by 226 from 2010 to 2011, there is no calculated difference among the average values of all observations for vertical curve length and vertical curve percent grade ahead or back between the two years (315 feet, 0, and 0 respectively). The maximum recorded value for vertical curve length is 6,700 feet located along SR 82 between ARM 106.24 and 107.51. The steepest vertical curve percent grade ahead is 16.13% along an Angle Point Curve at ARM 28.65 of SR 503; similarly, the steepest vertical curve percent grade back is located at ARM 28.66 of the same route. These maximum values are found at the same locations for the 2010 and 2011 datasets.

The WSDOT data for the number of lanes and roadway width information differentiates between the increasing and decreasing mile post directions for the State Routes. The 2010 dataset contains 8,519 observations while the 2011 dataset lists 8,549 rows, and increase of 30 observations over the period of two years. The WSDOT data captured in the 16 columns describing number of lanes and roadway information is listed in Table 2.5 on the next page.

Table 2.5: WSDOT Number of Lanes and Roadway Width Data.

Number of Lanes and Roadway Width Attribute	Definition
LRS_Date	Date input into Linear Referencing System
SRID	State Route ID
SR	State Route
RRT	Related Route Type
RRQ	Related Route Qualifier
BegARM	Beginning Accumulated Route Mileage
EndARM	Ending Accumulated Route Mileage
BegMP	Beginning Mile Post
BegAB	Beginning Mile Post Ahead/Back
EndMP	Ending Mile Post
EndAB	Ending Mile Post Ahead/Back
RoadwayDirection	Increasing or Decreasing or Both ways
NumberOfLanesIncreasing	Number of Lanes in Increasing Direction
NumberOfLanesDecreasing	Number of Lanes in Decreasing Direction
RoadwayWidthInc	Roadway Width (ft) in Increasing Direction
RoadwayWidthDec	Roadway Width (ft) in Decreasing Direction

When examining the average values among all observations within the 2010 and 2011 lane and roadway datasets, the average number of lanes in the increasing and decreasing direction do not change with both remaining at 2 lanes over the two-year period. Moreover, the calculated average roadway width in the increasing direction does not incur any difference at 23 feet for the 2010 and 2011 datasets. However, in regard to the decreasing direction, the average roadway width increases from 22 feet in 2010 to 23 feet for 2011. The maximum recorded values are the same for the two year datasets with six lanes in the increasing direction, five lanes in the decreasing direction, a maximum of 99 feet for roadway width in the increasing direction and 96 feet in the decreasing direction, respectively.

Similar to the lane configuration data, the WSDOT shoulder width data also accounts for increasing and decreasing mile post directions for the State Routes. The shoulder locations are referenced as Left, Left Center, Right Center, and Right. For 2010, there were 9,042 recorded shoulder width observations while 2011 recorded 9,056 observations; an increase of 14 observations over the two-year span. The shoulder width descriptors and their associated definitions are listed on the next page in Table 2.6.

Table 2.6: WSDOT Shoulder Width Data.

Shoulder Widths Attribute	Definition
LRS_Date	Date input into Linear Referencing System
SRID	State Route ID
SR	State Route
RRT	Related Route Type
RRQ	Related Route Qualifier
BegARM	Beginning Accumulated Route Mileage
EndARM	Ending Accumulated Route Mileage
BegMP	Beginning Mile Post
BegAB	Beginning Mile Post Ahead/Back
EndMP	Ending Mile Post
EndAB	Ending Mile Post Ahead/Back
RoadwayDirection	Increasing or Decreasing or Bothways
ShoulderWidthLeft	Shoulder Width (ft) of outer portion of Decreasing Direction
ShoulderWidthLeftCenter	Shoulder Width (ft) of median side of Decreasing Direction
ShoulderWidthRightCenter	Shoulder Width (ft) of median side of Increasing Direction
ShoulderWidthRight	Shoulder Width (ft) of outer portion of Increasing Direction

There exists no calculated difference between the average and maximum recorded shoulder widths values for the 2010 and 2011 datasets. The average shoulder width left and shoulder width right is calculated to be 5 feet, while the average shoulder width left center and right center remains at 1 foot. A maximum of 37 feet is the distance of the left shoulder width, while the right shoulder width maximum value is 40 feet. The greatest shoulder width for the left center and right center is 20 and 36 feet respectively.

2.3 Source AADT Data

The WSDOT GeoData Distribution Catalog webpage offers publically available data for download organized by transportation features, political and administrative features, geographic reference data, and environmental features. This downloadable data is provided in the form of ESRI shapefiles, which also includes the metadata files that accompany the shapefile information. Under the transportation features category, the Traffic Count Data file was downloaded from the GeoData Catalog webpage. Since this study examines highway crashes on a segmentation basis, the TPT Traffic Sections data was selected for download as opposed to the TPT Traffic Counts file which provides count information at specific point locations. The files selected for download include the TPT Traffic Sections data for years 2010, 2011, and 2012. The metadata files were extracted via ArcGIS and report the following information shown in Table 2.7.

Table 2.7: WSDOT TPT Traffic Sections Data.

AADT Attribute	Definition
FID	Internal Feature Number (sequential)
Shape *	Feature Geometry
OBJECTID	Internal Feature Number (sequential)
SRID	State Route Identifier
Begin_ARM	Beginning Accumulated Route Mileage
End_ARM	Ending Accumulated Route Mileage
Location	Milepost Count Locations and Ahead/Back indicator
Year_20**	WSDOT calculated AADT for specified year
LOC_ERROR	Error (if any) produced in LRS at time of input
RteType	Route Type: IS (Interstate), SR (State Route), US (United States)
Shape_Leng	Shape Length (coordinate defining measure)

The WSDOT TPT Traffic Sections data contains 5,388 counts for year 2010, 5,290 counts for year 2011, and 5,236 counts for year 2012. From this source data, the AADT counts will be input into the 2010-2012 crash database according to the segments defined by the mile post locations. The varying number of segments for each year does not impact the AADT inputs into the final crash database because the homogeneous segments are more finite in length. The homogeneous segments captured within the WSDOT TPT Traffic Sections data are input with the associated AADT values reported for those segment milepost limits.

2.4 Source Functional Classification Data

Also from the WSDOT GeoData Distribution Catalog webpage, the Functional Class, State Routes file under the transportation features category was downloaded for inclusion into the final crash database. The functional class observations were input by WSDOT based on the procedures previously explained in Section 1.2 WSDOT Functional Classification Methodology. Following the same process as the AADT data, the Functional Class, State Routes metadata file was extracted through ArcGIS to report the following information displayed on the following page in Table 2.8:

Table 2.8: WSDOT Functional Class State Routes Data.

Functional Class Attribute	Definition
OBJECTID *	Internal Feature Number (sequential)
Shape *	Feature Geometry
LRS_Date	Date input into Linear Referencing System
BegARM	Beginning Accumulated Route Mileage
EndARM	Ending Accumulated Route Mileage
BegMP	Beginning State Route Milepost
BegAB	Beginning State Route Milepost Ahead or Back
EndMP	Ending State Route Milepost
EndAB	Ending State Route Milepost Ahead or Back
Direction	Increasing or Decreasing Milepost direction
FederalFunctionalClassCode	Federal Highway Administration Numerical Code
FederalFunctionalClassDesc	Federal Highway Administration Code Definition
StateFunctionalClassCode	WSDOT Functional Class Code (Alphanumeric)
StateFunctionalClassDesc	WSDOT Functional Class Code Definition
LOC_ERROR	Error (if any) produced in LRS at time of input
RouteID	WSDOT Route Identifier
StateRouteNumber	Washington State Route Number
RelRouteType	State Route Related Roadway Type
RelRouteQual	State Route Related Roadway Qualifier
Shape.STLength()	Shape Length (coordinate defining measure)
Shape_Length	Shape Length (coordinate defining measure)

The available WSDOT Functional Class State Routes downloadable data only presented the functional class information for 2012; the 2010 and 2011 was unavailable for download on the GeoData Distribution Catalog website. The assigned functional class categories are shown on a segment basis according to accumulate route mileage and state route milepost markers. The 2012 dataset has 3,956 observations that show both the federal functional class designation as well as the state functional class designation for each stretch of roadway. Like the AADT data, the homogeneous segments captured within the WSDOT Functional Class State Route segments are input with the associated functional classes reported for those segment milepost limits.

The federal and state functional class designations from this dataset have been assigned according to standards and procedures established by the Federal Highway Administration and WSDOT. The homogenous segments crash database will show how the functional class designations will differ segment to segment if the designations were based on AADT and population thresholds. When assigning functional class designations by AADT and population counts, few changes in functional class labels were observed across the three year period of 2010 to 2012 for any individual segment. This would indicate that the federal and state functional class designations did not considerably change across the milepost segments within the WSDOT Functional Class State Routes downloadable data from 2010 to 2012.

2.5 Homogeneous Segments Crash Database 2010-2012

The development of the homogeneous segments crash database incorporates accident information, roadway geometrics, AADT counts, and functional class. The manner in which the final database was established began by first determining the segment lengths. The roadway segments were defined as segments that maintain consistency in roadway characteristics for the length of a particular stretch of roadway, with a new segment being defined when any of the roadway characteristics change. The roadway characteristics that determine the segmentation process are the roadway geometrics which include the WSDOT source roadway geometrics data described in Section 2.2: horizontal alignment, vertical alignment, number of lanes and roadway width, and shoulder width. The shortest segment length that maintains consistent roadway geometrics measures 0.009 miles in length. The total number of observations for the three year period of 2010 to 2012 is 323,085 segments of homogenous roadway, with 107,695 segments for each year.

A total of 97 parameters are captured in the database which covers roadway geometrics, crash type, accident severity, AADT counts, and functional class. The data and information was pulled from the sourced WSDOT data and integrated into the homogeneous roadway segment. The observations from the source data were input into the homogenous roadway segment format based on milepost markers recorded in the source WSDOT data. The WSDOT source accident data was input as counts or number of occurrences that occurred on any specific homogeneous roadway segment for each of the 2010 to 2012 crash years. The manner of accident tabulation for any particular roadway segment was determined by the recorded milepost location from the crash observations. The reported crashes were assigned to its corresponding homogeneous segment if the milepost location fell within the homogeneous segment milepost limits. These counts were accumulated for total crash count, impact location, collision severity, number of vehicles involved, and collision type on a segment-by-segment basis.

As described earlier, the roadway geometric data served as the basis for segmentation when creating the homogeneous roadway segments crash database. Not all segments contain complete roadway geometric information; these cells with omitted geometric information within the dataset were populated with the value -99 to signify missing data. Additionally, roadway geometric information was unavailable for year 2012; therefore, the roadway geometric information from 2011 was used as the basis for 2012. The segmentation process for homogeneous segments was standardized across the three year period; that is to say, the limits and attributes for the homogeneous segments from 2010 are the same for 2011 and 2012.

Section AADT information was used from the Annual Average Daily Traffic volumes along the state highway system in the WSDOT geospatial database, and matched to each segment according to milepost. Each homogenous segment was then classified based on one of five geographic classes: Rural, Small Urban, Small Urbanized, Large Urbanized, and Metropolitan. It was observed that areas designated as Rural did not always have low AADT levels and not all Metropolitan segments displayed high levels of AADT. In order to obtain finer resolution on the five geographical classes and to compare the definitions at the segment level, two sets of classifications were made based on section AADT and census population data.

Table 2.9 on the following pages lists the parameters in the homogenous roadway segments database with a brief description for each one.

Table 2.9: Homogeneous Roadway Segments Database Parameters.

Parameter	Description
SR	State Route
BegARM	Beginning Accumulated Route Mileage
EndARM	Ending Accumulated Route Mileage
Year	Crash Year
NumberOfLanesIncreasing	Number of Lanes in Increasing Direction
NumberOfLanesDecreasing	Number of Lanes in Decreasing Direction
RoadwayWidthInc	Roadway Width (ft) in Increasing Direction
RoadwayWidthDec	Roadway Width (ft) in Decreasing Direction
ShoulderWidthLeft	Shoulder Width (ft) of outer portion of Decreasing Direction
ShoulderWidthLeftCenter	Shoulder Width (ft) of median side of Decreasing Direction
ShoulderWidthRightCenter	Shoulder Width (ft) of median side of Increasing Direction
ShoulderWidthRight	Shoulder Width (ft) of outer portion of Increasing Direction
HorizontalCurvePointOfTangencyArm	Horizontal Curve PT Accumulated Route Mileage
HorizontalCurvePointOfCurvatureArm	Horizontal Curve PC Accumulated Route Mileage
HorizontalCurveRadius	Radius of Curve (R)
HorizontalCurveMaximum(Super)Elevation	Max Super Elevation (e)
HorizontalCurveLength	Length of Curve (L) in feet
HorizontalCurveCentralAngle	Angle of Deflection (Δ) in degrees
Vertical Curve Bvc Arm	Beginning Vertical Curve Accumulated Route Mileage
Vertical Curve Vpi Arm	Vertical Point of Intersection Accumulated Route Mileage
Vertical Curve Evc Arm	Ending Vertical Curve Accumulated Route Mileage
Vertical Curve Length	Length of Curve (ft)
Vertical Curve Percent Grade Ahead	Grade (%) ahead of Curve
Vertical Curve Percent Grade Back	Grade (%) back of Curve
totalacc	total count of roadside, roadway, and other location crashes in segment
rdside	count of roadside crashes in segment
rdway	count of roadway crashes in segment
othloc	count of other location crashes in segment
pdo	count of reported Property Damage Only from crashes in segment

Table 2.9 (continued): Homogeneous Roadway Segments Database Parameters.

Parameter	Description
pinj	count of reported Possible Injury from crashes in segment
evi	count of reported Evident Injury from crashes in segment
sinj	count of reported Serious Injury from crashes in segment
fatal	count of reported Fatal from crashes in segment
unknown	count of reported Unknown Injury from crashes in segment
hiinj	count of crashes in segment reporting more than one injury
justinj	count of crashes in segment reporting one injury
loinj	count of crashes in segment reporting no injuries
veh1	count of crashes in segment involving 1 vehicle
veh2	count of crashes in segment involving 2 vehicles
veh3	count of crashes in segment involving 3 vehicles
veh4	count of crashes in segment involving 4 vehicles
veh5	count of crashes in segment involving 5 vehicles
othveh	count of crashes in segment involving more than 5 vehicles
rend	count of Rear End type crashes in segment
trend	count of Turning Rear End type crashes in segment
sdirtsw	count of Same Direction Turning Sideswipe type crashes in segment
sdirsw	count of Same Direction Sideswipe type crashes in segment
sdirt	count of Same Direction Turning type crashes in segment
sdiroth	count of Same Direction Others type crashes in segment
headon	count of Head On type crashes in segment
odirsw	count of Opposite Direction Sideswipe type crashes in segment
odirt	count of Opposite Direction Turning type crashes in segment
fobj	count of Fixed Object type crashes in segment
eang	count of Entering At Angle type crashes in segment
oturn	count of Overturned type crashes in segment
animal	count of Animal type crashes in segment
bicycle	count of Bicycle type crashes in segment
ped	count of Pedestrian type crashes in segment
oneparkonemoving	count of One Parked, One Moving type crashes in segment
entlvdr	count of Entering/Leaving Driveway type crashes in segment
other	count of crashes classified as Other in segment
nostate	count of crashes classified as Not Stated in segment
StateFunctionalClass	Rural or Urban class indicator
FederalFunctionalClass	Federal Functional Class including 'Other Principal Arterial'
Functional class(4level)	Federal Functional Class 'Other Principal Arterial' captured in 'Principal Arterial'
Interstate	indicator for Interstate Functional Class type
Other Freeway/Expressway	indicator for Other Freeway/Expressway Functional Class type

Table 2.9 (continued): Homogeneous Roadway Segments Database Parameters.

Parameter	Description
Other Principal Arterial	indicator for Other Principal Arterial Functional Class type
Minor Arterial	indicator for Minor Arterial Functional Class type
Major Collector	indicator for Major Collector Functional Class type
AADT	WSDOT calculated AADT for specified year
Functional Class_AADT based	AADT based Geographic Classification
Functional Class_Population based	Population based Geographic Classification
Rural Rural	indicator for Rural AADT class and Rural population class
Small Urban Rural	indicator for Small Urban AADT class and Rural population class
Small Urbanized Rural	indicator for Small Urbanized AADT class and Rural population class
Large Urbanized Rural	indicator for Large Urbanized AADT class and Rural population class
Metropolitan Rural	indicator for Metropolitan AADT class and Rural population class
Rural Small Urban	indicator for Rural AADT class and Small Urban population class
Small Urban Small Urban	indicator for Small Urban AADT class and Small Urban population class
Small Urbanized Small Urban	indicator for Small Urbanized AADT class and Small Urban population class
Large Urbanized Small Urban	indicator for Large Urbanized AADT class and Small Urban population class
Metropolitan Small Urban	indicator for Metropolitan AADT class and Small Urban population class
Rural Small Urbanized	indicator for Rural AADT class and Small Urbanized population class
Small Urban Small Urbanized	indicator for Small Urban AADT class and Small Urbanized population class
Small Urbanized Small Urbanized	indicator for Small Urbanized AADT class and Small Urbanized population class
Large Urbanized Small Urbanized	indicator for Large Urbanized AADT class and Small Urbanized population class
Metropolitan Small Urbanized	indicator for Metropolitan AADT class and Small Urbanized population class
Rural Large Urbanized	indicator for Rural AADT class and Large Urbanized population class

Table 2.9 (continued): Homogeneous Roadway Segments Database Parameters.

Parameter	Description
Small Urban Large Urbanized	indicator for Small Urban AADT class and Large Urbanized population class
Small Urbanized Large Urbanized	indicator for Small Urbanized AADT class and Large Urbanized population class
Large Urbanized Large Urbanized	indicator for Large Urbanized AADT class and Large Urbanized population class
Metropolitan Large Urbanized	indicator for Metropolitan AADT class and Large Urbanized population class
Rural Metropolitan	indicator for Rural AADT class and Metropolitan population class
Small Urban Metropolitan	indicator for Small Urban AADT class and Metropolitan population class
Small Urbanized Metropolitan	indicator for Small Urbanized AADT class and Metropolitan population class
Large Urbanized Metropolitan	indicator for Large Urbanized AADT class and Metropolitan population class
Metropolitan Metropolitan	indicator for Metropolitan AADT class and Metropolitan population class

The functional class related parameters are the focal point of the homogeneous roadway segments crash database. While most of the data was obtained from WSDOT sources and formatted for input into the final crash database, the functional class parameters are the ones that address the nature of this study. The assigned WSDOT classifications are described in the parameters State Functional Class, Federal Functional Class, and Functional Class (4level), in addition to the indicators for each individual functional class type. The column for Functional Class AADT Based lists the geographic class that is assigned to the segment based on AADT alone. Alternatively, the Functional Class Population Based column labels the geographic class that is assigned to the segment based on population alone. The subsequent columns serve as indicators for the various combinations of functional classification based on AADT and functional classification based on population; the columns indicate whether the two geographic classifications match or not. As the homogeneous roadway segments crash database shows, there exist many observations in which the geographic class assigned on the basis of AADT for not match the geographic class assigned on the basis of population. The difference in the classifications illustrate the discrepancy that exists between using AADT and population for assigning geographic class, thus influencing the way in which functional class is assigned. The functional classification procedure for assignment based on population and AADT will be explained in the next chapter.

3.0 Functional Classification (Centerline Miles)

Section 1.2 discussed the procedure and protocol that WSDOT, in conjunction with the FHWA, follows in assigning functional classifications to roadway segments, and concludes by mentioning the process of assigning functional class by population and AADT. This chapter will introduce the process in which functional classifications were assigned by population and AADT counts. The two methods of assigning functional class are applied to the homogeneous segments crash database in which functional and geographic classifications are input into each observation. This chapter will begin by describing the procedures and conditions applying the geographical classifications of Rural, Small Urban, Small Urbanized, Large Urbanized, and Metropolitan, using the population and AADT criteria. The last section will discuss the validation process using the WSDOT Highway Logs, followed by comparisons between the population based and AADT based geographic and functional classifications in terms of centerline miles.

3.1 Population Based Geographic Type Classification

The source crash data provided by WSDOT was found to contain information on segment location by city and county. Census data was obtained for years 2010 to 2012 from the United States Census Bureau – U.S. Department of Commerce. The census data was found to contain population information at both county and city levels. This data was matched to the location information in the source data to obtain the area populations for each segment's location. Area names for several sections of roadway, predominantly in rural areas were absent in the source data. In order to assign them with a population estimate, WSDOT SRweb, and Geoportal were utilized to ascertain their area type or physical boundary. Segments for which area names were available were assigned a population count based on the census information available. This information was then used to categorize the segments into one of the five geographic classes, based on the following population criteria:

- Rural: < 5,000
- Small Urban: 5,000 – 49,999
- Small Urbanized: 50,000 – 199,999
- Large Urbanized: 200,000 – 499,999
- Metropolitan: > 500,000

3.2 AADT Based Geographic Type Classification

The source crash data obtained from WSDOT was found to classify the available routes within four functional classes: Principal Arterials, Minor Arterials, Collectors, and Interstates. The federal classifications for the same routes included an additional class with a distinction made between freeways/expressways and other principal arterials. To avoid repeated observations of freeway segments as Principal Arterials, the federal classifications were matched to the homogenous segments and all five federal classifications for functional class were included in this part of the study. Ranges were obtained from the FHWA guidelines to set the capacity levels for each functional class within each of the five geographical classes. The upper limits for Small Urban levels of AADT were also obtained from the FHWA guidelines and were used as a baseline to compute ranges of AADT for the higher order geographical classes, using volume to capacity ratios and the average number of lanes for each functional class. Table 3.1 shows the resulting ranges of AADT for each of the classes.

Table 3.1: AADT Ranges for Functional and Geographic Class.

Functional Class/ Geographic Class	Factors	Interstate	Other Freeways/ Expressways	Other Principal Arterials	Minor Arterials	Major & Minor Collectors
Metropolitan	Capacity	2,400	2,300	1,900	1,700	1,400
	V/C ratio	0.8	0.8	0.83	0.8	0.7
	Lane	8	6	4	2	2
	Boundary	153,600	110,400	63,080	27,200	19,600
Large Urbanized	Capacity	2,200	2,100	1,700	1,400	1,200
	V/C ratio	0.8	0.8	0.83	0.8	0.65
	Lane	6	6	4	2	2
	Boundary	105,600	100,800	56,440	22,400	15,600
Small Urbanized	Capacity	2,000	1,800	1,500	1,200	1,000
	V/C ratio	0.6	0.6	0.65	0.65	0.6
	Lane	6	4	4	2	2
	Boundary	72,000	43,200	39,000	15,600	12,000
Small Urban	Boundary	12,000	4,000	2,000	1,500	1,100

The ‘boundary’ values form an upper limit for the AADT range for each functional class within each geographic class; the Rural classification (not listed in the table) would be considered as anything less than Small Urban. These ranges were then matched to the AADTs for each homogenous segment to obtain the AADT based geographic classifications.

3.3 Highway Log Centerline Miles Validation

In checking the length of each route using the ARMs for each homogenous segment in the dataset, it was found that the total ARM lengths resulted in a figure about 300 miles in excess of the WSDOT highway log lengths. It was observed that the highway log ARMs were consistent with the homogenous segment ARMs and further investigation showed that the differences in length were in specific segments of routes that overlapped each other. These differences between ARM lengths and highway log lengths were matched to the overlapping segments, as a means of avoiding double counting the lengths while testing data consistency. One example of such a location is State Route 12, where the ARM length totals at 430.779 miles, while the highway log length is 106.38 miles less at 324.51 miles. It was found that SR12 overlapped with I-5 and I-82. After accounting for these overlaps, the homogenous segment data resulted in a total system mileage of 6,867.683 miles, which was found to be within acceptable limits of the WSDOT highway log total system length of 6,951.34 miles. Thus, the homogenous segment data was assembled based on specific criteria as a means of testing and ensuring its validity. A summary of the number of centerline mainline only miles based on 2010 ARM for principal arterial, minor arterial, and collector roadways is provided in Table 3.2, based on the homogeneous segments database.

Table 3.2: Functional Class Centerline Miles by Lane Configuration.

Number of Lanes	2-Lane	Multi-Lane	One-way
Principal Arterial	1,918.87	780.191	18.318
Minor Arterial	1,783.85	99.374	1.49
Collector	1,378.87	26.857	3.451
Total	5,081.59	906.422	23.259

Together, these three functional classes account for 6,011.267 miles of the 6,867.683 miles available. Principal arterials were found to comprise a total of 2,717.377 miles, of which 1,918.868 miles were 2-lane roadways, 780.191 were multi-lane roadways, and 18.318 miles being one-way. Of the 1,884.716 minor arterial miles, 1,783.852 miles were found to be 2-lane roadways, 99.374 miles were found to be multi-lane roadways with the remaining being one-ways. Similarly, collectors were found to be a total of 1,409.174 centerline miles, of which 1,378.866 miles were 2-lane roadways.

The functional classification of the homogenous segments using section AADT data and census population counts has been expressed in cumulative centerline miles. A segment wise comparison between the two classifications was made to show the similarities and differences in the resulting five geographical classifications from 2010 until 2012. Tables 3.3 and 3.4 show the summary of this comparison for 2010.

Table 3.3: Population Based Functional Class Centerline Miles by Geographic Classification.

Population Based	Rural	Small Urban	Small Urbanized	Large Urbanized	Metropolitan
Principal Arterial	1,935.036	521.684	190.364	36.095	34.198
Minor Arterial	1,701.500	131.176	49.616	2.424	0.000
Collector	1,344.655	49.208	11.672	3.639	0.000
Total	4,981.191	702.068	251.652	42.158	34.198

Table 3.4: AADT Based Functional Class Centerline Miles by Geographic Classification.

AADT Based	Rural	Small Urban	Small Urbanized	Large Urbanized	Metropolitan
Principal Arterial	453.379	2,112.08	138.105	7.543	6.270
Minor Arterial	716.077	1,052.298	65.598	13.994	36.749
Collector	652.946	685.351	7.989	26.742	36.146
Total	1,822.402	3,849.729	211.692	48.279	79.165

The largest differences were observed in the total centerline miles that fell under the Rural and Small Urban definitions. The population based classification resulted in 4,981.191 Rural centerline miles of roadway, while based on AADT, only 1,822.402 miles would fall under a Rural definition.

Similarly, Small Urban areas had a total of 702.068 centerline miles of roadway when classified by population, but 3,849.729 miles when described by AADT. Thus, segments that were being classified as falling within Rural areas were observing traffic volumes that would be expected in higher order geographic areas, something that was observed for Principal Arterials, Minor Arterials, and Collectors alike. These observations taken together suggest that a classification based solely on the population of the area that a segment falls within does not necessarily hold true based on the traffic volumes being observed along the segments.

Table 3.5 displays the centerline miles of roadway for each of the five geographic classifications based on section AADT data and census population information for Principal Arterials, Minor Arterials, and Collectors. The rows contain the centerline miles based on AADT while the columns show the centerline miles based on population and each cell shows the intersection of the respective geographic types. Thus, the diagonal entries show the number of miles where the classifications based on AADT and population matched, while the off-diagonal cells show the number of miles where the AADT classifications did not match with the population based classifications.

Table 3.5: Matrix of 2010 Population Based and AADT Based Functional Class Centerline Miles.

		Population Basis				
		Rural	**Small Urban**	**Small Urbanized**	**Large Urbanized**	**Metropolitan**
AADT Basis	**Rural**	1,742.492	51.43	26.355	2.125	0.000
	Small Urban	3,104.596	546.797	147.378	114.694	15.468
	Small Urbanized	70.864	66.299	54.256	4.562	15.672
	Large Urbanized	26.721	8.326	12.903	0.000	0.329
	Metropolitan	1,742.492	51.43	26.355	2.125	0.000

Of the 6,011.774 centerline miles of Principal Arterials, Minor Arterials and Collector roadways, the diagonal entries totaled to 2,343.545; only 38.983% of the geographic classifications by population corresponded to the classification based on observed AADT. The 3,108.709 miles that were classified as being within Rural areas based on population would fall under a Small Urban classification based on AADT. Similarly, 66.299 miles classified as being in Small Urban areas based on population would actually be considered as Small Urbanized based on AADT. These differences in geographical classification were less pronounced at the Large Urbanized and Metropolitan levels with the largest observed difference being 34.652 miles of roadway that were classified as being Large Urbanized based on population, but had small enough daily traffic volumes to be categorized as Small Urban by AADT.

Table 3.6 visualizes the percentage of the miles for each geographical definition type against the total system centerline miles of 6,011.267 for Principal Arterials, Minor Arterials and Collectors. The color scale employed in this table progresses in values from low to high with their corresponding color of green to red, with red signifying the highest percentage.

Table 3.6: Matrix of 2010 Population Based and AADT Based Functional Class Centerline Miles by Percent.

		Population Basis				
		Rural	Small Urban	Small Urbanized	Large Urbanized	Metropolitan
AADT Basis	Rural	28.99%	0.86%	0.44%	0.04%	0.00%
	Small Urban	51.65%	9.10%	2.45%	1.91%	0.26%
	Small Urbanized	1.18%	1.10%	0.90%	0.08%	0.26%
	Large Urbanized	0.44%	0.14%	0.21%	0.00%	0.01%
	Metropolitan	28.99%	0.86%	0.44%	0.04%	0.00%

As before, 90.65% of the total centerline miles fell within the Rural and Small Urban classifications. Approximately 80.69% of the total miles were classified as being Rural by population, only 28.98% of the centerline miles saw AADT classifications that correspond with a Rural area. The remaining 51.71% had annual daily traffic volumes that would be classified as being Small Urban. Another notable observation is that none of the Principal Arterial, Minor Arterial or Collector roadway miles that were classified as being Metropolitan or Large Urbanized by population actually fell within the corresponding categories based on AADT. This could be a result of either no corresponding segments, or perhaps an effect of low Metropolitan miles in comparison to Rural and Small Urban miles. This large difference in the total number of miles for each category could lead to a percentage of the total that is very close to zero. Additionally, 0.58% of Large Urbanized and 0.26% of Metropolitan areas by population were observed to have AADTs in the Small Urban ranges. Conversely, 0.61% of the Rural areas and 0.49% of the Small Urban areas by population were found to have Metropolitan levels of daily traffic volumes.

4.0 Functional Classification (Segments)

The centerline mileage matrices comparing population based and AADT based functional classes presented in Section 3.3, are presented in this chapter in counts of homogeneous segments. A total of 107,695 homogeneous roadway segments are account for each individual year of crash data. The functional classification matrices of AADT and population based measures will first be presented for all functional class segment types. The segment matrices will be further evaluated by presenting the comparison matrices for each specific WSDOT defined functional class: Interstate, Principal Arterial, Minor Arterial, Collector, and Non-Interstate segments.

All 107,695 homogeneous roadway segments for years 2010, 2011, and 2012 are shown in comparison matrices in Tables 4.1, 4.2, and 4.3. As with the centerline miles comparison tables, the rows represent the classifications based on AADT while the columns represent the classifications based on population, with each cell showing the intersection of the respective geographical classifications expressed in number of homogenous segments. The cells along the diagonal of the tables depict segments where the two types of classifications remained consistent with each other. The off-diagonal cells show segments that were classified as being of a certain geographical type by population but differences in AADTs resulted in differences in classification.

Table 4.1: Matrix of 2010 Population Based and AADT Based Functional Class Homogeneous Roadway Segments.

		2010 Population Basis				
		Rural	Small Urban	Small Urbanized	Large Urbanized	Metropolitan
2010 AADT Basis	Rural	27,379	1,067	436	65	4
	Small Urban	54,586	9,757	4,498	887	408
	Small Urbanized	1,471	1,604	1,348	128	378
	Large Urbanized	462	521	911	0	32
	Metropolitan	443	628	518	0	164

Table 4.2: Matrix of 2011 Population Based and AADT Based Functional Class Homogeneous Roadway Segments.

		2011 Population Basis				
		Rural	Small Urban	Small Urbanized	Large Urbanized	Metropolitan
2011 AADT Basis	Rural	28,718	1,381	794	94	18
	Small Urban	51,991	9,655	4,563	897	391
	Small Urbanized	2,026	1,298	1,133	68	271
	Large Urbanized	720	571	710	0	38
	Metropolitan	886	672	511	21	268

Table 4.3: Matrix of 2012 Population Based and AADT Based Functional Class Homogeneous Roadway Segments.

		2012 Population Basis				
		Rural	Small Urban	Small Urbanized	Large Urbanized	Metropolitan
2012 AADT Basis	Rural	29,054	1,695	1,123	104	50
	Small Urban	50,466	9,455	4,798	855	424
	Small Urbanized	2,615	1,228	747	43	174
	Large Urbanized	896	436	626	40	76
	Metropolitan	1,310	763	417	38	262

It should be noted that while the total number of homogenous segments remain the same over the three-year period, the number of segments in each category change depending on the adjustments in area population and traffic section AADT levels.

As observed in the centerline miles evaluation, the number of segments classified as Rural and Small Urban by AADT and population account for 86.15% of the total number of segments. While the number of segments in each category remains relatively consistent over the three years, some interesting observations could be made when aggregating some of the data. The number of segments classified as being Rural based on both population and AADT increased by 6% from 27,379 in 2010 to 29,054 in 2012. Conversely, the number of segments classified as being Rural based on population, but with Small Urban AADT levels, reduced by 7.55% from 54,586 in 2010 to 50,466 in 2012. The number of Rural segments by population that saw Metropolitan levels of traffic flow increased nearly threefold from 443 segments in 2010 to 1,310 segments in 2012. An increasing trend was also observed in the segments classified as Metropolitan by both measures wherein the number of homogenous segments increased from 164 in 2010 to 268 in 2011, and remained consistent through 2012. The largest changes were observed in the number of segments that fell within the Rural, Large Urbanized and Metropolitan classifications. The subsequent sections of this chapter will isolate the functional classifications of Interstates, Principal Arterials (Freeway/Expressway + Other Principal Arterial), Minor Arterials, and Collector roads to show the segment distribution among the geographic classifications.

4.1 Interstate Segments

The summary for all 7,459 homogenous Interstate segments is shown in Tables 4.4, 4.5, and 4.6. The greatest difference observed from 2010 to 2012 were in the number of segments classified as Small Urbanized by population and Rural by AADT levels, an increase from 51 homogenous segments in 2010 to 247 in 2012.

Table 4.4: Matrix of 2010 Population Based and AADT Based Functional Class Homogeneous Interstate Segments.

		2010 Population Basis				
		Rural	Small Urban	Small Urbanized	Large Urbanized	Metropolitan
2010 AADT Basis	Rural	211	37	51	0	4
	Small Urban	3,500	803	307	187	66
	Small Urbanized	255	211	194	0	0
	Large Urbanized	143	337	604	0	11
	Metropolitan	2	235	208	0	93

Table 4.5: Matrix of 2011 Population Based and AADT Based Functional Class Homogeneous Interstate Segments.

		2011 Population Basis				
		Rural	Small Urban	Small Urbanized	Large Urbanized	Metropolitan
2011 AADT Basis	Rural	243	38	143	0	18
	Small Urban	3,322	901	363	187	52
	Small Urbanized	317	139	110	0	0
	Large Urbanized	192	298	520	0	6
	Metropolitan	37	247	228	0	98

Table 4.6: Matrix of 2012 Population Based and AADT Based Functional Class Homogeneous Interstate Segments.

		2012 Population Basis				
		Rural	Small Urban	Small Urbanized	Large Urbanized	Metropolitan
2012 AADT Basis	Rural	274	40	247	10	35
	Small Urban	3,269	962	380	177	35
	Small Urbanized	201	159	85	0	0
	Large Urbanized	274	224	487	0	15
	Metropolitan	93	238	165	0	89

The total number of segments within each geographical classification by population remained the same over the three year span. Therefore, the differences observed in the number of corresponding segments by AADT are a result of the variations in AADT over the three year period. The number of homogenous segments that were classified as having Metropolitan, Small Urban and Large Urbanized levels of AADT showed the least amount of variation going from 2010 to 2012, while the number of segments with Rural levels of daily vehicular flow increased by 100% from 303 segments in 2010 to 606 segments in 2012. On the other hand, the number of segments with Small Urbanized levels of AADT reduced from 660 segments in 2010 by 14.24% from 2010 to 2011 and further reduced by 21.38% from 2011 to 2012, an overall reduction of 215 homogenous segments. The number of Interstate segments falling within areas of Rural definitions by population was unsurprisingly a significant portion of the total segments at 4,111. But under the AADT definition, this number was found to drop significantly to 442 segments in 2011, while the number of Small Urban Interstate segments increased from 1623 based on population, to 4825 segments in 2011 based on AADT. Similar increases were observed in the number of Large Urbanized and Metropolitan segments with an increase from 187 population based segments to 1,016 AADT based segments, and 174 population based segments to 610 AADT based segments respectively in 2011.

4.2 Principal Arterial (Freeway/Expressway + Other Principal Arterial) Segments

By definition, WSDOT characterizes the functional classification of Principal Arterials as a combination of Freeway/Expressway and Other Principal Arterials type functional classes. Tables 4.7, 4.8, and 4.9 depict the matrix comparisons of the 42,046 homogenous segments that fall within this category between the population based and AADT based classifications.

Similar to the Interstate segments, the total number of homogenous Principal Arterial segments remained the same over the three-year period at 42,046 segments. The number of segments with Rural levels of AADT increased by 1,688 segments from 6,091 in 2010 to 7,779 in 2012. The total number of Rural segments by the population definition of geographical area was found to be 27,735 while under the AADT classification this number was found to be significantly smaller at 6,967 segments in 2011.

Table 4.7: Matrix of 2010 Population Based and AADT Based Functional Class Homogeneous Principal Arterial Segments.

		2010 Population Basis				
		Rural	**Small Urban**	**Small Urbanized**	**Large Urbanized**	**Metropolitan**
2010 AADT Basis	**Rural**	5,485	341	200	65	0
	Small Urban	21,716	6,716	3,407	531	342
	Small Urbanized	531	968	909	100	378
	Large Urbanized	3	27	106	0	21
	Metropolitan	0	26	103	0	71

Table 4.8: Matrix of 2011 Population Based and AADT Based Functional Class Homogeneous Principal Arterial Segments.

		2011 Population Basis				
		Rural	**Small Urban**	**Small Urbanized**	**Large Urbanized**	**Metropolitan**
2011 AADT Basis	**Rural**	5,892	528	453	94	0
	Small Urban	21,145	6,686	3,388	543	339
	Small Urbanized	692	786	773	59	271
	Large Urbanized	4	35	25	0	32
	Metropolitan	2	43	86	0	170

Table 4.9: Matrix of 2012 Population Based and AADT Based Functional Class Homogeneous Principal Arterial Segments.

		2012 Population Basis				
		Rural	**Small Urban**	**Small Urbanized**	**Large Urbanized**	**Metropolitan**
2012 AADT Basis	**Rural**	6,183	826	661	94	15
	Small Urban	20,557	6,422	3,554	586	389
	Small Urbanized	964	665	439	16	174
	Large Urbanized	13	61	13	0	61
	Metropolitan	18	104	58	0	173

The difference between the two classifications was also observed in the other geographic classifications, but the most significant difference was observed for the Small Urban classification whereas the population based definition resulted in 8,078 segments while the daily traffic volumes based definition had 32,101 segments in 2011. Approximately 76% of the segments in the Principal

Arterial functional classification were observed to have Small Urban levels of AADT over the three-year study period.

4.3 Minor Arterial Segments

A total of 32,024 segments comprise the number of homogeneous segments identified with the Minor Arterial classification. Tables 4.10, 4.11, and 4.12 represent the population based and AADT based comparison matrices of the Minor Arterial segments for 2010, 2011, and 2012.

Table 4.10: Matrix of 2010 Population Based and AADT Based Functional Class Homogeneous Minor Arterial Segments.

		2010 Population Basis				
		Rural	**Small Urban**	**Small Urbanized**	**Large Urbanized**	**Metropolitan**
2010 AADT Basis	**Rural**	9,556	149	148	0	0
	Small Urban	17,146	1,966	562	68	0
	Small Urbanized	617	422	245	28	0
	Large Urbanized	103	102	201	0	0
	Metropolitan	218	295	198	0	0

Table 4.11: Matrix of 2011 Population Based and AADT Based Functional Class Homogeneous Minor Arterial Segments.

		2011 Population Basis				
		Rural	**Small Urban**	**Small Urbanized**	**Large Urbanized**	**Metropolitan**
2011 AADT Basis	**Rural**	10,244	357	161	0	0
	Small Urban	15,863	1,757	616	66	0
	Small Urbanized	758	333	249	9	0
	Large Urbanized	262	130	140	0	0
	Metropolitan	513	357	188	21	0

Consistent with the Interstate and Principal Arterials, the number of Rural segments based on population was found to reduce significantly from 27,640 compared to 10,762 segments based on AADT in 2011. The number of Small Urban segments by population showed an increase from 2,934 compared to the 18,302 AADT based segments in 2011. Another significant observation from the summary is that under the Minor Arterial functional class, there are zero segments that fall within a Metropolitan geographic definition based on population. On the contrary, the AADT based definition suggests that between 711 and 1,417 Minor Arterial segments demonstrated Metropolitan levels of daily traffic volumes over the three-year period.

Table 4.12: Matrix of 2012 Population Based and AADT Based Functional Class Homogeneous Minor Arterial Segments.

		2012 Population Basis				
		Rural	Small Urban	Small Urbanized	Large Urbanized	Metropolitan
2012 AADT Basis	Rural	10,451	465	209	0	0
	Small Urban	14,923	1,651	637	27	0
	Small Urbanized	1,116	361	197	0	0
	Large Urbanized	346	74	119	31	0
	Metropolitan	804	383	192	38	0

4.4 Collector Segments

A total count of 26,166 homogeneous roadway segments has been identified as the Collector type functional class for years 2010, 2011, and 2012. Tables 4.13, 4.14, and 4.15 show the matrices for the population based and AADT based comparisons for the Collector functional class types from 2010 to 2012.

Table 4.13: Matrix of 2010 Population Based and AADT Based Functional Class Homogeneous Collector Segments.

		2010 Population Basis				
		Rural	Small Urban	Small Urbanized	Large Urbanized	Metropolitan
2010 AADT Basis	Rural	12,127	540	37	0	0
	Small Urban	12,224	272	222	101	0
	Small Urbanized	68	3	0	0	0
	Large Urbanized	213	55	0	0	0
	Metropolitan	223	72	9	0	0

Table 4.14: Matrix of 2011 Population Based and AADT Based Functional Class Homogeneous Collector Segments.

		2011 Population Basis				
		Rural	Small Urban	Small Urbanized	Large Urbanized	Metropolitan
2011 AADT Basis	Rural	12339	458	37	0	0
	Small Urban	11661	311	196	101	0
	Small Urbanized	259	40	1	0	0
	Large Urbanized	262	108	25	0	0
	Metropolitan	334	25	9	0	0

Table 4.15: Matrix of 2012 Population Based and AADT Based Functional Class Homogeneous Collector Segments.

		2012 Population Basis				
		Rural	Small Urban	Small Urbanized	Large Urbanized	Metropolitan
2012 AADT Basis	Rural	12146	364	6	0	0
	Small Urban	11717	420	227	65	0
	Small Urbanized	334	43	26	27	0
	Large Urbanized	263	77	7	9	0
	Metropolitan	395	38	2	0	0

Like the Minor Arterial segment analysis, 24,855 Collector segments classified by population were reduced to 12,834 segments when based on AADT criteria in 2011. Similarly, the number of Small Urban segments were found to increase from 942 population based segments to 12,269 AADT based segments in 2011. Based on population, the Collectors contain zero Metropolitan segments while the AADTs over the same three year span of this study indicate between 304 and 435 Metropolitan level segments.

4.5 Non-Interstate Segments (Collector + Minor Arterial + Principal Arterial)

When excluding Interstate segments, the total count of homogeneous roadway segments is 100,236 Non-Interstate segments for 2010, 2011, and 2012. The Non-Interstate segments classification includes Principal Arterial (Freeway/Expressway + Other Principal Arterial), Minor Arterial, and Collector segments. Tables 4.16, 4.17, and 4.18 represent the matrices for the population based and AADT based comparisons for the Non-Interstate functional classification for 2010, 2011, and 2012.

Table 4.16: Matrix of 2010 Population Based and AADT Based Functional Class Homogeneous Non-Interstate Segments.

		2010 Population Basis				
		Rural	Small Urban	Small Urbanized	Large Urbanized	Metropolitan
2010 AADT Basis	Rural	27,168	1,030	385	65	0
	Small Urban	51,086	8,954	4,191	700	342
	Small Urbanized	1,216	1,393	1,154	128	378
	Large Urbanized	319	184	307	0	21
	Metropolitan	441	393	310	0	71

Table 4.17: Matrix of 2011 Population Based and AADT Based Functional Class Homogeneous Non-Interstate Segments.

		2011 Population Basis				
		Rural	Small Urban	Small Urbanized	Large Urbanized	Metropolitan
2011 AADT Basis	Rural	28,475	1,343	651	94	0
	Small Urban	48,669	8,754	4,200	710	339
	Small Urbanized	1,709	1,159	1,023	68	271
	Large Urbanized	528	273	190	0	32
	Metropolitan	849	425	283	21	170

Table 4.18: Matrix of 2012 Population Based and AADT Based Functional Class Homogeneous Non-Interstate Segments.

		2012 Population Basis				
		Rural	Small Urban	Small Urbanized	Large Urbanized	Metropolitan
2012 AADT Basis	Rural	28,780	1,655	876	94	15
	Small Urban	47,197	8,493	4,418	678	389
	Small Urbanized	2,414	1,069	662	43	174
	Large Urbanized	622	212	139	40	61
	Metropolitan	1,217	525	252	38	173

It was observed that while 80,230 segments fell under a Rural definition based on population, only between 28,648 and 31,420 segments demonstrated AADTs within an actual Rural range. Additionally, 11,954 segments were classified as being Small Urban based on population, but over the three-year period it was observed that between 61,175 and 65,273 segments showed Small Urban levels of daily traffic volumes. Rural areas based on population with Metropolitan levels of AADT increased from 441 segments in 2010 to 1,217 segments in 2012. This trend was observed for all the other population classes except for Small Urbanized areas, whereas the number of segments with Metropolitan levels of daily traffic volumes decreased from 310 in 2010 to 252 in 2012. Small Urbanized population based segments also saw an increase from 385 to 876 Rural level AADT segments, and 4,191 to 4,418 Small Urban level AADT segments from 2011 to 2012. Inversely, areas designated as Small Urbanized based on both the population and AADT criteria were found to reduce from 1,154 to 662 segments over the three years of 2010 to 2012.

5.0 Crash Summary

The crash counts in the homogeneous segments crash database were consolidated to ensure consistency with the WSDOT source crash data and Washington State collision data summary logs for the years 2010 to 2012. It should be noted that while the crash counts in the Washington State collision data summary logs include crashes on ramps, alternatives, spurs and couplets, only crashes occurring along the mainline of the roadway segments are examined in this study. The crash counts from the homogeneous segments crash database have been disaggregated to examine various mainline crash characteristics in tabular summaries. The summaries were prepared according to the total number of crashes, number of crashes by impact location, number of crashes by collision severity, and collision type for the three year time frame of 2010 to 2012. This chapter will present the crash summary tables by roadway functional classification in the first section, and by geographic classification in the second section. The functional classification tables are based on the results the WSDOT determined from their functional classification procedures. The geographic classification tables will present comparisons between the crash counts with the AADT based classification measure and the population based classification measure.

5.1 Crash Summaries by Roadway Functional Class

Each of the roadway functional class summary tables includes Rural and Urban crashes within the major functional classes of: Interstate, Principal Arterials, Minor Arterials, and Major Collectors. The resulting segment functional classifications stem from WSDOT's functional class assignment process in which the functional class were determined on a roadway segment basis according to accumulate route mileage and state route milepost markers. Table 5.1 displays the total number of crashes along the 6,867.683 miles of mainline roadway represented in the homogeneous crash segments database, grouped by year and area type for the four major functional classifications used by WSDOT.

Table 5.1: Total Crash Count by Functional Class from 2010 to 2012.

Functional Class	Rural/Urban	Total Crashes		
		2010	2011	2012
Interstate	Rural	2,188	2,180	2,346
	Urban	9,419	9,169	9,604
Principal Arterial	Rural	3,954	4,078	4,076
	Urban	15,214	15,267	15,445
Minor Arterial	Rural	2,089	2,066	2,085
	Urban	2,286	2,209	2,314
Major Collector	Rural	1,332	1,218	1,283
	Urban	15	15	12
Total		36,497	36,202	37,165

The number of crashes in Urban areas were found to be consistently about 2.8 times higher than the number of Rural crashes during the three-year time frame. The total number of crashes along minor arterial roadways in Washington State was found to be around 4,300 per year with a 100 crash reduction between 2010 and 2011, but an increase from 4,275 crashes in 2011 to 4,399 in 2012. Similarly, Interstate crashes were found to reduce from 11,607 in 2010 to 11,349 crashes in 2011, but increase significantly to 11,950 in 2012. Total crashes along Principal Arterials were found to show an increasing trend over the three years with 19,168 crashes in 2010 up to 19,521 crashes in 2012. Overall, the total number of crashes decreased from 2010 to 2011, but increased significantly between 2011 and 2012. The total number of crashes from 2010 to 2012 is organized by major impact location as Roadside, Roadway, or Other location in Table 5.2 on the following page. The information is presented for each of the crash years and disaggregated according to functional class and Rural or Urban indicators.

Table 5.2: Functional Class Crash Count by Impact Location from 2010 to 2012.

Functional Class	Rural/Urban	2010	2011	2012
		Roadside		
Interstate	Rural	800	772	891
	Urban	1,346	1,199	1,402
Principal Arterial	Rural	1,335	1,458	1,457
	Urban	1,612	1,611	1,707
Minor Arterial	Rural	924	875	885
	Urban	357	336	317
Major Collector	Rural	636	621	676
	Urban	5	5	2
Sub Total		7,015	6,877	7,337
Functional Class	Rural/Urban	Roadway		
Interstate	Rural	1,374	1,379	1,436
	Urban	8,066	7,959	8,195
Principal Arterial	Rural	2,609	2,606	2,612
	Urban	13,565	13,613	13,697
Minor Arterial	Rural	1,163	1,187	1,194
	Urban	1,918	1,867	1,991
Major Collector	Rural	695	593	606
	Urban	10	10	10
Sub Total		29,400	29,214	29,741
Functional Class	Rural/Urban	Other		
Interstate	Rural	14	29	19
	Urban	7	11	7
Principal Arterial	Rural	10	14	7
	Urban	37	43	41
Minor Arterial	Rural	2	4	6
	Urban	11	6	6
Major Collector	Rural	1	4	1
	Urban	0	0	0
Sub Total		82	111	87
Total		36,497	36,202	37,165

Crashes along the main Roadway section accounted for a significant portion of the total number of crashes. Crashes falling under the Other location category increased between 2010 and 2011 before reducing in 2012. The number of crashes on the Roadway or Roadside was found to show the opposite with 2012 having the highest number of total crashes for the three-year period. It was also found that crashes along Rural Principal Arterial Roadsides, Rural Interstate Roadways, Urban Principal Arterial Roadways, and Rural Minor Arterial Roadways, demonstrated a steady increase in crashes while Roadside Minor Arterial crashes showed a steady decrease in crashes from 2010 to 2012. Functional class crash counts sorted by collision severities are displayed in Table 5.3 according to PDO, Possible Injury, Evident Injury, Serious Injury, Fatal, and Unknown Injury.

Table 5.3: Functional Class Crash Count by Collision Severity from 2010 to 2012.

Functional Class	Rural/Urban	2010	2011	2012
		PDO		
Interstate	Rural	1,505	1,504	1,662
	Urban	6,474	6,250	6,607
Principal Arterial	Rural	2,537	2,652	2,724
	Urban	9,961	9,931	10,046
Minor Arterial	Rural	1,235	1,205	1,253
	Urban	1,503	1,447	1,494
Major Collector	Rural	797	690	790
	Urban	10	7	6
Sub Total		24,022	23,686	24,582
Functional Class	Rural/Urban	Possible Injury		
Interstate	Rural	353	319	347
	Urban	2,239	2,231	2,328
Principal Arterial	Rural	647	631	650
	Urban	3,786	3,843	3,853
Minor Arterial	Rural	390	397	382
	Urban	507	498	535
Major Collector	Rural	230	217	213
	Urban	1	5	4
Sub Total		8,153	8,141	8,312
Functional Class	Rural/Urban	Evident Injury		
Interstate	Rural	266	276	255
	Urban	554	546	539
Principal Arterial	Rural	537	556	505
	Urban	1,052	1,161	1,160
Minor Arterial	Rural	301	318	301
	Urban	177	178	188
Major Collector	Rural	203	229	179
	Urban	3	2	2
Sub Total		3,093	3,266	3,129

Table 5.3 (continued): Functional Class Crash Count by Collision Severity from 2010 to 2012.

Functional Class	Rural/Urban	2010	2011	2012
		Serious Injury		
Interstate	Rural	38	39	40
	Urban	87	79	73
Principal Arterial	Rural	138	136	95
	Urban	254	179	184
Minor Arterial	Rural	97	83	70
	Urban	40	50	53
Major Collector	Rural	54	47	54
	Urban	1	0	0
Sub Total		709	613	569
Functional Class	Rural/Urban	Fatal		
Interstate	Rural	14	24	17
	Urban	19	25	18
Principal Arterial	Rural	52	48	44
	Urban	43	39	51
Minor Arterial	Rural	39	30	31
	Urban	14	14	6
Major Collector	Rural	13	9	13
	Urban	0	1	0
Sub Total		194	190	180
Functional Class	Rural/Urban	Unknown		
Interstate	Rural	12	18	25
	Urban	46	38	39
Principal Arterial	Rural	43	55	58
	Urban	118	114	151
Minor Arterial	Rural	27	33	48
	Urban	45	22	38
Major Collector	Rural	35	26	34
	Urban	0	0	0
Sub Total		326	306	393
Total		36,497	36,202	37,165

PDO type crashes were found to be significantly higher in number than the other crash severity types with 2012 having the highest number of the three years. Fatalities were found to have the least number of overall crashes, displaying an apparent decreasing trend, with the exception of Urban Principal Arterial Fatalities which were found to be significantly higher in 2012 compared to 2010.

The functional class crash count by number of vehicles involved is presented on the next two pages in Table 5.4 ranging from one vehicle involved (Veh1) to more than six vehicles involved (≥Veh6).

Table 5.4: Functional Class Crash Count by Number of Vehicles Involved from 2010 to 2012.

Functional Class	Rural/Urban	2010	2011	2012
		Number of vehicles - Veh1		
Interstate	Rural	1,404	1,385	1,527
	Urban	1,647	1,501	1,721
Principal Arterial	Rural	2,227	2,399	2,374
	Urban	2,290	2,384	2,463
Minor Arterial	Rural	1,187	1,142	1,181
	Urban	442	415	416
Major Collector	Rural	786	747	825
	Urban	5	5	4
Sub Total		9,988	9,978	10,511
Functional Class	Rural/Urban	Number of vehicles - Veh2		
Interstate	Rural	692	682	690
	Urban	5,937	5,857	5,987
Principal Arterial	Rural	1,541	1,481	1,525
	Urban	11,045	11,025	11,055
Minor Arterial	Rural	798	832	793
	Urban	1,637	1,559	1,651
Major Collector	Rural	509	424	423
	Urban	10	9	8
Sub Total		22,169	21,869	22,132
Functional Class	Rural/Urban	Number of vehicles - Veh3		
Interstate	Rural	69	84	94
	Urban	1,396	1,400	1,450
Principal Arterial	Rural	164	172	152
	Urban	1,533	1,518	1,572
Minor Arterial	Rural	95	83	98
	Urban	182	208	204
Major Collector	Rural	30	39	31
	Urban	0	1	0
Sub Total		3,469	3,505	3,601
Functional Class	Rural/Urban	Number of vehicles - Veh4		
Interstate	Rural	17	15	22
	Urban	348	312	362
Principal Arterial	Rural	17	20	20
	Urban	285	283	298
Minor Arterial	Rural	7	7	12
	Urban	23	21	39
Major Collector	Rural	6	7	2
	Urban	0	0	0
Sub Total		703	665	755

Table 5.4 (continued): Functional Class Crash Count by Number of Vehicles Involved from 2010 to 2012.

Functional Class	Rural/Urban	2010	2011	2012
		Number of vehicles - Veh5		
Interstate	Rural	3	9	7
	Urban	64	73	70
Principal Arterial	Rural	5	5	3
	Urban	39	44	45
Minor Arterial	Rural	1	1	1
	Urban	2	5	4
Major Collector	Rural	0	0	0
	Urban	0	0	0
Sub Total		114	137	130
Functional Class	Rural/Urban	Number of vehicles - ≥Veh6		
Interstate	Rural	3	5	6
	Urban	27	26	14
Principal Arterial	Rural	0	1	2
	Urban	22	13	12
Minor Arterial	Rural	1	1	0
	Urban	0	1	0
Major Collector	Rural	1	1	2
	Urban	0	0	0
Sub Total		54	48	36
Total		36,497	36,202	37,165

The number of crashes involving one vehicle and two vehicles were found to be significantly higher than the other vehicle involvement types across all roadway functional classes. In crashes involving four vehicles or more, it was found that Urban Interstate and Urban Principal Arterial regions had significantly higher numbers of crashes than the other functional classes. Moreover, with the exception of crashes involving two vehicles, all the other categories show higher total accidents in 2012 than in 2010. One instance of a crash involving six vehicles or more on a Rural Major Collector was found for 2010 and 2011, and two such events were found to have occurred in 2012 despite the lower expected AADTs on such segments.

The crash counts for the 19 different collision types are arranged by functional class from 2010 to 2012 in Table 5.5. It was observed that the largest number of occurrences were Rear End, Fixed Object, Same Direction Sideswipe, Same Direction Others, and Entering at an Angle type crashes. As one would expect, Interstates were found to have had the least number of crashes related to Turning Traffic and Head-On collisions because of the divided directional lanes and reduced access points. It was observed that 43 crashes involving pedestrians occurred on the Interstate system over the three years. The total number of Rear End crashes for all functional types was found to remain fairly steady over the three year crash analysis period with more occurrences in Urban areas than in Rural areas, particularly in Urban Interstates and Principal Arterials.

Table 5.5: Functional Class Crash Count by Collision Type from 2010 to 2012.

Functional Class	Rural/Urban	2010	2011	2012
		Rear End		
Interstate	Rural	328	315	288
	Urban	5,537	5,501	5,563
Principal Arterial	Rural	738	735	747
	Urban	6,839	6,917	6,830
Minor Arterial	Rural	380	367	399
	Urban	858	900	884
Major Collector	Rural	203	165	167
	Urban	3	1	1
Sub Total		14,886	14,901	14,879
Functional Class	Rural/Urban	Turning Rear End		
Interstate	Rural	0	0	0
	Urban	0	0	1
Principal Arterial	Rural	7	9	7
	Urban	208	225	169
Minor Arterial	Rural	10	3	4
	Urban	20	9	21
Major Collector	Rural	2	0	1
	Urban	0	0	0
Sub Total		247	246	203
Functional Class	Rural/Urban	Same Direction Turning Sideswipe		
Interstate	Rural	0	0	0
	Urban	0	0	1
Principal Arterial	Rural	7	6	5
	Urban	135	127	142
Minor Arterial	Rural	3	5	1
	Urban	24	17	22
Major Collector	Rural	0	1	2
	Urban	0	0	1
Sub Total		169	156	174
Functional Class	Rural/Urban	Same Direction Sideswipe		
Interstate	Rural	205	202	243
	Urban	1,581	1,592	1,686
Principal Arterial	Rural	124	117	114
	Urban	1,482	1,510	1,598
Minor Arterial	Rural	39	47	30
	Urban	132	110	135
Major Collector	Rural	19	17	9
	Urban	1	1	0
Sub Total		3,583	3,596	3,815

Table 5.5 (continued): Functional Class Crash Count by Collision Type from 2010 to 2012.

Functional Class	Rural/Urban	2010	2011	2012
		Same Direction Turning		
Interstate	Rural	2	1	2
	Urban	0	0	1
Principal Arterial	Rural	104	88	91
	Urban	289	295	342
Minor Arterial	Rural	59	59	66
	Urban	72	80	67
Major Collector	Rural	35	30	41
	Urban	1	1	1
Sub Total		562	554	611
Functional Class	Rural/Urban	Same Direction Others		
Interstate	Rural	136	156	154
	Urban	398	349	416
Principal Arterial	Rural	80	71	86
	Urban	372	360	374
Minor Arterial	Rural	25	37	33
	Urban	37	48	52
Major Collector	Rural	16	14	18
	Urban	0	0	0
Sub Total		1,064	1,035	1,133
Functional Class	Rural/Urban	Head On		
Interstate	Rural	3	2	5
	Urban	2	7	6
Principal Arterial	Rural	36	41	33
	Urban	50	43	69
Minor Arterial	Rural	23	19	20
	Urban	14	14	19
Major Collector	Rural	10	13	18
	Urban	1	2	0
Sub Total		139	141	170
Functional Class	Rural/Urban	Opposite Direction Sideswipe		
Interstate	Rural	1	3	3
	Urban	4	4	4
Principal Arterial	Rural	51	58	42
	Urban	71	56	63
Minor Arterial	Rural	34	48	25
	Urban	26	22	23
Major Collector	Rural	28	25	27
	Urban	0	1	0
Sub Total		215	217	187

Table 5.5 (continued): Functional Class Crash Count by Collision Type from 2010 to 2012.

Functional Class	Rural/Urban	2010	2011	2012
		Opposite Direction Turning		
Interstate	Rural	0	0	0
	Urban	1	0	0
Principal Arterial	Rural	78	84	106
	Urban	1,047	1,047	1,008
Minor Arterial	Rural	60	62	52
	Urban	186	145	163
Major Collector	Rural	38	34	25
	Urban	0	1	0
Sub Total		1,410	1,373	1,354
Functional Class	Rural/Urban	Fixed Object		
Interstate	Rural	874	864	968
	Urban	1,433	1,240	1,467
Principal Arterial	Rural	1,179	1,334	1,316
	Urban	1,652	1,656	1,732
Minor Arterial	Rural	751	723	733
	Urban	320	297	287
Major Collector	Rural	546	529	560
	Urban	5	4	2
Sub Total		6,760	6,647	7,065
Functional Class	Rural/Urban	Entering At Angle		
Interstate	Rural	0	0	1
	Urban	0	2	2
Principal Arterial	Rural	341	287	290
	Urban	2,080	1,970	2,020
Minor Arterial	Rural	194	185	194
	Urban	412	392	461
Major Collector	Rural	139	112	101
	Urban	4	2	5
Sub Total		3,170	2,950	3,074
Functional Class	Rural/Urban	Overturned		
Interstate	Rural	275	233	259
	Urban	174	139	138
Principal Arterial	Rural	257	269	262
	Urban	180	192	176
Minor Arterial	Rural	190	173	164
	Urban	34	34	31
Major Collector	Rural	102	98	121
	Urban	0	1	0
Sub Total		1,212	1,139	1,151

Table 5.5 (continued): Functional Class Crash Count by Collision Type from 2010 to 2012.

Functional Class	Rural/Urban	2010	2011	2012
		Animal		
Interstate	Rural	184	198	226
	Urban	67	86	77
Principal Arterial	Rural	655	703	708
	Urban	110	136	145
Minor Arterial	Rural	186	200	228
	Urban	37	22	26
Major Collector	Rural	110	83	111
	Urban	0	0	1
Sub Total		1,349	1,428	1,522
Functional Class	Rural/Urban	Bicycle		
Interstate	Rural	20	2	0
	Urban	4	1	0
Principal Arterial	Rural	39	8	13
	Urban	16	140	130
Minor Arterial	Rural	32	14	10
	Urban	4	26	21
Major Collector	Rural	19	6	5
	Urban	0	0	0
Sub Total		134	197	179
Functional Class	Rural/Urban	Pedestrian		
Interstate	Rural	2	2	2
	Urban	10	16	11
Principal Arterial	Rural	25	21	14
	Urban	237	247	271
Minor Arterial	Rural	12	10	18
	Urban	28	35	41
Major Collector	Rural	3	11	10
	Urban	0	0	0
Sub Total		317	342	367
Functional Class	Rural/Urban	One Parked, One Moving		
Interstate	Rural	33	35	31
	Urban	33	39	33
Principal Arterial	Rural	34	31	28
	Urban	87	80	96
Minor Arterial	Rural	19	19	21
	Urban	25	20	21
Major Collector	Rural	13	20	15
	Urban	0	0	0
Sub Total		244	244	245

Table 5.5 (continued): Functional Class Crash Count by Collision Type from 2010 to 2012.

Functional Class	Rural/Urban	2010	2011	2012
		Entering/Leaving Driveway		
Interstate	Rural	5	2	3
	Urban	3	3	4
Principal Arterial	Rural	10	8	10
	Urban	20	23	25
Minor Arterial	Rural	6	5	2
	Urban	6	6	3
Major Collector	Rural	6	8	10
	Urban	0	0	0
Sub Total		56	55	57
Functional Class	Rural/Urban	Other		
Interstate	Rural	120	164	160
	Urban	171	188	193
Principal Arterial	Rural	189	208	204
	Urban	338	243	253
Minor Arterial	Rural	66	90	84
	Urban	51	32	37
Major Collector	Rural	42	51	42
	Urban	0	1	1
Sub Total		977	977	974
Functional Class	Rural/Urban	Not Stated		
Interstate	Rural	0	1	1
	Urban	1	2	1
Principal Arterial	Rural	0	0	0
	Urban	1	0	2
Minor Arterial	Rural	0	0	1
	Urban	0	0	0
Major Collector	Rural	1	1	0
	Urban	0	0	0
Sub Total		3	4	5
Total		36,497	36,202	37,165

Reduced access to interstate facilities led to nearly zero Turning Rear End and Same Direction Turning Sideswipe type crashes, the only exceptions being one incident each on an Urban Interstate reported in 2012. Urban Principal Arterials accounted for a significant number of the Turning Rear End type collisions on the network with 208, 225, and 169 crashes in 2010, 2011, and 2012. Same Direction Sideswipe crashes were found to follow an increasing trend going from 3,583 crashes in 2010 to 3,596 crashes in 2011 to 219 crashes in 2012. This trend was consistent within the Urban Interstate and Principal Arterial functional classes, while Rural Principal Arterials demonstrated a reduction from 124 crashes in 2010 to 114 in 2012.

Same Direction Turning type crashes decreased from 562 in 2010 to 554 in 2011, but increased to 611 in 2012. While Rural Principal Arterials decreased over the three year span, Urban Principal Arterial Same Direction Turning type crashes increased from 289 in 2010 to 342 in 2012. The number of Head-On crashes was also found to increase from 139 in 2010 to 170 in 2012, while the number of Opposite Direction Sideswipes was found to be 215 in 2010 lowering to 187 in 2012. Opposite Direction Turning type collisions were observed to decrease with 1,410 crashes in 2010 to 1,354 crashes in 2012, with over a third of the incidents occurring on Urban Principal Arterials. Collisions involving Fixed Objects were found to decrease from 2010 to 2011, but increase to 7,065 incidents in 2012, with Principal Arterials accounting for nearly half of the yearly total.

Another consideration in this analysis was the impact pedestrians and bicyclists had on crashes within the major roadway functional classes. It was found that over the three year period, 27 collisions involving bicyclists occurred on the interstate system, 22 of which occurred on Rural Interstates. Of these bicyclist collisions, 24 occurred in 2010 with zero incidents in 2012. Principal Arterials were found to have the highest number of bicyclist related crashes, with Rural regions decreasing from 39 crashes in 2010 to 13 in 2012. Conversely, Urban Arterials increased from 16 bicycle related crashes in 2010 to 140 in 2011 and 130 in 2012. Rural Minor Arterials and Major Collectors showed a decrease over the three year period, while Urban Minor Arterials increased by nearly five times from 2010 to 2012. Overall, bicycle related crashes were found to increase from 134 in 2010, to 197 in 2011, before reducing by 18 crashes reported in 2012.

Collisions involving pedestrians was found to exhibit an increasing trend over the three years with 317, 342, and 367 crashes respectively from 2010 to 2012. A total of 43 crashes over the three year period involved pedestrians on Interstates, of which 37 were found to have occurred in Urban areas. Crashes involving pedestrians on Rural Principal Arterials were found to decrease from 25 in 2010 to 14 in 2012. Urban Principal Arterials in contrast, while not only accounting for about 70% of the total pedestrian related crashes, also increased from 237 in 2010 to 271 in 2012. To a lesser extent, a similar trend was also observed in Urban Minor Arterials with 28 crashes in 2010 increasing to 41 in 2012.

5.2 Crash Summaries by Geographic Class

The next series of tables arranges the crash counts according to geographic class beginning with the total counts for all 6,867.683 miles of mainline roadway in Washington State. The crash counts were arranged based on geographic regions classified by segment AADT and regional census population data. The crash count tables are presented by impact location, collision severities, number of vehicles involved, and collision types. The tables aggregated by geographic class compare the measures of both the section AADT based classification results and the population based results. A large number of segments on the system fall within Small Urbanized, Small Urban or Rural definition when based on population. These segments are not isolated on the network and areas with low population levels could contain segments with very high AADT levels. Incident geographical area type was found to vary depending on the population and AADT of the respective segments on the system.

Table 5.6 shows the comparison of the total crash counts for the AADT and population based geographic class according to: Metropolitan, Large Urbanized, Small Urbanized, Small Urban, and Rural. The population based geographic classification shows that the number of accidents in

Metropolitan areas increased from 3,121 in 2010 to 3,181 in 2012. The highest number of crashes according to this measure occur in Small Urbanized and Small Urban areas, with the former showing a decreasing trend going from 2010 to 2012 and the latter showing and increasing trend

Table 5.6: Total Crash Count by Geographic Class from 2010 to 2012.

Geographic Class	AADT Based			Population Based		
	Total Crashes			Total Crashes		
	2010	2011	2012	2010	2011	2012
Metropolitan	5,018	5,148	5,194	3,121	3,134	3,181
Large Urbanized	3,619	3,321	3,689	922	941	794
Small Urbanized	4,874	3,487	2,519	11,026	10,749	10,885
Small Urban	21,008	21,626	21,893	10,460	10,422	11,019
Rural	1,978	2,620	3,870	10,968	10,956	11,286
Total	36,497	36,202	37,165	36,497	36,202	37,165

Between 2010 and 2012, crashes in Large Urbanized areas decreased by 128 crashes. Compared to the AADT based measure, while the total number of accidents for the years remains the same, the number within each geographic class varies due to the disparity between the two methods of classification. Population based Rural crashes total at 109,864 for the three years, whereas only 8,468 crashes based on AADT occur in areas that can be classified as Rural. Small Urban areas inversely show nearly double the number of crashes using AADT as the basis for classification compared to using the population based assessment. Similarly, AADT based Small Urbanized areas have about a third of the number of crashes in contrast to using population as a basis; Large Urbanized areas also show a significantly higher number of crashes when using AADT as a basis.

Table 5.7 on the following page displays the total number of crashes sorted by impact location for the AADT based and population based geographic classes. The impact locations are identified as Roadside, Roadway, or Other location and presented for crash years 2010, 2011, and 2012 disaggregated to five geographic classes.

As with the total crash counts discussion, Small Urban areas were found to have had between 4,603 and 4,668 Roadside crashes when consolidated by AADT. In contrast, population based Rural Roadside crashes were depicted as being the highest at about 3,970 crashes per year. In spite of the reduced totals, AADT based rural Roadside crashes were found to have an increasing trend over the three years. AADT based Metropolitan, Small Urbanized and Small Urban Roadside crashes saw a reduction from 2010 to 2011, before increasing in 2012. The general distribution of Roadway type crashes follows similar pattern as the Roadside type crashes when AADT is used as to classify geographic area. In addition to being the highest in number of crashes, Small Urban Roadway type crashes were observed to increase from 16,352 in 2010 to 17,159 in 2012.

Table 5.7: Geographic Class Crash Count by Impact Location from 2010 to 2012.

Geographic Class	AADT Based			Population Based		
	2010	2011	2012	2010	2011	2012
	Roadside					
Metropolitan	573	625	661	364	343	405
Large Urbanized	444	394	517	124	128	110
Small Urbanized	719	600	516	1,260	1,223	1,275
Small Urban	4,603	4,469	4,668	1,354	1,308	1,427
Rural	676	789	975	3,913	3,875	4,120
Sub Total	7,015	6,877	7,337	7,015	6,877	7,337
Geographic Class	Roadway					
Metropolitan	4,437	4,516	4,523	2,751	2,787	2,775
Large Urbanized	3,169	2,922	3,168	792	805	680
Small Urbanized	4,143	2,871	2,000	9,750	9,506	9,595
Small Urban	16,352	17,086	17,159	9,080	9,093	9,565
Rural	1,299	1,819	2,891	7,027	7,023	7,126
Sub Total	29,400	29,214	29,741	29,400	29,214	29,741
Geographic Class	Other					
Metropolitan	8	7	10	6	4	1
Large Urbanized	6	5	4	6	8	4
Small Urbanized	12	16	3	16	20	15
Small Urban	53	71	66	26	21	27
Rural	3	12	4	28	58	40
Sub Total	82	111	87	82	111	87
Total	36,497	36,202	37,165	36,497	36,202	37,165

Crash counts by geographic class are grouped by collision severities in Table 5.8 presented in the next page. The collision severity categories are listed as: PDO, Possible Injury, Evident Injury, Serious Injury, Fatal, and Unknown Injury. In regard to crash severities, PDO crashes were found to vary between 2,051 and 2,064 crashes over the 3-year period when classified on the population base, a range that increases to 3,417 to 3,563 crashes based on AADT. Similarly, AADT based Large Urbanized and Small Urban PDO crashes were found to be significantly higher than the corresponding population based counts. PDO crash locations that were classified as Small Urbanized and Rural based on population reduced greatly when examined on the AADT basis. Possible Injury crashes followed a similar relationship as demonstrated by the PDOs, with AADT based Small Urban crashes increasing over the 3-year period. AADT based Evident Injury crashes in Metropolitan areas were found to increase from 241 in 2010 to 307 in 2012, while in Small Urbanized areas they were found to decrease over the same period. AADT based Serious Injury crashes in Small Urbanized and Small Urban areas were exhibited a decreasing trend and Rural areas, while being fewer in number compared to the population based classification, showed an increase in number of crashes in 2012 over 2010. Consolidating crashes based on population would suggest that crashes in Rural areas result in the most fatalities on the system, but when classified based on AADT this number was found to indicate Small Urban areas as being more susceptible.

Table 5.8: Geographic Class Crash Count by Collision Severity from 2010 to 2012.

Geographic Class	AADT Based			Population Based		
	2010	2011	2012	2010	2011	2012
	PDO					
Metropolitan	3,417	3,432	3,563	2,051	2,069	2,064
Large Urbanized	2,440	2,230	2,412	550	565	470
Small Urbanized	3,208	2,265	1,646	7,366	7,091	7,210
Small Urban	13,657	14,102	14,398	7,064	7,013	7,443
Rural	1,300	1,657	2,563	6,991	6,948	7,395
Sub Total	24,022	23,686	24,582	24,022	23,686	24,582
Geographic Class	Possible Injury					
Metropolitan	1,271	1,316	1,238	834	827	863
Large Urbanized	899	798	993	262	248	204
Small Urbanized	1,181	866	598	2,708	2,751	2,802
Small Urban	4,471	4,659	4,715	2,367	2,369	2,480
Rural	331	502	768	1,982	1,946	1,963
Sub Total	8,153	8,141	8,312	8,153	8,141	8,312
Geographic Class	Evident Injury					
Metropolitan	241	309	307	167	196	205
Large Urbanized	220	222	228	85	104	92
Small Urbanized	360	272	189	699	700	682
Small Urban	2,034	2,135	2,038	745	782	791
Rural	238	328	367	1,397	1,484	1,359
Sub Total	3,093	3,266	3,129	3,093	3,266	3,129
Geographic Class	Serious Injury					
Metropolitan	58	47	52	52	22	34
Large Urbanized	32	39	34	13	10	12
Small Urbanized	79	51	45	141	119	91
Small Urban	478	400	347	148	140	157
Rural	62	76	91	355	322	275
Sub Total	709	613	569	709	613	569
Geographic Class	Fatal					
Metropolitan	10	18	8	6	7	5
Large Urbanized	10	12	7	3	3	3
Small Urbanized	18	11	12	29	29	25
Small Urban	137	130	129	40	26	36
Rural	19	19	24	116	125	111
Sub Total	194	190	180	194	190	180
Geographic Class	Unknown					
Metropolitan	21	26	26	11	13	10
Large Urbanized	18	20	15	9	11	13
Small Urbanized	28	22	29	83	59	75
Small Urban	231	200	266	96	92	112
Rural	28	38	57	127	131	183
Sub Total	326	306	393	326	306	393
Total	36,497	36,202	37,165	36,497	36,202	37,165

Geographic class crash counts disaggregated by number of vehicles involved is shown on the following page in Table 5.9. The categories for number of vehicles ranges from one vehicle involved (Veh1) to more than six vehicles involved (≥Veh6).

Table 5.9: Geographic Class Crash Count by Number of Vehicles Involved from 2010 to 2012.

Geographic Class	AADT Based			Population Based		
	2010	2011	2012	2010	2011	2012
	Number of vehicles - Veh1					
Metropolitan	633	744	823	401	400	451
Large Urbanized	531	522	630	203	189	182
Small Urbanized	1,003	817	700	1,592	1,563	1,616
Small Urban	6,840	6,744	6,924	1,928	1,948	2,086
Rural	981	1,151	1,434	5,864	5,878	6,176
Sub Total	9,988	9,978	10,511	9,988	9,978	10,511
Geographic Class	Number of vehicles - Veh2					
Metropolitan	3,414	3,406	3,382	2,072	2,094	2,115
Large Urbanized	2,361	2,174	2,319	596	617	509
Small Urbanized	3,180	2,186	1,487	7,743	7,542	7,543
Small Urban	12,324	12,839	12,878	7,285	7,197	7,540
Rural	890	1,264	2,066	4,473	4,419	4,425
Sub Total	22,169	21,869	22,132	22,169	21,869	22,132
Geographic Class	Number of vehicles - Veh3					
Metropolitan	751	763	744	502	484	470
Large Urbanized	563	496	576	100	104	83
Small Urbanized	526	387	256	1,311	1,315	1,375
Small Urban	1,538	1,696	1,734	1,021	1,049	1,111
Rural	91	163	291	535	553	562
Sub Total	3,469	3,505	3,601	3,469	3,505	3,601
Geographic Class	Number of vehicles - Veh4					
Metropolitan	171	184	200	112	123	117
Large Urbanized	139	93	132	21	26	19
Small Urbanized	126	71	68	304	252	291
Small Urban	253	280	289	192	189	233
Rural	14	37	66	74	75	95
Sub Total	703	665	755	703	665	755
Geographic Class	Number of vehicles - Veh5					
Metropolitan	34	39	41	25	27	23
Large Urbanized	19	24	25	2	2	1
Small Urbanized	22	21	4	50	58	48
Small Urban	38	49	49	23	28	41
Rural	1	4	11	14	22	17
Sub Total	114	137	130	114	137	130
Geographic Class	Number of vehicles - ≥Veh6					
Metropolitan	15	12	4	9	6	5
Large Urbanized	6	12	7	0	3	0
Small Urbanized	17	5	4	26	19	12
Small Urban	15	18	19	11	11	8
Rural	1	1	2	8	9	11
Sub Total	54	48	36	54	48	36
Total	36,497	36,202	37,165	36,497	36,202	37,165

For crashes involving one or two vehicles, the population based definition suggests Rural areas having the most occurrences; when based on AADT, the counts shift towards Small Urban areas. The number of single vehicle crashes in Small Urban areas dips from 2010 to 2011, and increases in 2012, while the number of two vehicle crashes shows an increasing trend. The number of Rural two vehicle crashes increases when based on AADT, but the total crash counts are much lower when compared to the population based classification. Three vehicle crashes in areas with Small Urban levels of AADT were found to be much higher than those in areas of Rural AADT. Crashes involving four vehicles were observed to increase in areas with Metropolitan, Small Urban, and Rural levels of AADT, whereas Small Urbanized levels of AADT decreased over the three-year period. Population based measures would indicate that there were 28 crashes in Rural areas involving six vehicles or more, but when AADT is taken into account this number dropped to four crashes over the three-year span.

It was found that while many of the crashes were recorded as having occurred in Rural areas based on segment area population, these numbers changed because of the AADT based geographical classifications reported on the segments. Table 5.10 on the following pages will present the crash counts for the 19 different collision types arranged by geographic class from 2010 to 2012 for the AADT and population based measures.

Rear End crashes were counted at their highest numbers in segments with Small Urban levels of AADT, with an increase in counts from 2010 to 2012 for both AADT levels with Small Urban and Rural levels. The number of Rear End crashes in areas with Large Urbanized levels of AADT was found to be in the range of 2,108 to 2,229 crashes, substantially higher than the numbers within Large Urbanized populated areas. Similarly, Turning Rear End, Same Direction Turning Sideswipe, and Same Direction Sideswipe type crashes were found to occur more frequently in areas with Small Urban levels of AADT, the latter two demonstrating an increase over the three year period. Same Direction Sideswipe crashes were observed to decrease for segments with Small Urbanized levels of AADT.

Head-On collisions were at their highest counts in Small Urban levels of AADT while Rural and Small Urbanized levels of AADT showed an increase from 2010 to 2012. Opposite Direction Sideswipe crashes have the greatest counts at Small Urbanized AADT levels or lower with Small Urban and Small Urbanized levels of AADT indicating a decrease in crash counts over the three years. Opposite Direction Turning type crashes were significantly higher in areas with Small Urban levels of AADT, but Rural and Large Urbanized appeared to increase. As with the previous crash types, Small Urban levels of AADT accounted for more Fixed Object, Overturned, Entering/Leaving Driveway, and Entering at an Angle crashes than the other geographic class.

The population based classification would suggest that Rural areas experienced the highest number of bicycle related crashes. Based on AADT, Rural bicycle crashes reduced to 45 crashes over the three-year period. Alternatively, areas with Small Urban levels of AADT were found to have had 386 crashes with an increase in crash counts over the same period. A similar observation was made with respect to crashes involving pedestrians, with increasing crash counts for all geographic classes with the exception of areas with the Small Urbanized class.

Table 5.10: Geographic Class Crash Count by Collision Type from 2010 to 2012.

Geographic Class	AADT Based			Population Based		
	2010	2011	2012	2010	2011	2012
	Rear End					
Metropolitan	2,982	2,974	2,951	1,774	1,815	1,771
Large Urbanized	2,229	2,003	2,108	380	417	324
Small Urbanized	2,343	1,636	1,013	5,710	5,588	5,602
Small Urban	6,881	7,515	7,548	4,669	4,718	4,829
Rural	451	773	1,259	2,353	2,363	2,353
Sub Total	14,886	14,901	14,879	14,886	14,901	14,879
Geographic Class	Turning Rear End					
Metropolitan	9	9	2	10	2	4
Large Urbanized	1	5	5	2	3	1
Small Urbanized	60	16	21	95	106	74
Small Urban	168	206	155	113	107	99
Rural	9	10	20	27	28	25
Sub Total	247	246	203	247	246	203
Geographic Class	Same Direction Turning Sideswipe					
Metropolitan	9	7	9	13	11	10
Large Urbanized	3	3	6	12	4	4
Small Urbanized	22	7	10	49	53	58
Small Urban	122	132	135	75	70	85
Rural	13	7	14	20	18	17
Sub Total	169	156	174	169	156	174
Geographic Class	Same Direction Sideswipe					
Metropolitan	865	817	842	484	474	533
Large Urbanized	507	492	563	75	99	75
Small Urbanized	563	377	269	1,457	1,415	1,518
Small Urban	1,506	1,733	1,762	1,031	1,076	1,152
Rural	142	177	379	536	532	537
Sub Total	3,583	3,596	3,815	3,583	3,596	3,815
Geographic Class	Same Direction Turning					
Metropolitan	17	43	37	24	39	25
Large Urbanized	20	9	16	21	18	15
Small Urbanized	49	42	40	117	125	128
Small Urban	436	419	444	207	189	226
Rural	40	41	74	193	183	217
Sub Total	562	554	611	562	554	611

Table 5.10 (continued): Geographic Class Crash Count by Collision Type from 2010 to 2012.

Geographic Class	AADT Based			Population Based		
	2010	2011	2012	2010	2011	2012
	Same Direction Others					
Metropolitan	204	204	179	89	99	89
Large Urbanized	118	92	152	29	20	17
Small Urbanized	141	111	79	356	309	345
Small Urban	569	561	622	292	288	345
Rural	32	67	101	298	319	337
Sub Total	1,064	1,035	1,133	1,064	1,035	1,133
Geographic Class	Head On					
Metropolitan	3	6	13	2	1	9
Large Urbanized	2	5	4	1	3	5
Small Urbanized	11	12	18	22	20	25
Small Urban	114	101	117	40	37	44
Rural	9	17	18	74	80	87
Sub Total	139	141	170	139	141	170
Geographic Class	Opposite Direction Sideswipe					
Metropolitan	11	6	6	7	6	3
Large Urbanized	3	10	3	0	0	1
Small Urbanized	22	15	12	32	27	27
Small Urban	161	148	132	51	48	47
Rural	18	38	34	125	136	109
Sub Total	215	217	187	215	217	187
Geographic Class	Opposite Direction Sideswipe					
Metropolitan	68	75	61	118	119	103
Large Urbanized	37	41	48	52	46	52
Small Urbanized	180	106	87	442	435	386
Small Urban	1,071	1,094	1,056	556	538	579
Rural	54	57	102	242	235	234
Sub Total	1,410	1,373	1,354	1,410	1,373	1,354
Geographic Class	Fixed Object					
Metropolitan	578	609	688	356	320	388
Large Urbanized	466	427	507	147	143	124
Small Urbanized	762	646	529	1,272	1,222	1,273
Small Urban	4,350	4,278	4,474	1,396	1,343	1,466
Rural	604	687	867	3,589	3,619	3,814
Sub Total	6,760	6,647	7,065	6,760	6,647	7,065

Table 5.10 (continued): Geographic Class Crash Count by Collision Type from 2010 to 2012.

Geographic Class	AADT Based			Population Based		
	2010	2011	2012	2010	2011	2012
	Entering At Angle					
Metropolitan	111	144	169	120	108	113
Large Urbanized	74	69	70	118	119	100
Small Urbanized	346	242	184	946	877	893
Small Urban	2,465	2,299	2,320	1,183	1,132	1,239
Rural	174	196	331	803	714	729
Sub Total	3,170	2,950	3,074	3,170	2,950	3,074
Geographic Class	Overturned					
Metropolitan	51	67	61	25	26	21
Large Urbanized	51	47	60	11	9	7
Small Urbanized	89	62	51	141	138	132
Small Urban	858	795	783	182	169	151
Rural	163	168	196	853	797	840
Sub Total	1,212	1,139	1,151	1,212	1,139	1,151
Geographic Class	Animal					
Metropolitan	8	16	33	2	2	0
Large Urbanized	25	34	28	14	13	5
Small Urbanized	52	57	74	33	53	48
Small Urban	1,093	1,095	1,097	161	194	220
Rural	171	226	290	1,139	1,166	1,249
Sub Total	1,349	1,428	1,522	1,349	1,428	1,522
Geographic Class	Bicycle					
Metropolitan	1	14	12	0	19	15
Large Urbanized	2	2	6	2	9	13
Small Urbanized	6	23	13	2	62	53
Small Urban	105	141	140	9	74	67
Rural	20	17	8	121	33	31
Sub Total	134	197	179	134	197	179
Geographic Class	Pedestrian					
Metropolitan	11	35	25	40	39	43
Large Urbanized	7	6	25	17	11	31
Small Urbanized	66	35	27	102	112	103
Small Urban	221	250	264	106	122	133
Rural	12	16	26	52	58	57
Sub Total	317	342	367	317	342	367

Table 5.10 (continued): Geographic Class Crash Count by Collision Type from 2010 to 2012.

Geographic Class	AADT Based			Population Based		
	2010	2011	2012	2010	2011	2012
	One Parked, One Moving					
Metropolitan	20	31	23	15	20	24
Large Urbanized	13	8	23	4	2	3
Small Urbanized	31	32	29	37	35	40
Small Urban	168	144	144	88	78	83
Rural	12	29	26	100	109	95
Sub Total	244	244	245	244	244	245
Geographic Class	Entering/Leaving Driveway					
Metropolitan	2	3	8	6	2	4
Large Urbanized	1	1	2	1	1	0
Small Urbanized	5	4	1	4	8	5
Small Urban	40	42	42	22	24	24
Rural	8	5	4	23	20	24
Sub Total	56	55	57	56	55	57
Geographic Class	Other					
Metropolitan	67	88	74	35	32	26
Large Urbanized	60	66	62	36	24	17
Small Urbanized	126	64	62	208	164	173
Small Urban	678	671	655	279	214	229
Rural	46	88	121	419	543	529
Sub Total	977	977	974	977	977	974
Geographic Class	Not Stated					
Metropolitan	1	0	1	1	0	0
Large Urbanized	0	1	1	0	0	0
Small Urbanized	0	0	0	1	0	2
Small Urban	2	2	3	0	1	1
Rural	0	1	0	1	3	2
Sub Total	3	4	5	3	4	5
Total	36,497	36,202	37,165	36,497	36,202	37,165

6.0 Model Findings

We begin with the discussion of results from the population-ADT classification models. This discussion provides a rational basis for evaluating the conventional urban-suburban modeling typology that typically includes three-lane, four-lane, five-lane and six-plus lane SPFs. The reasoning is that the population-ADT classifications are subsumed within the conventional urban-suburban architecture, but not in a neat nested manner. For example, a five-lane urban SPF can contain variables that belong in part to the urban-urban classification, and in part to an urban-rural classification. Due to this potential crossover effect, the heterogeneities extracted from the population-ADT classification are more micro-level than those that will be uncovered in the traditional urban-suburban SPF architecture. The implications are that the random parameter mean and standard deviation in the traditional urban-suburban architecture may not reflect the mean shifts due to the population-ADT effects that drive the underlying sub categories of urban-suburban arterials. Hence, inferences can be too aggregate – and one can miss the opportunity to target locations of safety interest at a more micro level consistent with the population-ADT classifications.

Global findings from the population-ADT classification models are based on the following geometric characteristics:
Lanes (number of lanes increasing, number of lanes decreasing, roadway width increasing, roadway width decreasing);
Shoulders (shoulder width left, shoulder width left center, shoulder width right center, shoulder width right);
Vertical alignment (vertical curve BVC arm, vertical curve VPI arm, vertical curve EVC arm, vertical curve length, vertical curve percent grade ahead, vertical curve percent grade back); and
Horizontal alignment (horizontal curve point of tangency arm, horizontal curve point of curvature arm, horizontal curve radius, horizontal curve maximum (super) elevation, horizontal curve length, horizontal curve central angle)

Out of the above mentioned 20 significant features, number of lanes, roadway width, shoulder width, point of vertical tangent grade (PVT), vertical curve point of vertical curve grade (PVC) horizontal curve maximum superelevation (e), curve central angle (delta), horizontal curve radius (R) were found to be random parameters. In addition, derived measures such as degree of curve, absolute vertical grade difference (A), and rate of vertical curvature (K) were also found to be random. The majority of the statistically significant effects were geometric. In addition, functional class indicators such as minor arterial indicator were also found to be random. Roadside information was not fully evaluated due to inconsistencies in matching roadside inventories for all homogeneous segments. Nevertheless, the finding of randomness in a substantial number of geometric features merits attention.

First, it demonstrates the significant amount of unobserved heterogeneity that is present in the urban-suburban context. There is no particular pattern in the nature of the randomness of parameters across the population-ADT spectrum. In other words, we do not observe a greater degree of randomness (as in numerous random parameters) in the urban-urban context, which one would typically expect due to traffic flow heterogeneities and functional class variations.

The heterogeneity of horizontal curvature variables such as degree of curve and radius reflects the fact that driver response to sharpness of curve effects is variable across segments, and that it is not reasonable to constrain the effect of curve degree or radius to a fixed parameter across segments. Likewise, the effect of superelevation is also not expected to be fixed across segments due to the inherent variations in superelevation design and driver reaction with respect to lane position on a superelevated curve. Randomness of superelevation effects in this study turns out to be motivated by the maximum value in a segment. This effect appears to capture the sensitivity of superelevation variation within the curve and associated driver expectations.

The randomness of vertical curvature parameters such as rate of vertical curvature and absolute grade difference reflects the variations from segment to segment due to design speed effects. The rate of vertical curvature in particular is a direct measure of design speed application, and it is not reasonable to constrain this effect to be fixed across segments. The absolute grade difference is a parameter that is influenced by the design speed and the length of curve. For the same A value, one can expect a longer curve with a higher design speed, versus a shorter curve with a lower design speed. It is not reasonable to expect the same effect size across these two segment types.

The randomness of vertical curve grades (PVC and PVT) is an interesting finding. It appears that the effect of a 3% forward tangent in a segment A would have a different effect size compared to the same magnitude forward tangent in segment B. While this is expected, the context in which this occurs requires further attention. For example, it is not possible to discern with the given data organization whether this is due to within-segment design features alone, or also motivated by prior segment and following segment features. The same reasoning is applied to the interpretation of randomness of the backward tangent as well. The heterogeneity effect, i.e., the random parameter means are smaller compared to the effect of the absolute grade difference by an order of magnitude, but still statistically significant.

The discussion above summarizes the findings from the population-ADT classification models. Out of the 24 major categories that were developed, 16 categories yielded sufficient sample sizes so as to enable the estimation of random parameter models. The six categories that did not yield estimable models included with sample size in parentheses:
Rural-metropolitan (0);
Large urban-large urbanized (0);
Large urbanized-small urban (200);
Metropolitan-large urbanized (0);
Small urbanized-large urbanized (16);
Large urbanized-metropolitan (8);
Small urbanized-metropolitan (198); and
Rural-large urbanized (188)

As result, a total of 87 models were estimated for the population-ADT classification SPFs.

6.1 Conclusions and Recommendations

Several conclusions arise from the development of the 87 models developed in this study. First and foremost is the treatment of heterogeneity in the form of random parameters in SPF development in the urban-suburban context. Since the majority of parameters that are random are geometric in nature, context appears to play a role that in that the roadside environment is unaccounted for. The treatment of roadside data on a consistent basis and its inclusion in the model database will potentially alleviate some of the ambiguities in the random parameter effects currently attributed to horizontal and vertical curvature.

Second, the presence of transition zones in the urban-suburban border areas can also play a role in the generation of unobserved heterogeneity. Land use information is usually a reasonable proxy for capturing this transition effect, in addition to design features such as speed limit change zones, cross sectional change areas and signage control. The addition of such data can provide added resolution to the nature of unobserved heterogeneity and the role it plays in the significance of geometric random parameters.

Third, the effect of roadside environment variables such as lighting, curb and sidewalk presence can also play a role in generating unobserved heterogeneities in the geometric parameter effect. Lighting is most likely a factor in segments containing horizontal curves, as well as vertical curves with climbing lanes, transition zones and segments where pedestrian and nonmotorized activity is significant. The addition of lighting data can provide for a richer set of random parameter identifications with more accurate effect sizes attributed to urban-suburban roadway geometry.

Roadside geometry is also potentially random if it were included. In the case of roadside geometry an added computational burden arises. Roadside geometry due to its correlation with roadway geometry will motivate the need for random parameter models where parameter correlation cannot be ignored. The correlated parameter models pose the burden of larger parameter dimensionalities and difficulties in interpretation. For example, if a roadside parameter represents a roadside variable that is an indicator, and its correlation with a roadway geometry parameter such as degree of curve is found to be significant, then, we have a potential mix of parameter distributions. This mix of parameter distributions makes the interpretations of parameter effects and their standard deviations difficult. In random parameter models, it is often useful to consider the simpler of mixing distributions, such as normal only distributions. However, given the complexity of the urban-suburban context, this aforementioned simplicity may not be suitable, motivating instead a much more complex modeling typology. The urban-suburban context is therefore a challenging area to gain insights from with respect to targeted geometric treatment; however, this challenge can be mitigated with the addition of consistent roadside geometry data, roadside environment data, and land use data.

With respect to modeling architectures, it is worthwhile to consider the mapping of the population-ADT classification SPFs with the conventional urban-suburban architecture in an embedded manner. For example, one can use population-ADT classification data indicators as additional variables in five-lane urban arterial SPF to see if the indicator is random or fixed across segments. Any randomness in the indicator will suggest that the heterogeneity due to multiple population-ADT class effects is significant. As a result, it may be worthwhile to consider further deepening of the five-lane SPF into stratifications along the population-ADT subsets provided that adequate sample sizes allow that differentiation.

Another aspect that has not been evaluated in this study is the effect of heterogeneity in means in random parameter models. Heterogeneity in the mean of a geometric parameter can result in mean shifts within stratified subgroups. For example, if it is determined that roadside variables are significant sources of heterogeneity in means, then, one can examine the nature of random parameter means by roadside stratification. This type of analysis also has its computational limitations due to parameter dimensionality. However, careful choice of the roadside stratifications, as well as potential land use and roadside environment stratifications can provide additional insights that can enrich the process of safety location prioritization.

A.1 Appendix on Population-ADT Classification SPFs

Random Parameter Negative Binomial Model of Total Crashes on Rural-Rural SPF Class Roadway Segments

```
Random Coefficients  NegBnReg Model
Dependent variable              TOTALACC
Log likelihood function      -6079.55767
Restricted log likelihood    -7155.57149
Chi squared [   6 d.f.]      2152.06765
Significance level                .00000
McFadden Pseudo R-squared       .1503771
Estimation based on N =  52040, K =  16
Inf.Cr.AIC  =  12195.1 AIC/N =      .234
Model estimated: Aug 28, 2015, 19:13:57
Sample is  2 pds and  26020 individuals
Negative binomial regression model
```

TOTALACC	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-7.29097***	.20035	-36.39	.0000	-7.68365	-6.89828
DEG1	.00405*	.00241	1.88	.0630	-.00068	.00878
VCK2	-.92239**	.36095	-2.56	.0106	-1.62979	-.21498
MCVLINE	-1.13925***	.18518	-6.15	.0000	-1.50220	-.77630
MCVCRAN	.00010***	.9240D-05	11.35	.0000	.00009	.00012
SHWDCK	-.96206***	.35785	-2.68	.0078	-1.68256	-.25128
MARL	-.18783***	.06322	-3.58	.0004	-.29214	-.08352
NOFLINC	-.35857***	.12547	-2.87	.0042	-.60880	-.11368
	Means for random parameters					
LNADT	.99957***	.02589	38.61	.0000	.94883	1.05032
LNLEN	.98962***	.01877	52.72	.0000	.95273	1.02691
SHWDLT	-.03446***	.00903	-3.81	.0001	-.05217	-.01676
	Diagonal elements of Cholesky matrix					
LNADT	.04005***	.00728	5.50	.0000	.02579	.05432
LNLEN	.08856***	.01428	6.22	.0000	.06066	.11665
SHWDLT	.01224***	.00401	3.05	.0023	.00438	.02010
	Below diagonal elements of Cholesky matrix					
lLNL_LNA	.04462**	.02003	2.23	.0259	.00536	.08388
lSHW_LNA	-.06391***	.00985	-6.49	.0000	-.08322	-.04460
lSHW_LNL	.02777***	.00705	3.94	.0001	.01395	.04159
	Dispersion parameter for NegBin distribution					
ScalParm	1.40392***	.14707	9.59	.0000	1.12167	1.69518

Implied covariance matrix of random parameters

Covariance matrix

	LNADT	LNLEN	SHWDLT
LNADT	.1604E-02		
LNLEN	.1787E-02	.9836E-02	
SHWDLT	-.2560E-02	-.3921E-03	.5006E-02

Implied standard deviations of random parameters

S.D_Beta	1
1	.0400528
2	.0991682
3	.0707517

Implied correlation matrix of random parameters

Cor.Mat.	LNADT	LNLEN	SHWDLT
LNADT	1.00000	.44992	-.90333
LNLEN	.44992	1.00000	-.05588
SHWDLT	-.90333	-.05588	1.00000

Random Parameter Negative Binomial Model of Property Damage Only Crashes on Rural-Rural SPF Class Roadway Segments

```
Random Coefficients  NegBnReg Model
Dependent variable                   PDO
Log likelihood function      -4204.98922
Restricted log likelihood    -4753.52279
Chi squared [  10 d.f.]      1097.06714
Significance level                .00000
McFadden Pseudo R-squared       .1153952
Estimation based on N =  52040, K =  21
Inf.Cr.AIC  =   8452.0 AIC/N =      .162
Model estimated: Aug 31, 2015, 17:17:55
Sample is  2 pds and  26020 individuals
Negative binomial regression model
```

PDO	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-8.00282***	.24082	-33.28	.0000	-8.47644	-7.53121
DEG1	.00994***	.00367	2.71	.0068	.00276	.01714
MCVCRAN	.884050D-04***	.14050D-04	6.29	.0000	.60811D-04	.11600D-03
MARL	-.22782***	.06915	-3.29	.0010	-.36342	-.09222
MCVMNSEL	-.00297***	.00086	-3.45	.0006	-.00465	-.00128
VCK2	-1.17914**	.48566	-2.43	.0152	-2.13103	-.22726
	Means for random parameters					
LNADT	1.02317***	.03263	31.36	.0000	.95921	1.08713
LNLEN	.98812***	.02150	45.96	.0000	.94598	1.03025
SHWDLT	-.07650***	.01139	-6.73	.0000	-.09882	-.05455
TOTLANE	-.18899***	.06718	-2.81	.0049	-.32057	-.05732
	Diagonal elements of Cholesky matrix					
LNADT	.00598*	.00319	1.98	.0603	-.00026	.01224
LNLEN	.08447***	.01866	4.53	.0000	.04791	.12106
SHWDLT	.02333**	.01030	2.26	.0235	.00314	.04352
TOTLANE	.03413***	.01182	2.88	.0042	.01077	.05745
	Below diagonal elements of Cholesky matrix					
lLNL_LNA	-.08998***	.02156	-4.17	.0000	-.13220	-.04768
lSHW_LNA	.14286***	.01231	11.60	.0000	.11872	.16699
lSHW_LNL	.04155***	.00977	4.25	.0000	.02241	.06069
lTOT_LNA	-.30914***	.07126	-4.34	.0000	-.44882	-.16947
lTOT_LNL	-.05651*	.03016	-1.87	.0610	-.11562	.00260
lTOT_SHW	-.03782	.02441	-1.55	.0212	-.08568	.01001
	Dispersion parameter for NegBin distribution					
ScalParm	1.53033***	.24130	6.33	.0000	1.05621	2.00444

Implied covariance matrix of random parameters

Covariance matrix

	LNADT	LNLEN	SHWDLT	TOTLANE
LNADT	.7080E-03			
LNLEN	-.2390E-02	.1825E-01		
SHWDLT	.8796E-02	-.9540E-02	.2269E-01	
TOTLANE	-.8214E-02	.2303E-01	-.4739E-01	.1014

Implied standard deviations of random parameters

S.D_Beta	1
1	.0266706
2	.123384
3	.150592
4	.318366

Implied correlation matrix of random parameters

Cor.Mat.	LNADT	LNLEN	SHWDLT	TOTLANE
LNADT	1.00000	-.72894	.94862	-.97102
LNLEN	-.72894	1.00000	-.50261	.58631
SHWDLT	.94862	-.50261	1.00000	-.98851
TOTLANE	-.97102	.58631	-.98851	1.00000

Random Parameter Negative Binomial Model of Possible Injury Crashes on Rural-Rural SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                 PINJ
Log likelihood function      -1653.51584
Restricted log likelihood    -1687.68584
Chi squared [   6 d.f.]        68.33340
Significance level               .00000
McFadden Pseudo R-squared      .0229663
Estimation based on N =  52040, K =  16
Inf.Cr.AIC  =   3338.0 AIC/N =     .064
Model estimated: Sep 01, 2015, 15:56:47
Sample is  2 pds and  26020 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
    PINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -3.92278***      .35668   -11.00  .0000    -4.62185  -3.22370
  SHWDCR|    -.10902**       .05043    -2.16  .0306     -.20787   -.01018
 MCVLIMI|     .70095*        .38740     1.95  .0704     -.05834   1.46024
SRYMDDEC|     .03880**       .01473     2.20  .0276      .00402    .06958
  MCOLR |    -.83165***      .14068    -5.90  .0000    -1.10796   -.55573
RCVDKSLI|    5.64183*       3.39861     1.96  .0670    -1.02128  12.30495
        |Means for random parameters
   LNLEN|     .94372***      .04222    22.35  .0000      .86097   1.02646
 TOTLANE|     .67783***      .17676     3.83  .0001      .33138   1.02428
    MARL|   -1.41640***      .19219    -7.37  .0000    -1.79308  -1.03971
        |Diagonal elements of Cholesky matrix
   LNLEN|     .14319***      .04093     3.50  .0005      .06297    .22340
 TOTLANE|     .13640***      .03483     3.38  .0001      .06876    .20407
    MARL|     .28255**       .13264     2.13  .0332      .02265    .54250
        |Below diagonal elements of Cholesky matrix
lTOT_LNL|    -.20552***      .04565    -4.59  .0000     -.29760   -.11345
lMAR_LNL|    -.18824         .23085    -1.62  .0148     -.64088    .26420
lMAR_TOT|    -.21931         .16429    -1.09  .0140     -.58051    .14189
        |Dispersion parameter for NegBin distribution
ScalParm|     .70711***      .24219     2.92  .0035      .23243   1.18180
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+------------------------------------------------------
               LNLEN      TOTLANE        MARL
--------+------------------------------------------------------
LNLEN      .2050E-01
TOTLANE   -.2984E-01   .6208E-01
MARL      -.2695E-01   .9338E-02        .1634

Implied standard deviations of random parameters

S.D_Beta|              1
--------+---------------
       1|        .143187
       2|        .249174
       3|        .404171


Implied correlation matrix of random parameters


--------+------------------------------
Cor.Mat.|    LNLEN  TOTLANE       MARL
--------+------------------------------
   LNLEN| 1.00000  -.83688   -.46575
 TOTLANE| -.83688  1.00000    .09272
    MARL| -.46575   .09272   1.00000

--------+------------------------------
Cor.Mat.|    LNLEN  TOTLANE       MARL
--------+------------------------------
   LNLEN| 1.00000  -.84404   -.48990
 TOTLANE| -.84404  1.00000    .12793
    MARL| -.48990   .12793   1.00000
```

Random Parameter Negative Binomial Model of Evident Injury crashes on rural-rural SPF class roadway segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                   EVI
Log likelihood function      -2020.61568
Restricted log likelihood    -2223.74687
Chi squared [   3 d.f.]       406.26042
Significance level               .00000
McFadden Pseudo R-squared      .0913560
Estimation based on N =  52040, K =  11
Inf.Cr.AIC  =   4063.2 AIC/N =     .078
Model estimated: Sep 01, 2015, 19:23:46
Sample is  2 pds and  26020 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
     EVI|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|  -11.2003***       .50200   -22.31  .0000    -12.1842  -10.2164
RCVMKSEL|    -.00808***      .00193    -4.13  .0000     -.01186   -.00430
RNYMDINC|    -.05062*        .02591    -1.95  .0499     -.10726    .00604
RCVPTCVA|     .00559***      .00065     8.55  .0000      .00431    .00687
    DEGI|    -.01974**       .00991    -1.99  .0464     -.03917   -.00031
        |Means for random parameters
   LNADT|     .89866***      .07799    12.04  .0000      .78580   1.09152
 TOTLANE|    -.11428**       .05042    -2.27  .0231     -.21380   -.01575
        |Diagonal elements of Cholesky matrix
   LNADT|     .89328**       .37003     2.41  .0158      .16503   1.61552
 TOTLANE|     .10271***      .02916     3.52  .0004      .04556    .15986
        |Below diagonal elements of Cholesky matrix
lTOT_LNA|     .17281         .13944     1.34  .0152     -.10080    .44611
        |Dispersion parameter for NegBin distribution
ScalParm|     .06649***      .00713     9.32  .0000      .05251    .08048
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+------------------------------------------------------
               LNADT      TOTLANE
--------+------------------------------------------------------
LNADT      .6020E-04
TOTLANE    .1224E-02   .4041E-01

Implied standard deviations of random parameters

S.D_Beta|              1
--------+---------------
       1|      .00708583
       2|        .201025

Implied correlation matrix of random parameters


--------+------------------
Cor.Mat.|    LNADT  TOTLANE
--------+------------------
   LNADT| 1.00000   .85962
 TOTLANE|  .85962  1.00000
```

Random Parameter Negative Binomial Model of Serious Injury Crashes on Rural-Rural SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                   SINJ
Log likelihood function       -652.46834
Restricted log likelihood     -658.36872
Chi squared [    3 d.f.]        11.80076
Significance level                .00810
McFadden Pseudo R-squared       .0089621
Estimation based on N =  52040, K =  11
Inf.Cr.AIC  =   1326.9 AIC/N =      .026
Model estimated: Sep 02, 2018, 17:58:11
Sample is  2 pds and  26020 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
    SINJ|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -13.6523***     1.19897   -11.31  .0000    -15.9016  -11.2038
   MCOLR|     .86635**       .34272     2.53  .0115      .19466   1.53810
    MARL|     .66517**       .31700     2.10  .0359      .04386   1.28647
 VCVBVCA|     .00369***      .00119     3.10  .0019      .00136    .00603
 HCVCRAH| .960290D-04**   .3914D-04     2.45  .0141  .193180D-04 .17274D-03
        |Means for random parameters
   LNADT|     .97201***      .14173     6.86  .0000      .69422   1.24979
 VCPARMA|    -.39224***      .09804    -4.00  .0001     -.58439   -.20010
        |Diagonal elements of Cholesky matrix
   LNADT|     .03563***      .01180     3.02  .0025      .01251    .05875
 VCPARMA|     .16447**       .06797     2.42  .0149      .03203    .29690
        |Below diagonal elements of Cholesky matrix
lVCP_LNA|    -.13017**       .06582    -1.98  .0479     -.25917   -.00118
        |Dispersion parameter for NegBin distribution
ScalParm|     .06632***      .02355     2.81  .0049      .02027    .11238
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
-------------------------------------------------------------------
                   LNADT      VCPARMA
-------------------------------------------------------------------
LNADT       .1269E-02
VCPARMA   -.4638E-02   .4430E-01

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|       .0356283
       2|        .209750

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|    LNADT  VCPARMA
--------+------------------
   LNADT| 1.00000  -.62062
 VCPARMA| -.62062  1.00000
```

Random Parameter Negative Binomial model of High Injury Crashes on Rural-Rural SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                  HIINJ
Log likelihood function      -2261.63755
Restricted log likelihood    -2346.15760
Chi squared [    3 d.f.]       169.04009
Significance level                .00000
McFadden Pseudo R-squared       .0360249
Estimation based on N =  52040, K =  10
Inf.Cr.AIC  =   4543.3 AIC/N =      .087
Model estimated: Sep 04, 2018, 14:52:28
Sample is  2 pds and  26020 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
   HIINJ|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -2.73668***      .23666   -11.56  .0000    -3.20052  -2.27284
    MARL|    -.65857***      .11597    -5.68  .0000     -.88617   -.43157
   MCOLR|    -.61745***      .11101    -5.56  .0000     -.83502   -.39988
 HCVCRAM| .80145D-04***   .1749D-04     4.58  .0000  .45833D-04 .11443D-03
        |Means for random parameters
   LNLEN|     .95870***      .02783    34.27  .0000      .89915   1.00828
 NOFLINC|     .90271***      .18366     4.92  .0000      .54275   1.26267
        |Diagonal elements of Cholesky matrix
   LNLEN|     .14279***      .01890     7.56  .0000      .10575    .17982
 NOFLINC|     .12704***      .04036     3.15  .0016      .04794    .20615
        |Below diagonal elements of Cholesky matrix
lNOF_LNL|    -.05131         .04082    -1.97  .0088     -.13078    .02812
        |Dispersion parameter for NegBin distribution
ScalParm|    1.54343**       .69312     2.23  .0260      .18495   2.90191
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
-------------------------------------------------------------------
                   LNLEN      NOFLINC
-------------------------------------------------------------------
LNLEN       .2039E-01
NOFLINC   -.7826E-02   .1877E-01

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|        .142787
       2|        .137013

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|    LNLEN  NOFLINC
--------+------------------
   LNLEN| 1.00000  -.37447
 NOFLINC| -.37447  1.00000
```

Random Parameter Negative Binomial Model of Just Injury Crashes on Rural-Rural SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable              JUSTINJ
Log likelihood function      -868.96638
Restricted log likelihood    -876.69535
Chi squared [   3 d.f.]        15.45792
Significance level               .00146
McFadden Pseudo R-squared      .0088160
Estimation based on N =  52040, K =  12
Inf.Cr.AIC  =   1761.9 AIC/N =     .034
Model estimated: Sep 04, 2015, 14:23:37
Sample is  2 pds and  26020 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
 JUSTINJ|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -4.26197***     .38324   -11.12  .0000    -5.01311  -3.51083
    MAEL|    -.92951***     .21749    -4.25  .0000    -1.35109   -.49853
   MCOLR|    -.75402***     .20466    -3.83  .0001    -1.18572   -.38231
EMTMDIEC|     .04597*       .02519     1.93  .0680     -.00340    .09533
 TOTLANE|     .48226**      .22272     2.17  .0304      .04574    .91875
 MCVLIMI|   -1.19266*       .69158    -1.96  .0846    -2.54813    .16281
        |Means for random parameters
   LNLEN|     .97967***     .05356    18.29  .0000      .87470   1.08465
 MCVCRAN|  .82508D-04**   .3919D-04    2.11  .0352  .57213D-05  .15934D-03
        |Diagonal elements of Cholesky matrix
   LNLEN|     .09226***     .02945     3.13  .0018      .03447    .15005
 MCVCRAN|  .52977D-04**   .2508D-04    2.11  .0346  .38243D-05  .10213D-03
        |Below diagonal elements of Cholesky matrix
1MCV_LNL|     .05903+       .03522     1.98  .0738     -.01001    .12807
        |Dispersion parameter for NegBin distribution
ScalParm|    1.65063**      .79429     2.08  .0377      .09385   3.20741

--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------------
                 LNLEN      MCVCRAN
--------+-----------------------------------------------------
LNLEN       .8512E-02
MCVCRAN     .6615E-08   .2807E-08

Implied standard deviations of random parameters

S.D_Beta|             1
--------+--------------
       1|      .0922606
       2|   .5297688-04

Implied correlation matrix of random parameters


--------+------------------
Cor.Mat.|   LNLEN  MCVCRAN
--------+------------------
   LNLEN| 1.00000   .00136
 MCVCRAN|  .00138  1.00000
```

Random Parameter Negative Binomial Model of Low Injury Crashes on Rural-Rural SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                LOINJ
Log likelihood function     -4615.05042
Restricted log likelihood   -5286.83555
Chi squared [   3 d.f.]      1342.91084
Significance level               .00000
McFadden Pseudo R-squared      .1270615
Estimation based on N =  52040, K =   9
Inf.Cr.AIC  =   9248.2 AIC/N =     .178
Model estimated: Sep 04, 2015, 16:47:47
Sample is  2 pds and  26020 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
   LOINJ|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -7.82640***     .20592   -38.38  .0000    -8.22807  -7.42873
 MCVCRAN| .98980D-04***  .1163D-04     8.66  .0000  .76577D-04  .12136D-03
    MCVL|    -.00023***  .4065D-04    -5.58  .0000     -.00031   -.00018
        |Means for random parameters
   LNADT|     .94732***     .02634    35.97  .0000      .89570    .99894
   LNLEN|    1.00323***     .02150    46.65  .0000      .96108   1.04538
        |Diagonal elements of Cholesky matrix
   LNADT|     .02504***     .00477     5.25  .0000      .01569    .03440
   LNLEN|     .02471**      .01132     2.18  .0292      .00250    .04692

        |Below diagonal elements of Cholesky matrix
lLNL_LNA|    -.08457***     .01580    -5.41  .0000     -.11773   -.05541
        |Dispersion parameter for NegBin distribution
ScalParm|    1.08633***     .12706     8.55  .0000      .83736   1.33541
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------------
                 LNADT        LNLEN
--------+-----------------------------------------------------
LNADT       .6272E-03
LNLEN      -.2160E-02   .7546E-02

Implied standard deviations of random parameters

S.D_Beta|             1
--------+--------------
       1|      .0250430
       2|      .0868686

Implied correlation matrix of random parameters


--------+------------------
Cor.Mat.|   LNADT    LNLEN
--------+------------------
   LNADT| 1.00000  -.99659
   LNLEN| -.99659  1.00000
```

Random Parameter Negative Binomial Model of Total Crashes on Small-Urban-Rural SPF Class Roadway Segments

```
--------------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable               TOTALACC
Log likelihood function     -31100.16961
Restricted log likelihood   -41097.14715
Chi squared [   6 d.f.]      19993.95514
Significance level                .00000
McFadden Pseudo R-squared       .2432523
Estimation based on N =  94114, K =  15
Inf.Cr.AIC  =  62230.3 AIC/N =     .661
Model estimated: Sep 06, 2015, 22:50:11
Sample is  2 pds and  47057 individuals
Negative binomial regression model
--------+-----------------------------------------------------------------------
        |                   Standard            Prob.       95% Confidence
TOTALACC|  Coefficient       Error         z    |z|>Z*         Interval
--------+-----------------------------------------------------------------------
        |Nonrandom parameters
Constant|    -7.85568***     .11456    -68.43  .0000    -8.38450  -7.63457
   LNADT|     .99565***      .01350     72.35  .0000      .97162  1.02574
 TOTLANE|    -.09610***      .01676     -5.73  .0000     -.12896  -.06325
  SBNDRT|    -.03099***      .00283    -10.96  .0000     -.03653  -.02544
 VCVLIMI|    -.55120***      .11898     -4.63  .0000     -.78440  -.31798
 HCVCRAN| .50507D-04***   .50210D-05    10.12  .0000  .40966D-04 .60648D-04
    HCVR|-.11997D-04***   .24200D-05    -4.96  .0000 -.16741D-04 -.72527D-05
 SBNDLTCR|   -.08532***      .00658    -12.97  .0000     -.09822  -.07243
  HCOLR|      .20994***      .03723      5.64  .0000      .13697    .28290
        |Means for random parameters
    DEG1|     .00332***      .00120      2.77  .0057      .00097    .00568
   LNLEN|     .90674***      .00892    101.60  .0000      .88925    .92423
 RWYWDINC|    .01186***      .00168      7.05  .0000      .00857    .01515
        |Diagonal elements of Cholesky matrix
    DEG1|     .00230***      .00081      2.84  .0045      .00071    .00389
   LNLEN|     .05977***      .00727      8.23  .0000      .04553    .07401
 RWYWDINC|    .00095**       .00043      2.21  .0272      .00011    .00179
        |Below diagonal elements of Cholesky matrix
 lLNL_DEG|    .06637***      .00870      7.63  .0000      .04932    .08342
 lRWY_DEG|   -.00219         .00126     -1.95  .0487     -.00267    .00226
 lRWY_LNL|   -.00455***      .00103     -4.75  .0000     -.00680   -.00257
        |Dispersion parameter for NegBin distribution
 ScalParm|    .90169***      .02425     37.18  .0000      .85416    .94922
--------+-----------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-------------------------------------------------
               DEG1          LNLEN      RWYWDINC
--------+-------------------------------------------------
DEG1        .3341E-06
LNLEN       .3534E-04    .7977E-02
RWYWDINC   -.1114E-06   -.3047E-03    .2479E-04

Implied standard deviations of random parameters

S.D_Beta|            1
--------+--------------
       1|   .577975E-03
       2|      .0893130
       3|     .00497884

Implied correlation matrix of random parameters

--------+--------------------------
Cor.Mat.|    DEG1     LNLEN RWYWDINC
--------+--------------------------
    DEG1| 1.00000   .76310  -.03872
   LNLEN|  .74910  1.00000  -.68521
RWYWDINC| -.03872  -.68521  1.00000
```

Random Parameter Negative Binomial Model of Property Damage Only Crashes on Small-Urban-Rural SPF Class Roadway Segments

```
--------------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                    PDO
Log likelihood function     -23122.64267
Restricted log likelihood   -28142.09312
Chi squared [   6 d.f.]      10056.90089
Significance level                .00000
McFadden Pseudo R-squared       .1783608
Estimation based on N =  94114, K =  18
Inf.Cr.AIC  =  46281.3 AIC/N =     .492
Model estimated: Sep 07, 2015, 00:49:13
Sample is  2 pds and  47057 individuals
Negative binomial regression model
--------+-----------------------------------------------------------------------
        |                   Standard            Prob.       95% Confidence
     PDO|  Coefficient       Error         z    |z|>Z*         Interval
--------+-----------------------------------------------------------------------
        |Nonrandom parameters
Constant|    -8.36073***     .12570    -66.52  .0000    -8.60708  -8.11437
   LNADT|    1.00836***      .01560     64.63  .0000      .97778  1.03894
    DEG1|     .01445**       .00693      2.09  .0367      .00090    .02807
  SBNDRT|    -.03335***      .00339     -9.83  .0000     -.04000  -.02670
 VCVLIMI|    -.78326***      .13549     -5.78  .0000    -1.04881  -.51768
 HCVCRAN| .454080D-04***  .61580D-05     7.37  .0000  .33337D-04 .57478D-04
    HCVR|-.978010D-05***  .27980D-05    -3.50  .0005 -.15265D-04 -.42956D-05
 SBNDLTCR|   -.07654***      .00756    -10.28  .0000     -.09335  -.06374
        |Means for random parameters
 TOTLANE|    -.07143***      .02122     -3.37  .0008     -.11306  -.02980
   LNLEN|     .90668***      .01046     86.73  .0000      .88618    .92718
 RWYWDINC|    .00910***      .00242      3.77  .0002      .00438    .01359
        |Diagonal elements of Cholesky matrix
 TOTLANE|     .08948***      .01879      4.76  .0000      .05264    .12631
   LNLEN|     .06003***      .00863      6.95  .0000      .04312    .07695
 RWYWDINC|    .00111**       .00051      2.18  .0291      .00011    .00210
        |Below diagonal elements of Cholesky matrix
 lLNL_TOT|    .06185***      .01040      5.95  .0000      .04147    .08223
 lRWY_TOT|   -.01279***      .00289     -4.43  .0000     -.01845  -.00713
 lRWY_LNL|   -.00472***      .00116     -4.09  .0000     -.00699  -.00246
        |Dispersion parameter for NegBin distribution
 ScalParm|    .94262***      .03367     28.00  .0000      .87664   1.00861
--------+-----------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-------------------------------------------------
             TOTLANE         LNLEN      RWYWDINC
--------+-------------------------------------------------
TOTLANE     .8006E-02
LNLEN       .5534E-02    .7429E-02
RWYWDINC   -.1144E-02   -.1074E-02    .1870E-03

Implied standard deviations of random parameters

S.D_Beta|            1
--------+--------------
       1|      .0894764
       2|      .0861943
       3|      .0136751

Implied correlation matrix of random parameters

--------+--------------------------
Cor.Mat.| TOTLANE    LNLEN RWYWDINC
--------+--------------------------
 TOTLANE| 1.00000   .71756  -.93496
   LNLEN|  .71756  1.00000  -.91146
RWYWDINC| -.93496  -.91146  1.00000
```

Random Parameter Negative Binomial Model of Possible Injury Crashes on Small-Urban-Rural SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                  PINJ
Log likelihood function      -9351.90636
Restricted log likelihood   -10073.04129
Chi squared [   3 d.f.]       1442.26986
Significance level                .00000
McFadden Pseudo R-squared       .0715906
Estimation based on N =  94114, K =  16
Inf.Cr.AIC  =  18735.8 AIC/N =      .199
Model estimated: Sep 07, 2015, 18:57:50
Sample is  2 pds and  47057 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
    PINJ|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|    -10.7457***      .26784   -40.12  .0000    -11.2707  -10.2208
   LNLEN|      .80349***      .01715    46.85  .0000      .76988    .83711
  SHWDRT|     -.04402***      .00671    -6.56  .0000     -.05718   -.03086
    HCVR|-.294000D-04***   .7359D-05    -4.00  .0001 -.438024D-04 -.149760D-04
 SHWDLTCR|    -.11637***      .01392    -8.36  .0000     -.14365   -.08908
 SCVMXSEL|     .00418***      .00051     8.13  .0000      .00317    .00519
 RMYWDDEC|     .01640***      .00546     3.00  .0027      .00569    .02711
 VCPARMA|      .02365*        .01253     1.89  .0587     -.00097    .04823
   MCOLR|      .22508***      .08563     2.63  .0086      .05726    .39291
 MCVLIMI|     -.82731***      .17365    -4.77  .0000    -1.16726   -.48735
        |Means for random parameters
 TOTLANE|     -.16066***      .04328    -3.71  .0002     -.24566   -.07582
   LNADT|     1.15855***      .03257    35.58  .0000     1.09472   1.22237
        |Diagonal elements of Cholesky matrix
 TOTLANE|      .05936***      .01419     4.18  .0000      .03155    .08716
   LNADT|      .01070***      .00231     4.63  .0000      .00617    .01522
        |Below diagonal elements of Cholesky matrix
 lLNA_TOT|    -.03805***      .00496    -7.67  .0000     -.04777   -.02832
        |Dispersion parameter for NegBin distribution
 ScalParm|     .53622***      .03890    13.78  .0000      .45998    .61247
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------
              TOTLANE       LNADT
--------+--------------------------------------------
TOTLANE     .3523E-02
LNADT      -.2258E-02   .1542E-02

Implied standard deviations of random parameters

S.D_Beta|            1
--------+--------------
       1|     .0593561
       2|     .0393231

Implied correlation matrix of random parameters

--------+----------------
Cor.Mat.| TOTLANE    LNADT
--------+----------------
 TOTLANE| 1.00000  -.96269
   LNADT| -.96268  1.00000
```

Random Parameter Negative Binomial Model of Evident Injury Crashes on Small-Urban-Rural SPF class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                   EVI
Log likelihood function      -7669.07234
Restricted log likelihood    -7907.57284
Chi squared [   3 d.f.]        477.00100
Significance level                .00000
McFadden Pseudo R-squared       .0301610
Estimation based on N =  94114, K =  15
Inf.Cr.AIC  =  15368.1 AIC/N =      .163
Model estimated: Sep 07, 2015, 19:52:27
Sample is  2 pds and  47057 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
     EVI|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|    -7.52552***      .28488   -26.42  .0000    -8.08388  -6.96715
   LNADT|      .73015***      .03420    21.35  .0000      .66315    .79720
  SHWDRT|     -.02097**       .00823    -2.55  .0108     -.03710   -.00483
    MCVR|-.186270D-04***   .6414D-05    -2.90  .0037 -.311970D-04 -.605680D-05
 SHWDLTCR|    -.04783***      .01636    -2.92  .0035     -.07990   -.01577
 SCVMXSEL|     .00188***      .00066     2.83  .0047      .00058    .00318
 RMYWDDEC|     .01187**       .00594     2.00  .0457      .00029    .02380
   MCOLR|      .26178***      .08219     3.18  .0014      .10069    .42288
 MCVCRAN| .37482D-04***    .1407D-04     2.66  .0077  .99078D-05  .65057D-04
        |Means for random parameters
 TOTLANE|     -.10370**       .04805    -2.16  .0309     -.19789   -.00952
   LNLEN|      .88089***      .01892    46.56  .0000      .84380    .91798
        |Diagonal elements of Cholesky matrix
 TOTLANE|      .02530***      .00920     2.75  .0060      .00726    .04333
   LNLEN|      .02976***      .00930     3.20  .0014      .01154    .04798
        |Below diagonal elements of Cholesky matrix
 lLNL_TOT|    -.05197***      .01122    -4.63  .0000     -.07395   -.02998
        |Dispersion parameter for NegBin distribution
 ScalParm|     .75189***      .09294     8.09  .0000      .56972    .93405
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------
              TOTLANE       LNLEN
--------+--------------------------------------------
TOTLANE     .6399E-03
LNLEN      -.1314E-02   .3586E-02

Implied standard deviations of random parameters

S.D_Beta|            1
--------+--------------
       1|     .0252953
       2|     .0598882

Implied correlation matrix of random parameters

--------+----------------
Cor.Mat.| TOTLANE    LNLEN
--------+----------------
 TOTLANE| 1.00000  -.86776
   LNLEN| -.86776  1.00000
```

Random Parameter Negative Binomial Model of Serious Injury Crashes on Small-Urban-Rural SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                SINJ
Log likelihood function     -2392.25153
Restricted log likelihood   -2407.83852
Chi squared [   3 d.f.]       31.17397
Significance level              .00000
McFadden Pseudo R-squared     .0064736
Estimation based on N =  94114, K =   9
Inf.Cr.AIC  =   4802.5 AIC/N =    .051
Model estimated: Sep 05, 2015, 17:20:16
Sample is  2 pds and  47057 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
    SINJ|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -9.01079***      .46824   -19.33  .0000    -9.92462  -8.09697
 MIVCRAN| .60122D-04**     .25770D-04   2.33  .0196  .96179D-05  .11063D-03
HCVPTCVA|     .00221***      .00064     3.49  .0005      .00097    .00346
        |Means for random parameters
   LNADT|     .41027***      .05135     7.99  .0000      .30957    .51098
    DEG1|    -.02648***      .00855    -3.05  .0021     -.04351   -.00966
        |Diagonal elements of Cholesky matrix
   LNADT|     .02824***      .00505     5.59  .0000      .01834    .03813
    DEG1|     .01662***      .00501     3.32  .0009      .00675    .02646
        |Below diagonal elements of Cholesky matrix
1DEG_LNA|     .01169**       .00521     2.24  .0249      .00147    .02191
        |Dispersion parameter for NegBin distribution
ScalParm|     .17843**       .08365     2.13  .0330      .01441    .34245
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------
                  LNADT        DEG1
--------+--------------------------------------------------
LNADT      .7979E-03
DEG1       .3302E-03   .4128E-03

Implied standard deviations of random parameters

S.D_Beta|             1
--------+-------------
       1|      .0282370
       2|      .0203178

Implied correlation matrix of random parameters

--------+-----------------
Cor.Mat.|   LNADT     DEG1
--------+-----------------
   LNADT| 1.00000   .57551
    DEG1|  .57551  1.00000
```

Random Parameter Negative Binomial Model of Fatal Injury Crashes on Small-Urban-Rural SPF class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable               FATAL
Log likelihood function     -1171.40341
Restricted log likelihood   -1177.75503
Chi squared [   3 d.f.]       12.70325
Significance level              .00532
McFadden Pseudo R-squared     .0053930
Estimation based on N =  94114, K =   9
Inf.Cr.AIC  =   2360.8 AIC/N =    .025
Model estimated: Sep 06, 2015, 18:04:39
Sample is  2 pds and  47057 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
   FATAL|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|  -10.0779***       .76548   -13.17  .0000    -11.5781   -8.5777
HCVPTCVA|     .00426***      .00073     5.82  .0000      .00282    .00569
  SHWDRT|     .04803*        .02510     1.97  .0557     -.00117    .09723
        |Means for random parameters
   LNADT|     .41509***      .08636     4.81  .0000      .24582    .58436
    DEG1|    -.03552**       .01409    -2.52  .0117     -.06313   -.00791
        |Diagonal elements of Cholesky matrix
   LNADT|     .03735***      .00766     4.87  .0000      .02233    .05236
    DEG1|     .02224**       .00940     2.37  .0180      .00381    .04066
        |Below diagonal elements of Cholesky matrix
1DEG_LNA|    -.01023         .00784    -1.31  .0418     -.02559    .00513
        |Dispersion parameter for NegBin distribution
ScalParm|     .14361         .12040     1.98  .0329     -.09236    .37959
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------
                  LNADT        DEG1
--------+--------------------------------------------------
LNADT      .1395E-02
DEG1      -.3821E-03   .5991E-03

Implied standard deviations of random parameters

S.D_Beta|             1
--------+-------------
       1|      .0373465
       2|      .0244772

Implied correlation matrix of random parameters

--------+-----------------
Cor.Mat.|   LNADT     DEG1
--------+-----------------
   LNADT| 1.00000  -.41798
    DEG1| -.41798  1.00000
```

Random Parameter Negative Binomial Model of Unknown Injury Crashes on Small-Urban-Rural SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable               UNKNOWN
Log likelihood function      -1250.87653
Restricted log likelihood    -1267.03245
Chi squared [   3 d.f.]         32.31224
Significance level                .00000
McFadden Pseudo R-squared       .0127511
Estimation based on N =  94114, K =  11
Inf.Cr.AIC  =   2523.8 AIC/N =     .027
Model estimated: Sep 09, 2015, 16:51:36
Sample is  2 pds and  47057 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
 UNKNOWN|  Coefficient       Error        z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -10.0530***      .78480   -12.81  .0000    -11.5912   -8.5148
 HCVLIMI|    -.93742**       .41006    -2.28  .0224    -1.74210   -.13275
 HCVCRAN| .884010-04**    .3824D-04     2.31  .0208  .134650-04 .163350-03
   MCOLR|     .62066***      .23772     2.61  .0090      .15474   1.08658
FNYNDISC|    -.01599         .11059    -1.81  .0312    -.03676     .00477
        |Means for random parameters
   LNLEN|     .92936***      .05067    18.30  .0000      .82643   1.02467
   LNADT|     .76654***      .09748     7.88  .0000      .57516    .95798
        |Diagonal elements of Cholesky matrix
   LNLEN|     .10600***      .03548     2.99  .0028      .03644    .17556
   LNADT|     .01592**       .00778     2.05  .0408      .00067    .03117
        |Below diagonal elements of Cholesky matrix
 lLNA_LNL|    .03239***      .00961     3.43  .0006      .01415    .05183
        |Dispersion parameter for NegBin distribution
ScalParm|     .24311**       .11471     2.08  .0373      .01436    .47187
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------
              LNLEN       LNADT
--------+--------------------------------------------------
LNLEN      .1124E-01
LNADT      .3497E-02   .1204E-02

Implied standard deviations of random parameters

S.D_Beta|             1
--------+--------------
       1|       .106000
       2|       .0347248

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|   LNLEN    LNADT
--------+------------------
   LNLEN| 1.00000    .95067
   LNADT|  .95067   1.00000
```

Random Parameter Negative Binomial Model of High Injury Crashes on Small-Urban-Rural SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                 HIINJ
Log likelihood function       -9738.23384
Restricted log likelihood    -10040.17320
Chi squared [   3 d.f.]        603.87873
Significance level                .00000
McFadden Pseudo R-squared       .0300731
Estimation based on N =  94114, K =  13
Inf.Cr.AIC  =  19502.5 AIC/N =     .207
Model estimated: Sep 09, 2015, 15:31:51
Sample is  2 pds and  47057 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
   HIINJ|  Coefficient       Error        z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -6.35672***      .21518   -29.54  .0000    -6.77847  -5.93498
    DEG1|    -.00627*        .00322    -1.98  .0520    -.01258    .00005
   MCOLR|     .15282**       .06812     2.21  .0270     .01795    .28830
 HCVLIMI|    -.70419***      .12859    -5.48  .0000    -.95422   -.45215
 HCVCRAN| .71336D-04***   .1232D-04     5.79  .0000  .47181D-04 .95481D-04
  SHWIRT|    -.02021***      .00666    -3.06  .0024    -.03326   -.00717
HCVHKSEL|     .00213***      .00058     3.67  .0002     .00099    .00326
        |Means for random parameters
   LNLEN|     .84075***      .01515    55.50  .0000      .81105    .87044
   LNADT|     .62101***      .02394    25.94  .0000      .57408    .66794
        |Diagonal elements of Cholesky matrix
   LNLEN|     .06615***      .01085     6.16  .0000      .04441    .08888
   LNADT|     .00885***      .00232     3.82  .0001      .00431    .01340
        |Below diagonal elements of Cholesky matrix
 lLNA_LNL|    .01138***      .00308     3.70  .0002      .00538    .01742
        |Dispersion parameter for NegBin distribution
ScalParm|    1.04450***      .12426     8.41  .0000      .80096   1.28803
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------
              LNLEN       LNADT
--------+--------------------------------------------------
LNLEN      .4244E-02
LNADT      .7415E-03   .2079E-03

Implied standard deviations of random parameters

S.D_Beta|             1
--------+--------------
       1|       .0651470
       2|       .0144196

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|   LNLEN    LNADT
--------+------------------
   LNLEN| 1.00000    .78936
   LNADT|  .78936   1.00000
```

Random Parameter Negative Binomial Model of Just Injury Crashes on Small-Urban-Rural SPF class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable               JUSTINJ
Log likelihood function      -4956.86102
Restricted log likelihood    -5166.21347
Chi squared [   6 d.f.]       418.70489
Significance level               .00000
McFadden Pseudo R-squared      .0405234
Estimation based on N =  94114, K =  18
Inf.Cr.AIC  =   9949.7 AIC/N =     .106
Model estimated: Sep 08, 2015, 16:08:18
Sample is  2 pds and  47057 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
 JUSTINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -12.2603***      .39917   -30.71  .0000    -13.0427  -11.4780
 MCVLIMI|   -1.92441***      .33462    -5.75  .0000    -2.55026  -1.26857
 MCVCRAN| .84400D-04***   .21690D-04    3.98  .0001  .43859D-04 .12591D-03
  SNNDRI|    -.04674***      .01041    -4.49  .0000     -.06715   -.02634
MCVMXSEL|     .00361***      .00092     3.91  .0001      .00180    .00542
 TOTLANE|    -.30701***      .06156    -4.99  .0000     -.42761   -.18660
  SNWDCR|    -.05321***      .01178    -4.52  .0000     -.07498   -.03013
SNVNDDEC|     .02549***      .00756     3.37  .0007      .01067    .04031
        |Means for random parameters
   LNLEN|     .82675***      .02641    31.31  .0000      .77500    .87851
   LNADT|    1.26383***      .04699    26.90  .0000     1.17174   1.35593
    DEG1|    -.00862*        .00441    -1.96  .0503     -.01726    .00001
        |Diagonal elements of Cholesky matrix
   LNLEN|     .09451***      .02398     3.95  .0001      .04756    .14148
   LNADT|     .02650***      .00443     5.98  .0000      .01782    .03518
    DEG1|     .01425***      .00464     3.07  .0022      .00514    .02336
        |Below diagonal elements of Cholesky matrix
lLNA_LNL|    -.01766**       .00811    -2.18  .0295     -.03356   -.00176
lDEG_LNL|    -.01097**       .00540    -2.03  .0421     -.02155   -.00039
lDEG_LNA|     .16447**       .06757     2.43  .0149      .03203    .29690
        |Dispersion parameter for NegBin distribution
ScalParm|     .43893***      .05749     7.63  .0000      .32625    .55161
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------
                 LNLEN        LNADT         DEG1
--------+--------------------------------------------------
LNLEN      .8931E-02
LNADT     -.1669E-02   .1014E-02
DEG1      -.1037E-02   .8712E-03   .3233E-03

Implied standard deviations of random parameters

S.D_Beta|              1
--------+-------------
       1|       .0945059
       2|       .0318425
       3|       .0179873

Implied correlation matrix of random parameters

--------+--------------------------
Cor.Mat.|   LNLEN    LNADT     DEG1
--------+--------------------------
   LNLEN| 1.00000  -.55456  -.61005
   LNADT| -.55456  1.00000   .98735
    DEG1| -.61005   .98735  1.00000
```

Random Parameter Negative Binomial Model of Low Injury Crashes on Small-Urban-Rural SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                 LOINJ
Log likelihood function     -25494.30660
Restricted log likelihood   -32097.49430
Chi squared [   6 d.f.]      13206.37501
Significance level                .00000
McFadden Pseudo R-squared       .2057228
Estimation based on N =  94114, K =  18
Inf.Cr.AIC  =  51024.6 AIC/N =      .542
Model estimated: Sep 09, 2015, 16:21:03
Sample is  2 pds and  47057 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
   LOINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -8.21652***      .12425   -66.11  .0000    -8.46010  -7.97294
 MCVLIMI|    -.75758***      .08531    -9.23  .0000     -.89473   -.62038
 MCVCRAN| .64488D-04***   .72472D-05    8.87  .0000  .50244D-04 .78732D-04
  SNNDRI|    -.03259***      .00329    -9.84  .0000     -.03884   -.02594
MCVMXSEL|     .00209***      .00042     5.01  .0000      .00127    .00291
  SNWDCR|    -.04400***      .00373   -11.80  .0000     -.05131   -.03669
NWVWIDEC|     .01675***      .00250     6.71  .0000      .01186    .02168
MCVPTTYA|    -.00063***      .00024    -2.65  .0081     -.00109   -.00016
        |Means for random parameters
   LNLEN|     .90457***      .01006    90.08  .0000      .88489    .92425
   LNADT|    1.02181***      .01512    67.58  .0000      .99217   1.05144
 TOTLANE|    -.12610***      .02091    -6.03  .0000     -.16708   -.08512
        |Diagonal elements of Cholesky matrix
   LNLEN|     .12506***      .00946    13.22  .0000      .10652    .14361
   LNADT|     .01693***      .00452     3.74  .0002      .00807    .02579
 TOTLANE|     .00692**       .00341     2.03  .0423      .00024    .01360
        |Below diagonal elements of Cholesky matrix
lLNA_LNL|    -.02817***      .00613    -4.60  .0000     -.04018   -.01617
lTOT_LNL|    -.02720*        .01867    -1.94  .0527     -.05791    .00352
lTOT_LNA|    -.02436*        .01309    -1.96  .0626     -.05001    .00128
        |Dispersion parameter for NegBin distribution
ScalParm|     .86823***      .02741    31.67  .0000      .81450    .92196
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------
                 LNLEN        LNADT      TOTLANE
--------+--------------------------------------------------
LNLEN      .1564E-01
LNADT     -.3523E-02   .1080E-02
TOTLANE   -.3601E-02   .3538E-03   .1381E-02

Implied standard deviations of random parameters

S.D_Beta|              1
--------+-------------
       1|        .125062
       2|       .0328650
       3|       .0371616

Implied correlation matrix of random parameters

--------+--------------------------
Cor.Mat.|   LNLEN    LNADT  TOTLANE
--------+--------------------------
   LNLEN| 1.00000  -.85717  -.73181
   LNADT| -.85717  1.00000   .28964
 TOTLANE| -.73181   .28964  1.00000
```

Random Parameter Negative Binomial Model of Total Crashes on Small-Urban-Small-Urban SPF Class Roadway Segments

```
--------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable              TOTALACC
Log likelihood function     -14531.92260
Restricted log likelihood   -38529.92022
Chi squared [   6 d.f.]      47355.19524
Significance level                .00000
McFadden Pseudo R-squared       .6145513
Estimation based on N =  17072, K =  17
Inf.Cr.AIC  =  29737.8 AIC/N =    1.742
Model estimated: Sep 09, 2015, 17:48:08
Sample is  2 pds and   8536 individuals
Negative binomial regression model
--------+-----------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
TOTALACC|  Coefficient       Error       z    |z|>Z*         Interval
--------+-----------------------------------------------------------------
        |Nonrandom parameters
Constant|   -4.70471***      .26486   -17.76  .0000    -5.22327  -4.18615
   LNLEN|    .82348***       .01559    52.55  .0000      .79259    .85398
    VCK2|    .55314***       .06617     8.36  .0000      .42344    .68283
MCVMMSL1|   -4.95835***     1.28975    -3.84  .0001    -7.48621  -2.43049
 TOTLANE|    .09785***       .01549     6.32  .0000      .06759    .12831
  SHWDCR|   -.04617***       .00469    -9.85  .0000     -.05536   -.03699
VCVPTGRB|    .00149***       .00032     4.59  .0000      .00085    .00212
        |Means for random parameters
   LNADT|    .70115***       .02981    23.54  .0000      .64351    .75878
     VCK|  -3.07667***       .27576   -11.17  .0000    -3.61511  -2.53823
  MCVLIMI|  -1.83436***      .13735   -12.08  .0000    -2.20276  -1.55596
        |Diagonal elements of Cholesky matrix
   LNADT|    .05216***       .00218    23.90  .0000      .04788    .05644
     VCK|    .61566***       .10681     5.76  .0000      .29458    .93673
  MCVLIMI|   .32289**        .14082     2.29  .0219      .04673    .59915
        |Below diagonal elements of Cholesky matrix
1VCK_LNA|   1.60284***       .29966     5.35  .0000     1.01551   2.19017
1MCV_LNA|   1.77309***       .21616     8.20  .0000     1.34938   2.19680
1MCV_VCK|   -.65168***       .16770    -3.69  .0002    -1.06957   -.32380
        |Dispersion parameter for NegBin distribution
ScalParm|    .35125***       .00852    41.24  .0000      .33456    .36794
--------+-----------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-------------------------------------------------------
                   LNADT           VCK      MCVLIMI
--------+-------------------------------------------------------
LNADT        .2721E-02
VCK          .8361E-01        2.948
MCVLIMI      .9248E-01        2.416        3.727

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|       .0521605
       2|        1.71702
       3|        1.93043

Implied correlation matrix of random parameters

--------+--------------------------
Cor.Mat.|    LNADT       VCK  MCVLIMI
--------+--------------------------
   LNADT| 1.00000    .93351   .91850
     VCK|  .93351   1.00000   .72895
 MCVLIMI|  .91850    .72895  1.00000
```

Random Parameter Negative Binomial Model of Property Damage Only Crashes on Small-Urban-Small-Urban SPF class roadway segments

```
--------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                   PDO
Log likelihood function     -11849.14537
Restricted log likelihood   -25672.53300
Chi squared [   6 d.f.]      27646.77486
Significance level                .00000
McFadden Pseudo R-squared       .5384500
Estimation based on N =  17072, K =  21
Inf.Cr.AIC  =  23740.3 AIC/N =    1.391
Model estimated: Sep 10, 2015, 18:02:23
Sample is  2 pds and   8536 individuals
Negative binomial regression model
--------+-----------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
     PDO|  Coefficient       Error       z    |z|>Z*         Interval
--------+-----------------------------------------------------------------
        |Nonrandom parameters
Constant|   -5.98582***      .32986   -18.15  .0000    -6.63233  -5.33931
     VCK|   -.47101***       .09594    -4.91  .0000     -.65905   -.28298
MCVMMSL1|   -6.20628***     1.55767    -3.98  .0001    -9.25925  -3.15331
 TOTLANE|   -.08122***       .02755    -2.95  .0032     -.13522   -.02722
  SHWDCR|   -.03998***       .00536    -7.46  .0000     -.05049   -.02948
VCVPTGRB|    .00391***       .00064     6.09  .0000      .00265    .00517
    DES1|   -.00377**        .00149    -2.54  .0110     -.00667   -.00086
RWYMDIMC|    .03166***       .00301    10.52  .0000      .02576    .03756
MCVPICVA|    .00146***       .00031     4.65  .0000      .00084    .00207
MCVCRAH| .22274D-04***  .58930D-05     3.21  .0000  .64772D-04 .39775D-04
VCVVPIA|   -.00281***       .00041    -6.86  .0000     -.00361   -.00200
        |Means for random parameters
   LNADT|    .79891***       .03737    21.38  .0000      .72566    .87215
   LNLEN|    .92216***       .01836    50.23  .0000      .88620    .95816
 MCVLIMI|  -3.13350***       .20140   -15.48  .0000    -3.54836  -2.75861
        |Diagonal elements of Cholesky matrix
   LNADT|    .01956***       .00653     3.00  .0027      .00676    .03233
   LNLEN|    .11585***       .00704    16.47  .0000      .10206    .12964
 MCVLIMI|    .44239***       .15611     2.83  .0046      .13642    .74836
        |Below diagonal elements of Cholesky matrix
1LNL_LNA|    .12607***       .01796     7.02  .0000      .09087    .16127
1MCV_LNA|    .76878***       .28161     2.73  .0063      .21683   1.32072
1MCV_LNL|   1.09000***       .22831     4.77  .0000      .64253   1.53747
        |Dispersion parameter for NegBin distribution
ScalParm|    .39547***       .01185    33.37  .0000      .37225    .41870
--------+-----------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-------------------------------------------------------
                   LNADT         LNLEN      MCVLIMI
--------+-------------------------------------------------------
LNADT        .3825E-03
LNLEN        .2466E-02    .2832E-01
MCVLIMI      .1504E-01        .2232        1.975

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|       .0195572
       2|        .171218
       3|        1.40529

Implied correlation matrix of random parameters

--------+--------------------------
Cor.Mat.|    LNADT     LNLEN  MCVLIMI
--------+--------------------------
   LNADT| 1.00000    .73632   .54706
   LNLEN|  .73632   1.00000   .92764
 MCVLIMI|  .54706    .92764  1.00000
```

Random Parameter Negative Binomial Model of Possible Injury Crashes on Small-Urban-Small-Urban SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients   NegBnReg Model
Dependent variable                   PINJ
Log likelihood function     -6321.71067
Restricted log likelihood   -8909.82291
Chi squared [   6 d.f.]      5176.22408
Significance level               .00000
McFadden Pseudo R-squared      .2904755
Estimation based on N =  17072, K =  19
Inf.Cr.AIC  =  12681.4 AIC/N =     .743
Model estimated: Sep 10, 2015, 18:15:55
Sample is  2 pds and   8566 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
    PINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -5.55183***      .47325   -12.37  .0000    -6.77937  -4.32428
     VCK|    -.36770**       .17360    -2.12  .0342     -.70785   -.02765
MCVMXSL1|   -5.03714*       2.57735    -1.95  .0507   -10.08861    .01433
  SHNDCR|    -.06048***      .00887    -6.82  .0000     -.07785   -.04310
VCVPTGRB|     .00495***      .00106     4.70  .0000      .00290    .00705
 MCVLINI|   -2.34819***      .27509    -8.54  .0000    -2.88736  -1.80902
RWYNDINC|     .02746***      .00300     9.16  .0000      .02157    .03332
 MCVCRAD| .75716D-04***  .14072D-04     5.38  .0000  .48137D-04 .10329D-03
 VCVVFIA|    -.00445***      .00076    -5.84  .0000     -.00581   -.00296
        |Means for random parameters
   LNADT|     .63677***      .04950    12.86  .0000      .53974    .73379
   LNLEN|     .87743***      .02764    31.75  .0000      .82325    .93161
    DEG1|    -.00716***      .00259    -2.77  .0057     -.01223   -.00209
        |Diagonal elements of Cholesky matrix
   LNADT|     .02582***      .00877     2.94  .0032      .00863    .04301
   LNLEN|     .10932***      .00994    10.88  .0000      .08984    .12290
    DEG1|     .42468**       .19680     2.16  .0309      .03896    .81040
        |Below diagonal elements of Cholesky matrix
lLNL_LNA|     .13924***      .02567     5.43  .0000      .08894    .18955
lDEG_LNA|     .05122***      .01136     4.51  .0000      .02896    .07348
lDEG_LNL|    -.00373         .00274    -1.36  .0741     -.00911    .00165
        |Dispersion parameter for NegBin distribution
ScalParm|     .33199***      .01721    19.40  .0000      .29855    .36552
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------
               LNADT        LNLEN         DEG1
--------+--------------------------------------------------
LNADT      .6667E-03
LNLEN      .3595E-02   .3006E-01
DEG1       .8717E-04   .8470E-04   .3046E-04

Implied standard deviations of random parameters

S.D_Beta|              1
--------+---------------
       1|      .0258206
       2|       .179987
       3|     .00551876

Implied correlation matrix of random parameters

--------+---------------------------
Cor.Mat.|   LNADT    LNLEN     DEG1
--------+---------------------------
   LNADT| 1.00000   .80307   .61176
   LNLEN|  .80307  1.00000   .08852
    DEG1|  .61176   .08852  1.00000
```

Random Parameter Negative Binomial Model of Evident Injury Crashes on Small-Urban-Small-Urban SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients   NegBnReg Model
Dependent variable                    EVI
Log likelihood function     -3063.74410
Restricted log likelihood   -3444.29350
Chi squared [   3 d.f.]       761.09881
Significance level               .00000
McFadden Pseudo R-squared      .1104868
Estimation based on N =  17072, K =  12
Inf.Cr.AIC  =   6151.5 AIC/N =     .360
Model estimated: Sep 10, 2015, 19:06:08
Sample is  2 pds and   8536 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
     EVI|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -5.42644***      .59162    -9.15  .0000    -6.58500  -4.26887
MCVMXSEL|     .05759***      .01754     3.28  .0010      .02322    .09196
 MCVLINI|   -2.11164***      .40468    -5.22  .0000    -2.90498  -1.31879
RWYNDINC|     .01307***      .00393     3.32  .0009      .00536    .02077
 MCVCRAM| .39928D-04*    .2075D-04     1.95  .0543 -.73264D-06 .80555D-04
  SHNDLT|    -.06004***      .00897    -6.69  .0000     -.07762   -.04245
        |Means for random parameters
   LNADT|     .53546***      .06383     8.39  .0000      .41027    .66066
   LNLEN|     .84861***      .03204    26.48  .0000      .78582    .91140
        |Diagonal elements of Cholesky matrix
   LNADT|     .01386**       .00698     1.98  .0475      .00015    .02757
   LNLEN|     .02268**       .01068     2.12  .0337      .00175    .04361
        |Below diagonal elements of Cholesky matrix
lLNL_LNA|     .05292**       .02307     2.29  .0218      .00771    .09813
        |Dispersion parameter for NegBin distribution
ScalParm|     .57342***      .06974     8.22  .0000      .43674    .71009
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------
               LNADT        LNLEN
--------+--------------------------------------------------
LNADT      .1922E-03
LNLEN      .7337E-03   .3816E-02

Implied standard deviations of random parameters

S.D_Beta|              1
--------+---------------
       1|      .0138638
       2|      .0617755

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|   LNADT    LNLEN
--------+------------------
   LNADT| 1.00000   .91814
   LNLEN|  .91814  1.00000
```

Random Parameter Negative Binomial Model of Serious Injury Crashes on Small-Urban-Small-Urban SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                  SINJ
Log likelihood function       -792.41315
Restricted log likelihood     -836.74700
Chi squared [   6 d.f.]        88.66769
Significance level               .00000
McFadden Pseudo R-squared      .0529836
Estimation based on N =  17072, K =  14
Inf.Cr.AIC  =   1610.8 AIC/N =     .094
Model estimated: Sep 10, 2015, 19:54:39
Sample is  2 pds and   8536 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
    SINJ|  Coefficient       Error        z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -5.95448***     1.21119    -4.92  .0000    -8.32837  -3.58060
 MCVLIMI|   -1.80751**       .77155    -2.34  .0191    -3.31972   -.29531
 VCPAMSA|     .09092***      .03527     2.58  .0099      .02179    .16005
        |Means for random parameters
   LNADT|     .42565***      .12472     3.41  .0006      .18120    .67010
   LNLEN|     .87795***      .05814    15.10  .0000      .76400    .99190
  SHWDRT|    -.04303**       .02134    -2.01  .0440     -.08490   -.00116
        |Diagonal elements of Cholesky matrix
   LNADT|     .04633***      .01707     2.71  .0066      .01287    .07979
   LNLEN|     .10587**       .04540     2.33  .0201      .01659    .19456
  SHWDRT|     .03257***      .01157     2.77  .0056      .00980    .05614
        |Below diagonal elements of Cholesky matrix
lLNL_LNA|     .09715***      .03437     2.83  .0047      .02978    .16452
lSHW_LNA|    -.02778**       .01230    -2.26  .0239     -.05188   -.00368
lSHW_LNL|     .01944         .02041      .95  .0407     -.02055    .05944
        |Dispersion parameter for NegBin distribution
ScalParm|     .08255**       .03397     2.43  .0151      .01597    .14914
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------
               LNADT        LNLEN       SHWDRT
--------+-----------------------------------------------
LNADT      .2147E-02
LNLEN      .8946E-03   .1152E-01
SHWDRT    -.3780E-03   .1895E-02   .1526E-02

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|      .0463326
       2|       .107324
       3|      .0390534

Implied correlation matrix of random parameters

--------+---------------------------
Cor.Mat.|    LNADT     LNLEN   SHWDRT
--------+---------------------------
   LNADT| 1.00000    .17991   -.20890
   LNLEN|  .17991   1.00000    .45215
  SHWDRT| -.20890    .45215   1.00000
```

Random Parameter Negative Binomial Model of Fatal Injury Crashes on Small-Urban-Small-Urban SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                 FATAL
Log likelihood function       -218.73312
Restricted log likelihood     -219.43172
Chi squared [   1 d.f.]         1.39720
Significance level               .23719
McFadden Pseudo R-squared      .0031837
Estimation based on N =  17072, K =   5
Inf.Cr.AIC  =    447.5 AIC/N =     .026
Model estimated: Sep 10, 2015, 20:32:46
Sample is  2 pds and   8536 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
   FATAL|  Coefficient       Error        z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -9.81669***     2.24011    -4.38  .0000   -14.20723  -5.42615
   LNLEN|     .98632***      .09180    10.73  .0000      .80620   1.16643
        |Means for random parameters
   LNADT|     .66762***      .22532     2.96  .0030      .22601   1.10923
        |Scale parameters for dists. of random parameters
   LNADT|     .37829*        .19911     1.90  .0574     -.01198    .76856
        |Dispersion parameter for NegBin distribution
ScalParm|     .08365**       .03595     2.33  .0197      .01339    .15431
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

Random Parameter Negative Binomial Model of Unknown Injury Crashes Small-Urban-Small-Urban SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable               UNKNOWN
Log likelihood function       -599.45361
Restricted log likelihood     -611.48635
Chi squared [   1 d.f.]         24.06508
Significance level                .00000
McFadden Pseudo R-squared       .0196775
Estimation based on N =  17072, K =    7
Inf.Cr.AIC  =   1212.9 AIC/N =      .071
Model estimated: Sep 11, 2015, 16:10:30
Sample is  2 pds and   8536 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
 UNKNOWN|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -2.63375***      .26293   -10.02  .0000    -3.14809  -2.11941
   LNLEN|     .81565***      .04602    17.72  .0000      .72546    .90584
     VCR|   -9.93744***     2.87707    -3.45  .0006   -15.57638  -4.29849
 TOTLANE|     .22952***      .07562     3.04  .0024      .08132    .37772
        |Means for random parameters
  SHWDLT|    -.10138***      .02487    -4.08  .0000     -.15013   -.05263
        |Scale parameters for dists. of random parameters
  SHWDLT|     .05156***      .01704     3.02  .0025      .01813    .08498
        |Dispersion parameter for NegBin distribution
ScalParm|     .15881*        .08345     1.90  .0656     -.01660    .33422
--------+--------------------------------------------------------------------
```

Random Parameter Negative Binomial Model of High Injury Crashes on Small-Urban-Small-Urban SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                 HIINJ
Log likelihood function      -3311.69179
Restricted log likelihood    -3884.05727
Chi squared [   8 d.f.]       1144.73096
Significance level                .00000
McFadden Pseudo R-squared       .1473625
Estimation based on N =  17072, K =   11
Inf.Cr.AIC  =   6645.4 AIC/N =      .389
Model estimated: Sep 11, 2015, 14:54:52
Sample is  2 pds and   8536 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
   HIINJ|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -6.35564***      .52701   -12.06  .0000    -7.38856  -5.32273
   LNLEN|     .82962***      .02597    31.95  .0000      .77873    .88051
HCVFITYA|     .00125**       .00051     2.51  .0120      .00028    .00228
    HCVL|    -.00030***   .6979D-04    -4.27  .0000     -.00043   -.00016
    MARL|    -.30014**       .13441    -2.23  .0255     -.56357   -.03671
        |Means for random parameters
   LNADT|     .67436***      .05475    12.32  .0000      .56703    .78165
  SHWDRT|    -.07347***      .00868    -8.46  .0000     -.09061   -.05644
        |Diagonal elements of Cholesky matrix
   LNADT|     .02187***      .00391     5.59  .0000      .01421    .02953
  SHWDRT|     .00128**       .00051     2.53  .0115      .00029    .00227
        |Below diagonal elements of Cholesky matrix
lSHW_LNA|     .05965***      .00627     9.51  .0000      .04735    .07194
        |Dispersion parameter for NegBin distribution
ScalParm|     .64664***      .08182     7.90  .0000      .48628    .80700
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------
               LNADT       SHWDRT
--------+--------------------------------------------------
LNADT      .4783E-03
SHWDRT     .1305E-02    .3582E-02

Implied standard deviations of random parameters

S.D_Beta|             1
--------+--------------
       1|      .0218711
       2|      .0598520


Implied correlation matrix of random parameters


--------+------------------
Cor.Mat.|   LNADT    SHWDRT
--------+------------------
   LNADT| 1.00000    .99521
  SHWDRT|  .99521   1.00000
```

Random Parameter Negative Binomial Model of Just Injury Crashes on Small-Urban-Small-Urban SPF class roadway segments

```
Random Coefficients  NegBnReg Model
Dependent variable                 JUSTINJ
Log likelihood function      -4136.25575
Restricted log likelihood    -4929.35491
Chi squared [   6 d.f.]      1586.20232
Significance level               .00000
McFadden Pseudo R-squared      .1608925
Estimation based on N =  17072, K =  20
Inf.Cr.AIC  =   8312.6 AIC/N =     .487
Model estimated: Sep 11, 2015, 15:27:11
Sample is  2 pds and   8536 individuals
Negative binomial regression model
```

JUSTINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-5.05105***	.58375	-8.65	.0000	-6.19521	-3.90694
VCBARMA	.05670***	.02120	2.58	.0099	.01314	.09826
HCVMXSEL	-7.29129**	3.07537	-2.37	.0177	-13.31891	-1.26367
SHWDCR	-.05035***	.01104	-4.56	.0000	-.07200	-.02871
VCVPTGRA	.00317**	.00130	2.44	.0147	.00062	.00572
HCVLIMI	-38514.0**	16235.48	-2.37	.0177	-70340.8	-6687.3
RWYWDINC	.03260***	.00392	8.32	.0000	.02492	.04028
HCVCRAN	.56380D-04***	.18850D-04	2.99	.0028	.19433D-04	.93326D-04
VCVVPIA	-.00356***	.00088	-4.03	.0001	-.00529	-.00183
HCVL	7.29381**	3.07547	2.37	.0177	1.26600	13.32162
	Means for random parameters					
LNLEN	.86122***	.03159	27.26	.0000	.79931	.92314
LNADT	.48249***	.06051	7.97	.0000	.36389	.60109
DEG1	-.00620**	.00304	-2.04	.0413	-.01215	-.00025
	Diagonal elements of Cholesky matrix					
LNLEN	.16225***	.02850	5.69	.0000	.10634	.21674
LNADT	.02558***	.00427	5.99	.0000	.01721	.03394
DEG1	.00617**	.00271	2.27	.0230	.00085	.01149
	Below diagonal elements of Cholesky matrix					
lLNA_LNL	-.03572***	.01029	-3.76	.0002	-.05588	-.01556
lDEG_LNL	-.00457	.00339	-1.35	.0778	-.01123	.00208
lDEG_LNA	.00017	.00281	2.06	.0423	-.00538	.00565
	Dispersion parameter for NegBin distribution					
ScalParm	.35344***	.02915	12.13	.0000	.29631	.41056

Implied covariance matrix of random parameters

Covariance matrix

	LNLEN	LNADT	DEG1
LNLEN	.2634E-01		
LNADT	-.6263E-02	.2153E-02	
DEG1	-.7424E-03	.1814E-03	.5905E-04

Implied standard deviations of random parameters

S.D_Beta	1
1	.162290
2	.0464027
3	.00768467

Implied correlation matrix of random parameters

Cor.Mat.	LNLEN	LNADT	DEG1
LNLEN	1.00000	-.83435	-.59524
LNADT	-.83435	1.00000	.50871
DEG1	-.59524	.50871	1.00000

Random Parameter Negative Binomial Model of Low Injury Crashes on Small-Urban-Small-Urban SPF Class Roadway Segments

```
Random Coefficients  NegBnReg Model
Dependent variable                  LOINJ
Log likelihood function     -12865.08763
Restricted log likelihood   -29993.78271
Chi squared [   6 d.f.]      34251.39017
Significance level               .00000
McFadden Pseudo R-squared      .5709745
Estimation based on N =  17072, K =  23
Inf.Cr.AIC  =  25782.2 AIC/N =    1.510
Model estimated: Sep 11, 2015, 15:42:11
Sample is  2 pds and   8536 individuals
Negative binomial regression model
```

LOINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-5.53639***	.30775	-17.99	.0000	-6.13956	-4.93321
VCK	-.43660***	.10581	-4.13	.0000	-.64399	-.22921
HCVMXSEL	-5.41775***	1.44548	-3.75	.0002	-8.25073	-2.58477
SHWDCR	-.02345**	.01011	-2.32	.0204	-.04327	-.00363
VCVPTGRA	.00310***	.00065	4.73	.0000	.00181	.00438
RWYWDINC	.01428***	.00193	7.40	.0000	.01050	.01805
HCVCRAN	.66365D-04***	.8199D-05	8.09	.0000	.50236D-04	.82434D-04
VCVVPIA	-.00249***	.00045	-5.57	.0000	-.00336	-.00161
HCVL	5.42099***	1.44544	3.75	.0002	2.58797	8.25386
DEG1	-.00608***	.00144	-4.22	.0000	-.00890	-.00326
SHWDLT	-.03790***	.00612	-6.19	.0000	-.04990	-.02590
SHMDRT	-.04370***	.00640	-6.83	.0000	-.05624	-.03115
MARL	-.20609***	.05697	-3.62	.0003	-.31774	-.09443
	Means for random parameters					
LNLEN	.90987***	.01761	51.66	.0000	.87346	.94448
LNADT	.82911***	.03271	25.35	.0000	.76900	.89322
HCVLIMI	-28625.8***	7631.856	-3.75	.0002	-43584.1	-13667.6
	Diagonal elements of Cholesky matrix					
LNLEN	.23711***	.01700	13.95	.0000	.20379	.27043
LNADT	.04023***	.00297	13.63	.0000	.03918	.04527
HCVLIMI	.31142**	.14692	2.12	.0340	.02345	.59938
	Below diagonal elements of Cholesky matrix					
lLNA_LNL	-.06252***	.00662	-9.45	.0000	-.07549	-.04955
lHCV_LNL	.30571	.25750	1.99	.0351	-.19898	.81039
lHCV_LNA	1.21816***	.22266	5.47	.0000	.78133	1.65499
	Dispersion parameter for NegBin distribution					
ScalParm	.41141***	.01161	35.45	.0000	.38868	.43416

Implied covariance matrix of random parameters

Covariance matrix

	LNLEN	LNADT	HCVLIMI
LNLEN	.5622E-01		
LNADT	-.1482E-01	.5527E-02	
HCVLIMI	.7249E-01	.2969E-01	1.674

Implied standard deviations of random parameters

S.D_Beta	1
1	.237110
2	.0743460
3	1.29396

Implied correlation matrix of random parameters

Cor.Mat.	LNLEN	LNADT	HCVLIMI
LNLEN	1.00000	-.84096	.23628
LNADT	-.84096	1.00000	.31071
HCVLIMI	.23626	.31071	1.00000

Random Parameter Negative Binomial Model of Total Crashes on Small-Urban-Small-Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable            TOTALACC
Log likelihood function    -8731.85525
Restricted log likelihood -24417.30937
Chi squared [   6 d.f.]    31370.90822
Significance level              .00000
McFadden Pseudo R-squared     .6423552
Estimation based on N =   8320, K =  31
Inf.Cr.AIC  =  17505.9 AIC/N =   2.104
Model estimated: Sep 11, 2015, 15:38:01
Sample is  2 pds and   4160 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
TOTALACC|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -5.00398***     .47424   -10.55  .0000   -5.93349  -4.07446
    VCVL|   -.00031***    .6661D-04   -4.57  .0000    -.00044   -.00018
 MCVCRAN| .32207D-04***  .11182D-04    2.72  .0065  .90305D-05 .55383D-04
VCVPTGRA|    .00363***      .00090     4.03  .0001     .00186    .00540
    MCVR| .16955D-04**   .7064D-05     2.40  .0164  .31097D-05 .30801D-04
  SMNDRT|   -.09048***      .00503   -18.01  .0000    -.10033   -.08063
  SMNDCR|    .03535***      .00694     5.10  .0000     .02176    .04895
 MCVLIMI|  -2.38455***      .28938    -8.24  .0000   -2.95171  -1.81738
     VCR|   -.29057**       .14303    -2.03  .0423    -.57102   -.01013
  MCOLR|  -1.30074***      .25124    -5.18  .0000   -1.79317   -.80832
VCVEVCA|   -.00125**       .00063    -1.96  .0496    -.00249    .00000
        |Means for random parameters
   LNLEN|    .90567***      .02474    36.61  .0000     .85718    .95415
   LNADT|    .79265***      .05349    14.82  .0000     .68781    .89749
 TOTLANE|    .12464***      .02917     4.27  .0000     .06747    .18181
        |Diagonal elements of Cholesky matrix
   LNLEN|    .23989***      .02458     9.76  .0000     .19171    .28807
   LNADT|    .06164***      .01353     4.56  .0000     .03513    .08815
 TOTLANE|    .01968***      .00486     4.05  .0001     .01015    .02920
        |Below diagonal elements of Cholesky matrix
 lLNA_LNL|   -.07701***      .01730    -4.45  .0000    -.11092   -.04308
 lTOT_LNL|    .03437         .03836     1.87  .0625    -.04278    .11153
 lTOT_LNA|   -.05437         .03402    -1.57  .0703    -.12105    .01231
        |Dispersion parameter for NegBin distribution
 ScalParm|    .40110***      .01273    31.51  .0000     .37615    .42605
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+---------------------------------------------
               LNLEN         LNADT       TOTLANE
--------+---------------------------------------------
LNLEN       .5755E-01
LNADT     -.1847E-01   .9730E-02
TOTLANE    .5246E-02  -.5999E-02   .4525E-02

Implied standard deviations of random parameters

S.D_Beta|              1
--------+----------------
       1|        .239890
       2|        .0986415
       3|        .0672650

Implied correlation matrix of random parameters

--------+--------------------------
Cor.Mat.|   LNLEN     LNADT  TOTLANE
--------+--------------------------
   LNLEN| 1.00000  -.78069   .51099
   LNADT| -.78069  1.00000  -.90404
 TOTLANE|  .51099  -.90404  1.00000
```

Random Parameter Negative Binomial Model of Property Damage Only Crashes on Small-Urban-Small-Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                 PDO
Log likelihood function    -7010.08390
Restricted log likelihood -15505.26011
Chi squared [   6 d.f.]    16990.35241
Significance level              .00000
McFadden Pseudo R-squared     .5478900
Estimation based on N =   8320, K =  20
Inf.Cr.AIC  =  14060.2 AIC/N =   1.690
Model estimated: Sep 12, 2015, 13:04:50
Sample is  2 pds and   4160 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
     PDO|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -5.85663***     .54900   -10.67  .0000   -6.93271  -4.78065
    VCVL|   -.00030***    .4751D-04   -4.40  .0000    -.00043   -.00017
 MCVCRAN| .40624D-04***  .13230D-04    3.08  .0020  .14487D-04 .66761D-04
VCVPTGRA|    .00237***      .00058     4.10  .0000     .00124    .00350
    MCVR| .22560D-04***  .8023D-05     2.81  .0049  .68946D-05 .38285D-04
  SMNDRT|   -.08901***      .00584   -15.25  .0000    -.10045   -.07757
  SMNDCR|    .03268***      .00787     4.15  .0000     .01725    .04812
 MCVLIMI|  -2.42617***      .33788    -7.18  .0000   -3.08794  -1.76301
  MCOLR|  -1.36350***      .31373    -4.35  .0000   -1.98043   -.75056
     VCR|   -.27457*        .14365    -1.97  .0457    -.55868    .00675
        |Means for random parameters
   LNLEN|    .88125***      .02836    31.08  .0000     .82588    .93883
   LNADT|    .83017***      .06185    13.42  .0000     .70898    .95139
 TOTLANE|    .10216***      .03275     3.12  .0018     .03808    .16625
        |Diagonal elements of Cholesky matrix
   LNLEN|    .22761***      .02829     8.05  .0000     .17217    .28306
   LNADT|    .06094***      .01473     4.14  .0000     .03208    .08980
 TOTLANE|    .01895***      .00528     3.79  .0002     .00963    .03028
        |Below diagonal elements of Cholesky matrix
 lLNA_LNL|   -.06886***      .01941    -3.55  .0004    -.10690   -.03082
 lTOT_LNL|    .02417         .04361     1.75  .0795    -.06131    .10964
 lTOT_LNA|   -.05462         .03678    -1.99  .0376    -.12668    .01744
        |Dispersion parameter for NegBin distribution
 ScalParm|    .36398***      .01349    26.98  .0000     .33750    .39058
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+---------------------------------------------
               LNLEN         LNADT       TOTLANE
--------+---------------------------------------------
LNLEN       .5181E-01
LNADT     -.1367E-01   .6456E-02
TOTLANE    .5501E-02  -.4993E-02   .3961E-02

Implied standard deviations of random parameters

S.D_Beta|              1
--------+----------------
       1|        .227612
       2|        .0819550
       3|        .0629716

Implied correlation matrix of random parameters

--------+--------------------------
Cor.Mat.|   LNLEN     LNADT  TOTLANE
--------+--------------------------
   LNLEN| 1.00000  -.74889   .38377
   LNADT| -.74889  1.00000  -.86222
 TOTLANE|  .38377  -.86222  1.00000
```

Random Parameter Negative Binomial Model of Possible Injury Crashes on Small-Urban-Small-Urbanized SPF Class Roadway Segments

```
Random Coefficients  NegBnReg Model
Dependent variable                 PINJ
Log likelihood function     -4225.06312
Restricted log likelihood   -6375.32116
Chi squared [   6 d.f.]     4300.51605
Significance level              .00000
McFadden Pseudo R-squared     .3375431
Estimation based on N =   8320, K =  19
Inf.Cr.AIC  =   8478.1 AIC/N =    1.019
Model estimated: Sep 12, 2015, 13:46:07
Sample is  2 pds and   4160 individuals
Negative binomial regression model
```

PINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-5.26936***	.74027	-7.12	.0000	-6.72025	-3.81846
LNADT	.64128***	.08179	7.84	.0000	.48097	.80159
VCVL	-.00039***	.9451D-04	-4.12	.0000	-.00057	-.00020
SHWDRT	-.09713***	.00841	-11.55	.0000	-.11361	-.08065
SHWDCR	.03370***	.01051	3.21	.0013	.01317	.05428
HCVL1MI	-2.76365***	.34985	-7.90	.0000	-3.44935	-2.07795
MCOLR	-1.77518***	.49884	-3.56	.0004	-2.75309	-.79728
ENVWDINC	.01646***	.00563	2.92	.0035	.00542	.02750
HCVR	.21081D-04*	.1086D-04	1.97	.0523	-.21233D-06	.42274D-04
	Means for random parameters					
LNLEN	.81674***	.03230	25.29	.0000	.75343	.88005
VCVPTGRA	.00218***	.00081	2.70	.0069	.00060	.00376
TOTLANE	.07746	.05113	1.55	.0195	-.02275	.17766
	Diagonal elements of Cholesky matrix					
LNLEN	.06036**	.02540	2.37	.0176	.01051	.11025
VCVPTGRA	.00407***	.00079	5.15	.0000	.00252	.00561
TOTLANE	.10951***	.02848	3.85	.0001	.05370	.16533
	Below diagonal elements of Cholesky matrix					
lVCV_LNL	.00519***	.00094	5.52	.0000	.00334	.00703
lTOT_LNL	-.00770	.02631	-2.29	.0125	-.05926	.04386
lTOT_VCV	-.03266***	.01263	-2.59	.0097	-.05744	-.00792
	Dispersion parameter for NegBin distribution					
ScalParm	.24664***	.01872	12.51	.0000	.20994	.28334

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------
              LNLEN      VCVPTGRA      TOTLANE
--------+--------------------------------------------
LNLEN       .3644E-02
VCVPTGRA    .3131E-03   .4342E-04
TOTLANE    -.4449E-03  -.1728E-03   .1154E-02

Implied standard deviations of random parameters

S.D_Beta|            1
--------+-------------
       1|     .0603531
       2|    .00658917
       3|     .0340044

Implied correlation matrix of random parameters

--------+--------------------------
Cor.Mat.|   LNLEN VCVPTGRA  TOTLANE
--------+--------------------------
   LNLEN| 1.00000   .78699  -.22640
VCVPTGRA|  .78699  1.00000  -.77114
 TOTLANE| -.22640  -.77114  1.00000
```

Random parameter Negative Binomial Model of Evident Injury Crashes on Small-Urban-Small-Urbanized SPF Class Roadway Segments

```
Random Coefficients  NegBnReg Model
Dependent variable                  EVI
Log likelihood function     -1963.86523
Restricted log likelihood   -2141.40980
Chi squared [   3 d.f.]      355.08314
Significance level              .00000
McFadden Pseudo R-squared     .0829087
Estimation based on N =   8320, K =  11
Inf.Cr.AIC  =   3949.7 AIC/N =     .475
Model estimated: Sep 14, 2015, 14:12:12
Sample is  2 pds and   4160 individuals
Negative binomial regression model
```

EVI	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-4.32987***	.87129	-4.97	.0000	-6.03748	-2.62227
TOTLANE	.13120**	.05965	2.20	.0278	.01429	.24812
HCVMXSEL	.00336***	.00105	3.20	.0014	.00130	.00542
LNLEN	.78092***	.04348	17.96	.0000	.69574	.86616
HCVL1MI	-2.52162***	.52454	-4.80	.0000	-3.55027	-1.49296
	Means for random parameters					
LNADT	.43117***	.09682	4.45	.0000	.24121	.62114
SHWDRT	-.06347***	.01082	-5.87	.0000	-.08467	-.04226
	Diagonal elements of Cholesky matrix					
LNADT	.03475***	.00461	7.54	.0000	.02572	.04378
SHWDRT	.13364**	.06144	2.17	.0298	.01311	.25097
	Below diagonal elements of Cholesky matrix					
lSHW_LNA	-.01202	.00760	-1.95	.0137	-.02692	.00287
	Dispersion parameter for NegBin distribution					
ScalParm	.58168***	.08846	6.58	.0000	.40830	.75506

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------
              LNADT       SHWDRT
--------+--------------------------------------------
LNADT       .1207E-02
SHWDRT     -.4177E-03   .2463E-03

Implied standard deviations of random parameters

S.D_Beta|            1
--------+-------------
       1|     .0347469
       2|     .0156935

Implied correlation matrix of random parameters

--------+-----------------
Cor.Mat.|   LNADT   SHWDRT
--------+-----------------
   LNADT| 1.00000  -.76605
  SHWDRT| -.76605  1.00000
```

Random Parameter Negative Binomial Model of Serious Injury crashes on Small-Urban-Small-Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                 SINJ
Log likelihood function      -459.49248
Restricted log likelihood    -461.59596
Chi squared [   1 d.f.]        4.20701
Significance level              .04026
McFadden Pseudo R-squared     .0042769
Estimation based on N =   8320, K =   8
Inf.Cr.AIC  =    935.0 AIC/N =    .120
Model estimated: Sep 16, 2015, 16:34:52
Sample is  2 pds and   4160 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
    SINJ|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -3.88317***     1.42226    -2.73  .0063    -6.67075  -1.09559
  SHNDRT|    -.04726*        .02651    -1.95  .0555    -.09903     .00450
MCVMXSEL|     .00581**       .00263     2.10  .0368     .00096     .01066
   LNLEN|     .74619***      .09351     7.98  .0000     .56292     .92947
 RCVLIMI|   -2.79513**      1.36611    -2.05  .0408   -5.47266   -.11760
        |Means for random parameters
   LNADT|     .25215*        .14610     1.85  .0720w   -.03421     .53851
        |Scale parameters for dists. of random parameters
   LNADT|     .03300***      .01012     3.26  .0011     .01317     .05283
        |Dispersion parameter for NegBin distribution
 ScalParm|    .00671**       .00283     2.02  .0438     .00016     .01125
--------+--------------------------------------------------------------------
```

Random Parameter Negative Binomial Model of Unknown Injury Crashes on Small-Urban-Small-Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable              UNKNOWN
Log likelihood function      -371.42875
Restricted log likelihood    -376.70292
Chi squared [   1 d.f.]       10.54836
Significance level              .00116
McFadden Pseudo R-squared     .0140003
Estimation based on N =   8320, K =   8
Inf.Cr.AIC  =    758.9 AIC/N =    .091
Model estimated: Sep 16, 2015, 16:04:13
Sample is  2 pds and   4160 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
 UNKNOWN|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -5.88367**      2.90005    -2.06  .0391   -11.46766   -.29969
   LNADT|     .08808***      .02701     3.26  .0011     .03514     .14102
 RCVLIMI|   -4.01482**      2.01912    -1.99  .0461   -7.95997   -.06866
  SHNDLT|    -.11973***      .03822    -3.98  .0029    -.18864   -.03083
  SHNDCR|     .09046***      .02715     3.33  .0009     .03724     .14368
        |Means for random parameters
   LNLEN|     .71888***      .11287     6.94  .0000     .49466     .89710
        |Scale parameters for dists. of random parameters
   LNLEN|     .10124***      .03922     2.58  .0098     .02436     .17811
        |Dispersion parameter for NegBin distribution
ScalParm|     .30079*        .18066     1.96  .0760    -.05334     .65481
--------+--------------------------------------------------------------------
```

Random Parameter Negative Binomial Model of High Injury Crashes on Small-Urban-Small-Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients   NegBnReg Model
Dependent variable               HIINJ
Log likelihood function    -2175.42530
Restricted log likelihood  -2439.04894
Chi squared [   6 d.f.]      527.24727
Significance level              .00000
McFadden Pseudo R-squared     .1080846
Estimation based on N =   8320, K =  16
Inf.Cr.AIC  =   4382.9 AIC/N =    .527
Model estimated: Sep 14, 2015, 15:58:46
Sample is  2 pds and   4160 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                Standard            Prob.      95% Confidence
   HIINJ|  Coefficient     Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -3.77881***    .77200    -4.89  .0000    -5.29180  -2.26573
 HCVLIMI|   -2.18875***    .52695    -4.16  .0000    -3.22262  -1.15688
 TOTLANE|     .16705***    .05446     3.07  .0022      .06031    .27378
    VCVL|    -.00031***  .9563D-04   -3.20  .0014     -.00049   -.00012
  SHWDLT|    -.06811***    .01119    -6.09  .0000     -.09003   -.04619
  SHWDCR|     .03237***    .01140     2.84  .0045      .01003    .05471
        |Means for random parameters
   LNLEN|     .88657***    .04002    22.14  .0000      .80814    .96500
   LNADT|     .40813***    .08847     4.61  .0000      .23472    .58153
HCVMAXSEL|    .00259**     .00105     2.46  .0138      .00053    .00466
        |Diagonal elements of Cholesky matrix
   LNLEN|     .14183***    .03717     3.82  .0001      .06897    .21469
   LNADT|     .01913***    .00696     2.75  .0060      .00550    .03277
HCVMAXSEL|    .15919*      .08171     1.95  .0514     -.00096    .31934
        |Below diagonal elements of Cholesky matrix
lLNA_LNL|    -.05185***    .01405    -3.65  .0003     -.07890   -.02381
lHCV_LNL|    -.00446***    .00133    -3.35  .0008     -.00707   -.00185
lHCV_LNA|     .00175       .00105     1.32  .0255     -.00037    .00387
        |Dispersion parameter for NegBin distribution
ScalParm|     .59181***    .07499     7.49  .0000      .44091    .74271
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-------------------------------------------------------
              LNLEN        LNADT     HCVMAXSEL
--------+-------------------------------------------------------
LNLEN      .2011E-01
LNADT     -.7283E-02    .3003E-02
HCVMAXSEL -.6327E-03    .2626E-03   .2374E-04

Implied standard deviations of random parameters

S.D_Beta|            1
--------+-------------
       1|      .141828
       2|      .0548002
       3|      .00487254

Implied correlation matrix of random parameters

--------+--------------------------
Cor.Mat.|   LNLEN     LNADT HCVMAXSEL
--------+--------------------------
   LNLEN| 1.00000  -.93707  -.91555
   LNADT| -.93707  1.00000   .98337
HCVMAXSEL| -.91559   .98337  1.00000
```

Random Parameter Negative Binomial Model of Just Injury Crashes on Small-Urban-Small-Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients   NegBnReg Model
Dependent variable              JUSTINJ
Log likelihood function    -2793.20536
Restricted log likelihood  -3632.81132
Chi squared [   5 d.f.]     1479.21192
Significance level              .00000
McFadden Pseudo R-squared     .2333534
Estimation based on N =   8320, K =  14
Inf.Cr.AIC  =   5614.4 AIC/N =    .675
Model estimated: Sep 14, 2015, 16:45:33
Sample is  2 pds and   4160 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                Standard            Prob.      95% Confidence
 JUSTINJ|  Coefficient     Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -5.50239***    .94345    -5.83  .0000    -7.35152  -3.65327
   LNLEN|     .75935***    .04051    18.75  .0000      .67997    .83874
  SHWDLT|    -.02653*      .01398    -1.90  .0655     -.05706    .00400
 TOTLANE|     .18422***    .05573     3.31  .0009      .07498    .29345
     VCE|    -.94429**     .39576    -2.39  .0170    -1.71997   -.16860
  MCOLR|   -1.70262***     .60813    -2.80  .0051    -2.59456   -.51067
    HCVL|    -.00064***  .8764D-04   -7.27  .0000     -.00081   -.00047
HCVMAXSEL|    .00494***    .00100     4.85  .0000      .00299    .00690
        |Means for random parameters
   LNADT|     .59548***    .10451     5.70  .0000      .39065    .80031
  SHWDRT|    -.07696***    .01539    -5.00  .0000     -.10712   -.04680
        |Diagonal elements of Cholesky matrix
   LNADT|     .03130***    .00397     7.88  .0000      .02351    .03908
  SHWDRT|     .13264***    .04452     2.98  .0029      .04539    .21990
        |Below diagonal elements of Cholesky matrix
lSHW_LNA|     .02412***    .00712     3.39  .0007      .01017    .03807
        |Dispersion parameter for NegBin distribution
ScalParm|     .33592***    .02726    12.32  .0000      .28249    .38936
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-------------------------------------------------------
              LNADT       SHWDRT
--------+-------------------------------------------------------
LNADT      .9794E-03
SHWDRT     .7548E-03   .5822E-03

Implied standard deviations of random parameters

S.D_Beta|            1
--------+-------------
       1|      .0312961
       2|      .0241298

Implied correlation matrix of random parameters

--------+-----------------
Cor.Mat.|   LNADT   SHWDRT
--------+-----------------
   LNADT| 1.00000   .99948
  SHWDRT|  .99949  1.00000
```

Random Parameter Negative Binomial Model of Low Injury Crashes on Small-Urban-Small-Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable               LOINJ
Log likelihood function    -7692.54354
Restricted log likelihood -15815.05685
Chi squared [    3 d.f.]   22245.02680
Significance level              .00000
McFadden Pseudo R-squared     .5911496
Estimation based on N =   5323, K =  16
Inf.Cr.AIC  =  15417.1 AIC/N =   1.658
Model estimated: Sep 14, 2015, 17:06:43
Sample is  2 pds and   4160 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                Standard            Prob.      95% Confidence
   LOINJ|  Coefficient     Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -5.81581***     .51761   -11.24  .0000    -6.83030  -4.80131
   LNADT|     .85768***     .05802    14.78  .0000      .74396    .97141
  SRNDLT|    -.02476***     .00806    -3.07  .0021     -.04056   -.00897
 VCPARMA|     .04701**      .01882     2.50  .0125      .01013    .08389
  MCOLE |   -1.35418***     .27234    -4.97  .0000    -1.88799   -.82036
   MCVL |    -.00046***  .5600D-04    -8.23  .0000     -.00057   -.00035
MCVMMXSEL|     .00342***     .00059     5.78  .0000      .00226    .00458
  SRWDRT|    -.07831***     .00788    -9.88  .0000     -.09369   -.06293
    VCVL|    -.00030***  .5814D-04    -5.14  .0000     -.00041   -.00018
  SRNDCR|     .04254***     .00642     6.63  .0000      .02996    .05512
        |Means for random parameters
   LNLEN|     .89860***     .02767    32.47  .0000      .84436    .95285
 TOTLANE|     .09929***     .03001     3.31  .0009      .04048    .15810
        |Diagonal elements of Cholesky matrix
   LNLEN|     .21138***     .01588    13.31  .0000      .18026    .24251
 TOTLANE|     .01121***     .00408     2.75  .0060      .00321    .01920

        |Below diagonal elements of Cholesky matrix
lTOT_LNL|     .06365***     .01362     4.60  .0000      .03653    .09077
        |Dispersion parameter for NegBin distribution
ScalParm|     .38329***     .01393    25.76  .0000      .35717    .40942
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------
              LNLEN      TOTLANE
--------+--------------------------------------------------------
LNLEN       .4468E-01
TOTLANE     .1345E-01   .4112E-02

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|        .211384
       2|       .0641219

Implied correlation matrix of random parameters

--------+--------------------
Cor.Mat.|   LNLEN   TOTLANE
--------+--------------------
   LNLEN| 1.00000    .98264
 TOTLANE|  .98264   1.00000
```

Random Parameter Negative Binomial Model of Total Crashes on Rural-Small-Urban SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable             TOTALACC
Log likelihood function     -1152.05476
Restricted log likelihood   -2693.22331
Chi squared [    6 d.f.]     3082.28110
Significance level               .00000
McFadden Pseudo R-squared      .5722256
Estimation based on N =   2202, K =  15
Inf.Cr.AIC  =   2334.2 AIC/N =    1.060
Model estimated: Sep 15, 2015, 13:40:23
Sample is  2 pds and   1101 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                Standard            Prob.      95% Confidence
TOTALACC|  Coefficient     Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -9.17886***     .80230   -11.44  .0000   -10.75133  -7.60639
   LNADT|    1.32459***     .10587    12.58  .0000     1.11778   1.53139
MCVMMXSEL|     .00263*      .00135     1.97  .0486     -.00007    .00533
  SRNDLT|    -.11048***     .01620    -6.48  .0000     -.13431   -.08266
    VCVL|    -.00050***     .00016    -2.80  .0051     -.00066   -.00015
        |Means for random parameters
   LNLEN|     .91320***     .06096    14.98  .0000      .79378   1.03267
    MCVR|    -.00028***  .8173D-04    -3.47  .0005     -.00044   -.00012
 TOTLANE|    -.15509**      .07006    -2.21  .0269     -.29241   -.01777
        |Diagonal elements of Cholesky matrix
   LNLEN|     .12821***     .04052     3.16  .0016      .04878    .20763
    MCVR|     .00048***  .7982D-04     5.98  .0000      .00030    .00060
 TOTLANE|     .06046***     .01605     3.77  .0002      .02901    .09191
        |Below diagonal elements of Cholesky matrix
lMCV_LNL|     .00018     .9303D-04     1.90  .0456     -.00003    .00035
lTOT_LNL|     .10726**      .05290     2.03  .0426      .00357    .21096
lTOT_MCV|     .12717***     .02413     5.27  .0000      .07988    .17443
        |Dispersion parameter for NegBin distribution
ScalParm|     .66622***     .07655     8.64  .0000      .51358    .81480
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------
              LNLEN        MCVR       TOTLANE
--------+--------------------------------------------------------
LNLEN       .1644E-01
MCVR        .1914E-04   .2262E-08
TOTLANE     .1375E-01   .7844E-04   .3139E-01

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|        .128206
       2|    .475608E-03
       3|        .177010

Implied correlation matrix of random parameters

--------+----------------------------
Cor.Mat.|   LNLEN      MCVR   TOTLANE
--------+----------------------------
   LNLEN| 1.00000    .31389    .60695
    MCVR|  .31389   1.00000    .87232
 TOTLANE|  .60695    .87232   1.00000
```

Random Parameter Negative Binomial Model of Property Damage Only Crashes on Rural-Small-Urban SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                 PDO
Log likelihood function     -938.98844
Restricted log likelihood  -1843.35587
Chi squared [   6 d.f.]     1808.73255
Significance level              .00000
McFadden Pseudo R-squared     .4906087
Estimation based on N =   2202, K =  15
Inf.Cr.AIC  =   1904.0 AIC/N =    .865
Model estimated: Sep 15, 2016, 13:59:03
Sample is  2 pds and   1101 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                Standard            Prob.      95% Confidence
     PDO|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -9.09553***      .97183    -9.36  .0000   -10.99568  -7.19050
   LNADT|   1.24294***       .12987     9.59  .0000      .98898   1.49690
  SHWDLT|   -.11072***       .02088    -5.30  .0000     -.15164   -.06979
        |Means for random parameters
   LNLEN|    .92566***       .07122    13.00  .0000      .78606   1.06526
    HCVR|   -.00028***     .9655D-04   -2.92  .0036     -.00047   -.00009
 TOTLANE|   -.00025**      .9744D-04   -2.33  .0107     -.00044   -.00006
        |Diagonal elements of Cholesky matrix
   LNLEN|    .17450***       .04515     3.55  .0006      .07809    .27090
    HCVR|    .00047***     .8114D-04    5.79  .0000      .00031    .00063
 TOTLANE|    .05166***       .01796     2.88  .0040      .01646    .08687
        |Below diagonal elements of Cholesky matrix
lHCV_LNL|    .10012          .04010     1.97  .1004     -.00008    .00032
lTOT_LNL|    .14291**        .06375     2.24  .0250      .01757    .26755
lTOT_HCV|    .11445***       .02462     4.27  .0000      .06187    .16702
        |Dispersion parameter for NegBin distribution
ScalParm|    .57367***       .07610     7.54  .0000      .42452    .72283
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------
                LNLEN         HCVR      TOTLANE
--------+--------------------------------------------------------------
LNLEN      .3045E-01
HCVR       .2324E-04   .2264E-06
TOTLANE    .2494E-01   .7117E-04   .3619E-01

Implied standard deviations of random parameters

S.D_Beta|             1
--------+-------------
       1|       .174496
       2|   .483350E-03
       3|       .190237


Implied correlation matrix of random parameters

--------+--------------------------
Cor.Mat.|    LNLEN      HCVR  TOTLANE
--------+--------------------------
   LNLEN| 1.00000    .25083    .75122
    HCVR|  .25083  1.00000    .77079
 TOTLANE|  .75122   .77079  1.00000
```

Random Parameter Negative Binomial Model of Possible Injury Crashes on Rural-Small-Urban SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                PINJ
Log likelihood function     -470.84045
Restricted log likelihood   -649.66043
Chi squared [   6 d.f.]      357.63997
Significance level              .00000
McFadden Pseudo R-squared     .2752515
Estimation based on N =   2202, K =  15
Inf.Cr.AIC  =    971.7 AIC/N =    .441
Model estimated: Sep 15, 2016, 14:21:25
Sample is  2 pds and   1101 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                Standard            Prob.      95% Confidence
    PINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|  -12.4490***      1.46559    -8.48  .0000    -15.3270   -9.5711
   LNLEN|    .87053***       .08270    10.53  .0000      .70544   1.03261
  SHWDLT|   -.12916***       .02804    -4.61  .0000     -.18411   -.07419
HCVMASEL|    .00395*         .00203     1.97  .0523     -.00004    .00794
 VCVLIMI|  -3.82600**       1.84538    -2.07  .0381    -7.44289   -.20911
        |Means for random parameters
   LNADT|   1.51441***       .17519     8.68  .0000     1.17107   1.85774
    HCVR|   -.00032**        .00016    -1.98  .0478     -.00064    .00000
 TOTLANE|   -.18365**        .09175    -2.00  .0454     -.36354   -.00376
        |Diagonal elements of Cholesky matrix
   LNADT|    .05008*         .02522     1.97  .0560     -.00523    .10539
    HCVR|    .00092***       .00011     2.99  .0028      .00011    .00084
 TOTLANE|    .05432***       .02048     2.63  .0086      .01378    .09485
        |Below diagonal elements of Cholesky matrix
lHCV_LNA|    .00020          .00013     1.92  .0475     -.00006    .00045
lTOT_LNA|    .12446          .08583     1.96  .0466     -.04317    .29209
lTOT_HCV|    .14221***       .03394     4.22  .0000      .07670    .20972
        |Dispersion parameter for NegBin distribution
ScalParm|   1.02038***       .26829     3.85  .0001      .50041   1.54034
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------
                LNADT         HCVR      TOTLANE
--------+--------------------------------------------------------------
LNADT      .2508E-02
HCVR       .1016E-04   .1466E-06
TOTLANE    .6232E-02   .7170E-04   .3896E-01

Implied standard deviations of random parameters

S.D_Beta|             1
--------+-------------
       1|      .0500776
       2|   .382976E-03
       3|       .197356


Implied correlation matrix of random parameters

--------+--------------------------
Cor.Mat.|    LNADT      HCVR  TOTLANE
--------+--------------------------
   LNADT| 1.00000    .53023    .63062
    HCVR|  .53023  1.00000    .94962
 TOTLANE|  .63062   .94962  1.00000
```

Random Parameter Negative Binomial Model of Evident Injury Crashes on Rural-Small-Urban SPF class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                 EVI
Log likelihood function     -215.95611
Restricted log likelihood   -227.06749
Chi squared [   3 d.f.]       22.22277
Significance level              .00006
McFadden Pseudo R-squared     .0489342
Estimation based on N =   2202, K =   9
Inf.Cr.AIC  =    449.9 AIC/N =    .204
Model estimated: Sep 15, 2015, 14:39:32
Sample is  2 pds and   1101 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
     EVI|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -8.11773***     1.30848    -6.26  .0000   -11.88437  -6.35108
   LNLEN|    .75082***      .10944     6.86  .0000     .53633    .96531
  SHNDLT|   -.07898         .03059    -1.96  .0185    -.17814    .02018
        |Means for random parameters
   LNADT|    .96615***      .24107     4.01  .0001     .45569   1.45568
 TOTLANE|   -.58814***      .20748    -2.84  .0046    -.99474   -.18154
        |Diagonal elements of Cholesky matrix
   LNADT|    .07305*        .03795     1.95  .0541    -.00130    .14739
 TOTLANE|    .06851*        .03445     1.97  .0477    -.00644    .18347
        |Below diagonal elements of Cholesky matrix
lTOT_LNA|    .30554**       .12412     2.46  .0138     .06228    .54882
        |Dispersion parameter for NegBin distribution
ScalParm|    .35449*        .19461     2.02  .0285    -.02699    .73592
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-------------------------------------------------------
              LNADT      TOTLANE
--------+-------------------------------------------------------
LNADT      .5536E-02
TOTLANE    .2232E-01        .1012

Implied standard deviations of random parameters

S.D_Beta|            1
--------+---------------
       1|      .0730485
       2|       .318104

Implied correlation matrix of random parameters

---------+------------------
Cor.Mat.:|   LNADT  TOTLANE
---------+------------------
   LNADT| 1.00000   .96051
 TOTLANE|  .96051  1.00000
```

Random Parameter Negative Binomial Model of Serious Injury Crashes on Rural-Small-Urban SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                SINJ
Log likelihood function      -81.33119
Restricted log likelihood    -83.28719
Chi squared [   1 d.f.]        3.91198
Significance level              .04794
McFadden Pseudo R-squared     .0234849
Estimation based on N =   2202, K =   8
Inf.Cr.AIC  =    178.7 AIC/N =    .079
Model estimated: Sep 16, 2015, 15:38:18
Sample is  2 pds and   1101 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
    SINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|  -10.7749***      4.11254    -2.62  .0088   -18.8354   -2.7143
   LNADT|   1.15459**       .49803     2.32  .0204     .17847   2.13071
   LNLEN|    .95824***      .26759     3.65  .0002     .46318   1.61330
        |Means for random parameters
 TOTLANE|   -.56162*        .28697    -1.96  .0503   -1.12407    .00083
        |Scale parameters for dists. of random parameters
 TOTLANE|    .17669*        .09120     1.94  .0527    -.00206    .35543
        |Dispersion parameter for NegBin distribution
ScalParm|    .17830*        .09500     1.98  .0486    -.00790    .36451
--------+--------------------------------------------------------------------
```

Random Parameter Negative Binomial Model of High Injury Crashes on Rural-Small-Urban SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                HIINJ
Log likelihood function      -290.86469
Restricted log likelihood    -311.84268
Chi squared [   3 d.f.]        41.95598
Significance level               .00000
McFadden Pseudo R-squared      .0672711
Estimation based on N =   2202, K =   8
Inf.Cr.AIC  =    599.7 AIC/N =     .272
Model estimated: Sep 16, 2018, 16:01:26
Sample is  2 pds and   1101 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                Standard            Prob.      95% Confidence
   HIINJ|  Coefficient     Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -12.5915***    1.43305    -8.79  .0000   -15.4002    -9.7828
VCVPTURB|    -.00594**      .00257    -2.31  .0209    -.01099    -.00090
HCVMMSL1|   -12.1579*      7.04568    -1.93  .0844   -25.9671     1.6514
        |Means for random parameters
   LNADT|    1.09795***     .17486     6.28  .0000     .75565    1.44026
 TOTLANE|    -.39707***     .14169    -2.80  .0051    -.67466    -.11948
        |Diagonal elements of Cholesky matrix
   LNADT|     .06075**      .02962     2.05  .0403     .00269     .11880
 TOTLANE|     .10882**      .04316     2.52  .0117     .02424     .19341
        |Below diagonal elements of Cholesky matrix
ITOT_LNA|     .23532***     .08848     2.66  .0078     .06190     .40874
        |Dispersion parameter for NegBin distribution
ScalParm|     .70859**      .34309     2.07  .0389     .03615    1.38103
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------
               LNADT      TOTLANE
--------+--------------------------------------------------
LNADT      .3690E-02
TOTLANE    .1429E-01   .6722E-01

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|       .0607462
       2|        .259264

Implied correlation matrix of random parameters

--------+----------------
Cor.Mat.|   LNADT  TOTLANE
--------+----------------
   LNADT| 1.00000   .90765
 TOTLANE|  .90765  1.00000
```

Random Parameter Negative Binomial Model of Just Injury Crashes on Rural-Small-Urban SPF class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable               JUSTINJ
Log likelihood function      -297.95633
Restricted log likelihood    -358.40693
Chi squared [   3 d.f.]       120.69720
Significance level               .00000
McFadden Pseudo R-squared      .1686591
Estimation based on N =   2202, K =  10
Inf.Cr.AIC  =    615.9 AIC/N =     .280
Model estimated: Sep 16, 2018, 16:21:25
Sample is  2 pds and   1101 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                Standard            Prob.      95% Confidence
 JUSTINJ|  Coefficient     Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -10.7550***    1.79982    -5.98  .0000   -14.2858    -7.2302
RRYWODEC|     .03548**      .01586     2.18  .0314     .00299     .06398
   LNLEN|     .86666***     .10480     8.27  .0000     .66125    1.07207
    HARL|     .62990**      .27430     2.30  .0217     .09229    1.16751
        |Means for random parameters
   LNADT|    1.03544***     .20862     4.97  .0000     .62677    1.44414
 TOTLANE|    -.00579**      .00262    -2.21  .0272    -.01098    -.00065
        |Diagonal elements of Cholesky matrix
   LNADT|     .13255***     .03150     4.22  .0000     .07115     .19487
 TOTLANE|     .05756*       .03244     1.97  .0760    -.00602     .12113
        |Below diagonal elements of Cholesky matrix
ITOT_LNA|     .39166***     .08404     4.66  .0000     .22693     .55638
        |Dispersion parameter for NegBin distribution
ScalParm|     .92346**      .41893     2.20  .0275     .10237    1.74454
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------
               LNADT      TOTLANE
--------+--------------------------------------------------
LNADT      .1767E-01
TOTLANE    .5206E-01       .1567

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|        .132930
       2|        .395869

Implied correlation matrix of random parameters

--------+----------------
Cor.Mat.|   LNADT  TOTLANE
--------+----------------
   LNADT| 1.00000   .98937
 TOTLANE|  .98937  1.00000
```

Random Parameter Negative Binomial Model of Low Injury Crashes on Rural-Small-Urban SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                LOINJ
Log likelihood function      -1043.44916
Restricted log likelihood    -2182.26010
Chi squared [   3 d.f.]      2277.62189
Significance level               .00000
McFadden Pseudo R-squared      .5218498
Estimation based on N =   2202, K =  12
Inf.Cr.AIC  =   2110.9 AIC/N =     .959
Model estimated: Sep 15, 2016, 16:48:20
Sample is  2 pds and   1101 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
   LOINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|    -9.94524***      .97016   -10.25  .0000  -11.84972  -8.04676
 TOTLANE|    -.15403**        .07671    -2.01  .0447   -.30458   -.00348
   LNLEN|     .93215***       .06859    13.43  .0000    .79810   1.06620
HCVMMSL1|   -11.0167***      3.53846    -3.11  .0018  -17.9520   -4.0815
    HCVR|     .00017***   .4177D-04     3.88  .0001    .00008    .00025
     VCR|    -.59023**        .28984    -2.08  .0376  -1.14655   -.03392
        |Means for random parameters
   LNADT|    1.36693***       .12682    10.80  .0000   1.11896   1.61490
  SHWDLT|    -.10712***       .02108    -5.08  .0000   -.14843   -.06581
        |Diagonal elements of Cholesky matrix
   LNADT|     .05303***       .00735     7.18  .0000    .03865    .06751
  SHWDLT|     .05556***       .01589     3.50  .0005    .02442    .08670
        |Below diagonal elements of Cholesky matrix
1SHW_LNA|    -.12282***       .01456    -8.31  .0000   -.15214   -.09349
        |Dispersion parameter for NegBin distribution
ScalParm|     .54336***       .06204     8.76  .0000    .42176    .66495
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------
              LNADT       SHWDLT
--------+-----------------------------------------------
LNADT       .2812E-02
SHWDLT    -.6613E-02   .1817E-01

Implied standard deviations of random parameters

S.D_Beta|               1
--------+--------------
       1|       .0530305
       2|       .134795

Implied correlation matrix of random parameters

--------+--------------------
Cor.Mat.|    LNADT    SHWDLT
--------+--------------------
   LNADT| 1.00000   -.91112
  SHWDLT| -.91112   1.00000
```

Random Parameter Negative Binomial Model of Total Crashes on Small-Urbanized-Rural SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable             TOTALACC
Log likelihood function      -1119.13432
Restricted log likelihood    -1586.05562
Chi squared [   6 d.f.]       933.84260
Significance level               .00000
McFadden Pseudo R-squared      .2943912
Estimation based on N =   2020, K =  16
Inf.Cr.AIC  =   2270.3 AIC/N =    1.124
Model estimated: Sep 16, 2016, 15:40:48
Sample is  2 pds and   1010 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
TOTALACC|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|    -7.84202***      .82621    -8.47  .0000   -9.45738  -6.02668
   LNLEN|     .84394***       .05099    16.55  .0000    .74401    .94387
    HCVR|-.75276D-04***   .27300D-04    -2.76  .0058 -.12879D-03 -.21764D-04
    DEGI|     .03057***       .00760     4.04  .0001    .01591    .04584
  SHWDCR|    -.04138***       .01429    -2.89  .0038   -.06939   -.01336
 VCVLIMI|   -1.97381*         .70126    -1.96  .0501  -2.74827    .00064
        |Means for random parameters
   LNADT|    1.00716***       .10622     9.48  .0000    .79897   1.21535
 TOTLANE|    -.14686**        .06389    -2.30  .0218   -.27208   -.02165
  SHWDLT|   -1.14362***       .42691    -2.68  .0073  -1.98234   -.30490
        |Diagonal elements of Cholesky matrix
   LNADT|     .07329***       .02121     3.46  .0005    .03173    .11486
 TOTLANE|     .06190*         .03576     1.95  .0624   -.00818    .13198
  SHWDLT|     .02372***       .00628     3.73  .0002    .01144    .03598
        |Below diagonal elements of Cholesky matrix
1TOT_LNA|    -.00025**        .00012    -1.98  .0478   -.00049    .00000
1SHW_LNA|     .07554***       .02462     3.06  .0021    .02759    .12409
1SHW_TOT|     .01749          .01608     1.59  .0987   -.01398    .04896
        |Dispersion parameter for NegBin distribution
ScalParm|     .85222***       .12201     6.99  .0000    .61309   1.09135
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------
              LNADT      TOTLANE       SHWDLT
--------+-----------------------------------------------
LNADT       .5372E-02
TOTLANE   -.2364E-03   .3842E-02
SHWDLT      .5559E-02   .5381E-03   .6620E-02

Implied standard deviations of random parameters

S.D_Beta|               1
--------+--------------
       1|       .0732947
       2|       .0619805
       3|       .0813625

Implied correlation matrix of random parameters

--------+---------------------------
Cor.Mat.|    LNADT  TOTLANE    SHWDLT
--------+---------------------------
   LNADT| 1.00000  -.05205    .93210
 TOTLANE| -.05205  1.00000    .16618
  SHWDLT|  .93210   .16618   1.00000
```

Random Parameter Negative Binomial Model of Property Damage Only Crashes on Small-Urbanized-Rural SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                 PDO
Log likelihood function    -843.30331
Restricted log likelihood  -1043.39011
Chi squared [   3 d.f.]     400.17359
Significance level             .00000
McFadden Pseudo R-squared    .1917660
Estimation based on N =   2020, K =   9
Inf.Cr.AIC  =   1704.6 AIC/N =    .844
Model estimated: Sep 16, 2015, 16:28:20
Sample is  2 pds and   1010 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                 Standard            Prob.       95% Confidence
     PDO|  Coefficient      Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -7.52550***    1.01491    -7.71  .0000    -9.51469  -5.53632
   LNLEN|     .85066***     .05100    16.29  .0000      .75071    .95061
 TOTLANE|    -.04306**      .01980    -2.17  .0297     -.08186   -.00425
        |Means for random parameters
  LNADT|      .90573***     .11140     8.13  .0000      .68739   1.12406
  SHWDCR|    -.04323***     .01569    -2.75  .0059     -.07399   -.01248
        |Diagonal elements of Cholesky matrix
   LNADT|     .02595***     .00585     4.87  .0000      .01729    .04061
  SHWDCR|     .04219***     .00966     4.40  .0000      .02341    .06097
        |Below diagonal elements of Cholesky matrix
lSHW_LNA|     .03266***     .00996     3.28  .0010      .01315    .05217
        |Dispersion parameter for NegBin distribution
ScalParm|    1.12809***     .22962     4.91  .0000      .67766   1.57852
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+------------------------------------------------
                 LNADT       SHWDCR
--------+------------------------------------------------
LNADT        .8355E-03
SHWDCR       .8456E-03    .2846E-02

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|       .0289534
       2|       .0533523

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|   LNADT   SHWDCR
--------+------------------
   LNADT| 1.00000   .61216
  SHWDCR|  .61216  1.00000
```

Random Parameter Negative Binomial Model of Possible Injury Crashes on Small-Urbanized-Rural SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                FINJ
Log likelihood function    -452.65754
Restricted log likelihood  -500.67920
Chi squared [   6 d.f.]      96.04331
Significance level             .00000
McFadden Pseudo R-squared    .0959130
Estimation based on N =   2020, K =  14
Inf.Cr.AIC  =    933.3 AIC/N =    .462
Model estimated: Sep 16, 2015, 15:26:07
Sample is  2 pds and   1010 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                 Standard            Prob.       95% Confidence
    FINJ|  Coefficient      Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -8.93822***    1.33539    -6.65  .0000   -12.06630  -5.31014
   LNLEN|     .76559***     .08130     9.43  .0000      .60622    .92493
 TOTLANE|    -.26909**      .11718    -2.30  .0217     -.49875   -.03942
MCVETCVA|     .00477*       .00249     1.96  .0552     -.00011    .00965
        |Means for random parameters
   LNADT|    1.04786***     .17652     5.94  .0000      .70185   1.33383
 HCVLINI|   -6.72795***    1.97034    -3.65  .0003    -8.80916  -2.64954
  SHWDCR|    -.15298***     .02974    -5.14  .0000     -.21127   -.09468
        |Diagonal elements of Cholesky matrix
   LNADT|     .08237***     .03359     2.75  .0060      .02658    .15820
 HCVLINI|    3.23370***    1.12975     2.88  .0040     1.03119   5.43621
  SHWDCR|     .06789***     .02008     3.38  .0007      .02853    .10725
        |Below diagonal elements of Cholesky matrix
lHCV_LNA|     .00458*       .00230     1.92  .0557     -.00032    .00948
lSHW_LNA|     .09266***     .03353     2.76  .0057      .02694    .15838
lSHW_HCV|    -.05846**      .02552    -2.33  .0197     -.10948   -.00847
        |Dispersion parameter for NegBin distribution
ScalParm|    1.92676**      .68122     2.91  .0209      .28079   2.82274
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+------------------------------------------------------
                 LNADT        HCVLINI        SHWDCR
--------+------------------------------------------------------
LNADT        .1116E-03
HCVLINI      .1160E-02       10.47
SHWDCR       .9708E-03      -.1022     .1678E-01

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|       .0105626
       2|        3.23556
       3|        .129537

Implied correlation matrix of random parameters

--------+--------------------------
Cor.Mat.|   LNADT  HCVLINI   SHWDCR
--------+--------------------------
   LNADT| 1.00000   .03393   .71633
 HCVLINI|  .03386  1.00000  -.43523
  SHWDCR|  .71633  -.43523  1.00000
```

Random Parameter Negative Binomial Model of Evident Injury Crashes on Small-Urbanized-Rural SPF Class Roadway Segments

```
--------------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                 EVI
Log likelihood function     -172.73261
Restricted log likelihood   -176.85749
Chi squared [   3 d.f.]        8.25015
Significance level              .04112
McFadden Pseudo R-squared     .0233243
Estimation based on N =   2020, K =   9
Inf.Cr.AIC  =    363.5 AIC/N =    .180
Model estimated: Sep 17, 2015, 19:40:47
Sample is  2 pds and   1010 individuals
Negative binomial regression model
--------+-----------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
     EVI|  Coefficient       Error       z    |z|>Z*          Interval
--------+-----------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -6.43115***     2.35442    -2.73  .0063   -11.04573   -1.81657
   LNLEN|    1.03305***      .11514     8.97  .0000      .80737    1.25873
 VCVVFIA|     .00717**       .00313     2.29  .0220      .00103     .01331
        |Means for random parameters
  SHNDCR|    -.08385*        .04521    -1.85  .0636    -.17245      .00476
   LNADT|     .60283**       .23552     2.56  .0105     .14122     1.06445
        |Diagonal elements of Cholesky matrix
  SHNDCR|     .07534***      .02678     2.81  .0049     .02284      .12784
   LNADT|     .03024*        .01590     1.90  .0571    -.00092      .06141
        |Below diagonal elements of Cholesky matrix
lLNA_SHN|    -.03380**       .01418    -2.38  .0171    -.06160     -.00601
        |Dispersion parameter for NegBin distribution
ScalParm|     .02818*        .01553     1.81  .0695    -.00225      .05861
--------+-----------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------------------------------
---
              SHNDCR       LNADT
--------+-----------------------------------------------------------------------
---
SHNDCR      .5677E-02
LNADT      -.2547E-02   .2067E-02

Implied standard deviations of random parameters

S.D_Beta|             1
--------+--------------
       1|      .0753486
       2|      .0455503

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|  SHNDCR    LNADT
--------+------------------
  SHNDCR| 1.00000  -.74526
   LNADT| -.74526  1.00000
```

Random Parameter Negative Binomial Model of Serious Injury Crashes on Small-Urbanized-Rural SPF Class Roadway Segments

```
--------------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                SINJ
Log likelihood function      -91.76247
Restricted log likelihood   -101.06942
Chi squared [   3 d.f.]       18.61391
Significance level              .00033
McFadden Pseudo R-squared     .0920939
Estimation based on N =   2020, K =   9
Inf.Cr.AIC  =    201.5 AIC/N =    .100
Model estimated: Sep 18, 2015, 18:25:34
Sample is  2 pds and   1010 individuals
Negative binomial regression model
--------+-----------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
    SINJ|  Coefficient       Error       z    |z|>Z*          Interval
--------+-----------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -9.09905**      4.20220    -2.17  .0303   -17.33614    -.86381
   LNADT|     .76897*        .44240     1.74  .0822    -.09811     1.63606
    DEG1|     .06823***      .02339     2.92  .0035     .02239      .11408
        |Means for random parameters
  SHWDCR|    -.46965**       .18363    -2.56  .0106    -.82954     -.10936
   LNLEN|    1.16871***      .18448     6.34  .0000     .80713     1.53029
        |Diagonal elements of Cholesky matrix
  SHNDCR|     .30160***      .11041     2.73  .0063     .08520      .51801
   LNLEN|     .17176         .10765     1.59  .1112    -.03923      .38312
        |Below diagonal elements of Cholesky matrix
lLNL_SHN|     .22706***      .06803     3.34  .0008     .09373      .36040
        |Dispersion parameter for NegBin distribution
ScalParm|     .96084*        .50613     1.90  .0573    -.02971     1.95038
--------+-----------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------------------------------
              SHNDCR       LNLEN
--------+-----------------------------------------------------------------------
SHNDCR      .9097E-01
LNLEN       .6548E-01   .8106E-01

Implied standard deviations of random parameters

S.D_Beta|             1
--------+--------------
       1|      .301604
       2|      .284719

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|  SHNDCR    LNLEN
--------+------------------
  SHNDCR| 1.00000   .76250
   LNLEN|  .76250  1.00000
```

Random Parameter Negative Binomial Model of High Injury Crashes on Small-Urbanized-Rural SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                HIINJ
Log likelihood function      -348.43985
Restricted log likelihood    -365.95952
Chi squared [   8 d.f.]        40.09989
Significance level               .00000
McFadden Pseudo R-squared      .0543341
Estimation based on N =   2020, K =  11
Inf.Cr.AIC  =    718.9 AIC/N =     .356
Model estimated: Sep 17, 2015, 17:00:07
Sample is  2 pds and   1010 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
   HIINJ|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -7.40550***    1.51029    -4.90  .0000   -10.36562  -4.44538
   LNADT|     .79319***     .16608     4.78  .0000      .46768   1.11869
    MCVL|    -.00082***     .00026    -3.12  .0018     -.00133   -.00030
 HCVTRAN|     .00029***   .9175D-04    3.14  .0017      .00011    .00047
XNYNDDEC|    -.03429**      .01690    -2.03  .0425     -.06742   -.00116
        |Means for random parameters
   LNLEN|     .90133***     .09607     9.38  .0000      .71284   1.09011
  SHWDCR|    -.07131**      .02989    -2.39  .0171     -.12990   -.01272
        |Diagonal elements of Cholesky matrix
   LNLEN|     .17982***     .03438     5.23  .0000      .11243    .24722
  SHWDCR|     .08100***     .01731     4.68  .0000      .04708    .11493
        |Below diagonal elements of Cholesky matrix
lSHW_LNL|     .02895        .01944     1.99  .0764     -.00915    .06705
        |Dispersion parameter for NegBin distribution
ScalParm|     .00343        .00229     1.50  .1385     -.00109    .00792
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+----------------------------------------------------
               LNLEN      SHWDCR
--------+----------------------------------------------------
LNLEN      .3234E-01
SHWDCR     .1467E-01   .7400E-02

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|        .179824
       2|       .0860210

Implied correlation matrix of random parameters

--------+-----------------
Cor.Mat.|   LNLEN   SHWDCR
--------+-----------------
   LNLEN| 1.00000   .94166
  SHWDCR|  .94166  1.00000
```

Random Parameter Negative Binomial Model of Just Injury Crashes on Small-Urbanized-Rural SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable              JUSTINJ
Log likelihood function      -217.10101
Restricted log likelihood    -236.11811
Chi squared [   8 d.f.]        38.03421
Significance level               .00000
McFadden Pseudo R-squared      .0805406
Estimation based on N =   2020, K =  10
Inf.Cr.AIC  =    454.2 AIC/N =     .225
Model estimated: Sep 17, 2015, 14:46:15
Sample is  2 pds and   1010 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
 JUSTINJ|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|  -10.2685***     2.16495    -4.74  .0000   -14.5117   -6.0253
   LNADT|    1.08584***     .23275     4.67  .0000      .62968   1.54201
  SHWDCR|    -.22990***     .04893    -4.70  .0000     -.32579   -.13400
    MCVL|    -.00098**      .00044    -2.22  .0266     -.00185   -.00011
        |Means for random parameters
   LNLEN|    1.11266***     .13097     8.50  .0000      .85596   1.36937
HCVMXSEL|     .00740        .00903     1.97  .0610     -.00285    .01725
        |Diagonal elements of Cholesky matrix
   LNLEN|     .20205***     .06360     3.17  .0015      .07700    .32709
HCVMXSEL|     .00295**      .00135     2.19  .0285      .00031    .00558
        |Below diagonal elements of Cholesky matrix
lHCV_LNL|     .00740        .00403     1.97  .0480     -.00245    .01726
        |Dispersion parameter for NegBin distribution
ScalParm|     .03784*       .02062     2.05  .0660     -.00220    .07787
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+----------------------------------------------------
               LNLEN    HCVMXSEL
--------+----------------------------------------------------
LNLEN      .4082E-01
HCVMXSEL   .9166E-03   .1114E-04

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|        .202045
       2|      .00333750

Implied correlation matrix of random parameters

--------+-----------------
Cor.Mat.|   LNLEN HCVMXSEL
--------+-----------------
   LNLEN| 1.00000   .46937
HCVMXSEL|  .46937  1.00000
```

Random Parameter Negative Binomial Model of Low Injury Crashes on Small-Urbanized-Rural SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable               LOINJ
Log likelihood function     -929.55054
Restricted log likelihood  -1137.65378
Chi squared [   3 d.f.]     416.60648
Significance level              .00000
McFadden Pseudo R-squared     .2170693
Estimation based on N =   2020, K =   9
Inf.Cr.AIC  =   1877.7 AIC/N =    .930
Model estimated: Sep 17, 2015, 14:18:58
Sample is  2 pds and   1010 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
   LOINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -7.19481***      .78144    -9.09  .0000    -8.74612  -5.64371
   LNADT|     .85113***      .08024    10.61  .0000      .69386   1.00839
 VCVLINI|   -1.41442*        .76620    -1.95  .0649    -2.91814    .08729
        |Means for random parameters
   LNLEN|     .89677***      .05100    17.58  .0000      .79681    .99673
  SHNDCR|    -.04277***      .01430    -2.99  .0028     -.07081   -.01474
        |Diagonal elements of Cholesky matrix
   LNLEN|     .14896***      .01952     7.62  .0000      .11011    .18781
  SHNDCR|     .03885***      .00885     4.39  .0000      .02151    .05619
        |Below diagonal elements of Cholesky matrix
lSHN_LNL|     .02405**       .00963     2.50  .0124      .00521    .04298
        |Dispersion parameter for NegBin distribution
ScalParm|    1.10573***      .20727     5.33  .0000      .69948   1.51197
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+----------------------------------------------
               LNLEN      SHNDCR
--------+----------------------------------------------
LNLEN      .2219E-01
SHNDCR     .3589E-02   .2090E-02

Implied standard deviations of random parameters

S.D_Beta|            1
--------+-------------
       1|      .148963
       2|      .0457121

Implied correlation matrix of random parameters

--------+-----------------
Cor.Mat.|   LNLEN   SHNDCR
--------+-----------------
   LNLEN| 1.00000   .52655
  SHNDCR|  .52655  1.00000
```

Random parameter Negative Binomial Model of Total Crashes on Small-Urban-Large-Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable            TOTALACC
Log likelihood function    -1275.37555
Restricted log likelihood  -3049.91848
Chi squared [   6 d.f.]    3534.65631
Significance level              .00000
McFadden Pseudo R-squared     .5802332
Estimation based on N =   1608, K =  16
Inf.Cr.AIC  =   2589.2 AIC/N =   1.610
Model estimated: Sep 22, 2015, 16:56:03
Sample is  2 pds and    804 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
TOTALACC|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -5.72401***     1.04743    -5.46  .0000    -7.77692  -3.67109
    DEGl|     .00857***      .00311     2.76  .0058      .00248    .01466
  SHWDRT|    -.10227***      .01453    -7.04  .0000     -.13074   -.07379
 MCVCRAN|-.92455D-04**    .40600D-04   -2.28  .0228 -.17203D-03 -.12884D-04
     VCR|    1.54300**       .68164     2.27  .0234      .20898   2.88103
  MCULR|   -1.16873**        .54215    -2.15  .0314    -2.22940   -.10606
        |Means for random parameters
   LNADT|     .76325***      .11143     6.85  .0000      .54487    .98168
   LNLEN|     .95979***      .05873    16.34  .0000      .84464   1.07494
RWYMDINC|     .03545***      .00665     5.31  .0000      .02236    .04853
        |Diagonal elements of Cholesky matrix
   LNADT|     .06872**       .02875     2.39  .0169      .01231    .12512
   LNLEN|     .04074**       .01641     2.48  .0131      .00857    .07290
RWYMDINC|     .03288*        .01700     1.96  .0531     -.00044    .06620
        |Below diagonal elements of Cholesky matrix
lLNL_LNA|     .13467*        .07869     1.98  .0870     -.01966    .28890
lRWY_LNA|    -.02383**       .01049    -2.27  .0229     -.04437   -.00330
lRWY_LNL|     .00352         .00640     1.55  .0522     -.00902    .01606
        |Dispersion parameter for NegBin distribution
ScalParm|     .64054***      .06566     9.76  .0000      .51184    .76923
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------
              LNADT        LNLEN     RWYMDINC
--------+--------------------------------------------------
LNADT      .4722E-02
LNLEN      .9254E-02   .1897E-01
RWYMDINC  -.1638E-02  -.3108E-02   .5846E-03

Implied standard deviations of random parameters

S.D_Beta|            1
--------+-------------
       1|      .0687152
       2|      .137741
       3|      .0241784

Implied correlation matrix of random parameters

--------+--------------------------
Cor.Mat.|   LNADT    LNLEN RWYMDINC
--------+--------------------------
   LNADT| 1.00000   .97771  -.98568
   LNLEN|  .97771  1.00000  -.93314
RWYMDINC| -.98568  -.93314  1.00000
```

Random Parameter Negative Binomial Model of Property Damage Only Crashes on Small-Urban-Large-Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                 PDO
Log likelihood function     -966.15627
Restricted log likelihood  -1732.77671
Chi squared [   3 d.f.]     1533.17888
Significance level              .00000
McFadden Pseudo R-squared     .4424065
Estimation based on N =   1608, K =  13
Inf.Cr.AIC  =   1958.4 AIC/N =    1.218
Model estimated: Sep 22, 2015, 17:42:45
Sample is  2 pds and    804 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
     PDO|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -5.83718***     1.36154    -4.29  .0000    -8.50576  -3.16861
   LNADT|     .63785***      .14322     4.45  .0000      .35714    .91856
    DESI|    1.62975**       .69042     2.06  .0399      .06457   3.07494
  SHWDLT|    -.05471***      .02074    -2.64  .0083     -.09526   -.01406
 MCVCRAN|    -.00016***   .5431D-04    -3.02  .0026     -.00027   -.00006
     VCH|    1.69425*        .65529     1.92  .0545     -.03206   3.32061
HCVMRBEL|     .00346**       .00177     1.96  .0497      .00001    .00498
        |Means for random parameters
   LNLEN|     .93349***      .07240    12.59  .0000      .79155   1.07539
 RWYWDINC|     .05790***     .00807     7.17  .0000      .04208    .07372
        |Diagonal elements of Cholesky matrix
   LNLEN|     .18394***      .03816     4.82  .0000      .10916    .25872
 RWYWDINC|     .00689***     .00213     3.23  .0012      .00271    .01106
        |Below diagonal elements of Cholesky matrix
 lRWY_LNL|    -.00734*       .00382    -1.92  .0551     -.01483    .00016
        |Dispersion parameter for NegBin distribution
ScalParm|     .67824***      .09384     7.23  .0000      .49432    .86216
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+------------------------------------------------------
                  LNLEN     RWYWDINC
--------+------------------------------------------------------
LNLEN        .3383E-01
RWYWDINC  -.1349E-02    .1012E-03

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|        .183935
       2|       .0100620


Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|    LNLEN RWYWDINC
--------+------------------
   LNLEN| 1.00000  -.72812
RWYWDINC| -.72812  1.00000
```

Random Parameter Negative Binomial Model of Possible Injury Crashes on Small-Urban-Large-Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                PINJ
Log likelihood function     -566.66302
Restricted log likelihood   -813.09649
Chi squared [   3 d.f.]      492.86694
Significance level              .00000
McFadden Pseudo R-squared     .3030855
Estimation based on N =   1608, K =  11
Inf.Cr.AIC  =   1155.3 AIC/N =     .718
Model estimated: Sep 23, 2015, 17:12:44
Sample is  2 pds and    804 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
    PINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -9.62081***     1.75979    -5.47  .0000   -13.06995  -6.17168
   LNADT|    1.03695***      .18505     5.60  .0000      .67429   1.39967
    DESI|     .01087*        .00606     1.96  .0525     -.00099    .02273
RWYWDINC|     .03666***      .01033     3.55  .0004      .01642    .05690
 MCVCRAN|    -.00015**    .6078D-04    -2.53  .0114     -.00027   -.00003
        |Means for random parameters
  SHWDLT|    -.16878***      .02676    -6.31  .0000     -.22121   -.11636
   LNLEN|     .97817***      .09711    10.08  .0000      .78884   1.16950
        |Diagonal elements of Cholesky matrix
  SHWDLT|     .01862**       .00859     2.17  .0301      .00173    .03545
   LNLEN|     .07358***      .02548     2.89  .0038      .02363    .12353
        |Below diagonal elements of Cholesky matrix
lLNL_SHW|     .06139***      .02253     2.73  .0064      .01724    .10556
        |Dispersion parameter for NegBin distribution
ScalParm|     .67557***      .14479     4.67  .0000      .39179    .95936
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+------------------------------------------------------
                SHWDLT        LNLEN
--------+------------------------------------------------------
SHWDLT     .4174E-04
LNLEN      .3946E-03    .9183E-02

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|      .00646032
       2|       .0958262


Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|  SHWDLT     LNLEN
--------+------------------
  SHWDLT| 1.00000    .64065
   LNLEN|  .64065   1.00000
```

Random Parameter Negative Binomial Model of Evident Injury Crashes on Small-Urban-Large-Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                 EVI
Log likelihood function     -370.49675
Restricted log likelihood   -427.46266
Chi squared [   3 d.f.]      113.93186
Significance level              .00000
McFadden Pseudo R-squared     .1332645
Estimation based on N =   1608, K =  10
Inf.Cr.AIC  =    761.0 AIC/N =    .473
Model estimated: Sep 23, 2015, 17:42:13
Sample is  2 pds and    804 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
     EVI|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -4.80664**      1.90027    -2.53  .0114    -8.53110  -1.08218
   LNADT|     .43594**       .21060     2.07  .0384     .02318    .84870
   LNLEN|     .82759***      .08240    10.05  .0000     .66639    .98840
  SHWDLT|    -.07768***      .02777    -2.80  .0051    -.13228   -.02341
        |Means for random parameters
 VCPARMA|    -.17647**       .08983    -1.99  .0470    -.35454   -.00240
 RWYMDINC|    .03252**       .01486     2.23  .0255     .00399    .06105
        |Diagonal elements of Cholesky matrix
 VCPARMA|     .15725*        .08112     1.94  .0526    -.00175    .31625
 RWYMDINC|    .01044***      .00382     2.74  .0062     .00296    .01793
        |Below diagonal elements of Cholesky matrix
 lRWY_VCP|    .00671**       .00290     2.31  .0209     .00102    .01240
        |Dispersion parameter for NegBin distribution
ScalParm|     .76018**       .29569     2.57  .0101     .18064   1.33973
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------
             VCPARMA     RWYMDINC
--------+--------------------------------------
VCPARMA     .2473E-01
RWYMDINC    .1058E-02    .1541E-03

Implied standard deviations of random parameters

S.D_Beta|             1
--------+-------------
       1|       .157246
       2|       .0124123

Implied correlation matrix of random parameters

--------+----------------
Cor.Mat.| VCPARMA RWYMDINC
--------+----------------
 VCPARMA| 1.00000   .54030
RWYMDINC|  .54030  1.00000
```

Random Parameter Negative Binomial Model of Serious Injury Crashes on Small-Urban-Large-Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                SINJ
Log likelihood function      -78.50778
Restricted log likelihood    -81.20519
Chi squared [   1 d.f.]        5.39479
Significance level              .02020
McFadden Pseudo R-squared     .0332170
Estimation based on N =   1608, K =   6
Inf.Cr.AIC  =    169.0 AIC/N =    .105
Model estimated: Sep 25, 2015, 15:00:21
Sample is  2 pds and    804 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
    SINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -7.66961***     1.11278    -6.89  .0000    -9.85081  -5.48860
RWYMDINC|     .09083***      .02767     3.28  .0010     .03660    .14507
    VCVL|    -.00630*        .00330    -1.91  .0561    -.01276    .00016
        |Means for random parameters
    HCVR    -.00715**        .00363    -1.97  .0491    -.01426   -.00003
        |Scale parameters for dists. of random parameters
   HCVR|      .00030***      .00011     2.84  .0049     .00009    .00051
        |Dispersion parameter for NegBin distribution
ScalParm|    1.03930         .03725     2.33  .0169    -.20967   2.28828
--------+--------------------------------------------------------------------
```

Random Parameter Negative Binomial Model of Unknown Injury Crashes on Small-Urban-Large-Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable              UNKNOWN
Log likelihood function       -92.60565
Restricted log likelihood     -96.46565
Chi squared [   3 d.f.]         7.71955
Significance level               .05218
McFadden Pseudo R-squared      .0400105
Estimation based on N =   1608, K =   9
Inf.Cr.AIC  =    203.2 AIC/N =     .126
Model estimated: Sep 25, 2018, 17:19:44
Sample is  2 pds and    804 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
 UNKNOWN|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -9.25375**      4.14244    -2.23  .0255   -17.37276  -1.13472
   LNLEN|     .53098***      .14748     3.60  .0003      .24190    .82006
MCVMKSEL|     .01532*        .00782     1.95  .0605     -.00162    .02528
        |Means for random parameters
   LNADT|     .01634*        .00879     1.86  .0632     -.00090    .03358
RWYNDINC|     .00313*        .00177     1.97  .0565     -.00033    .00660
        |Diagonal elements of Cholesky matrix
   LNADT|     .18878***      .07049     2.68  .0074      .05063    .32694
RWYNDINC|     .01680**       .00821     2.05  .0407      .00071    .03289
        |Below diagonal elements of Cholesky matrix
lRWY_LNA|    -.04536**       .01918    -2.36  .0181     -.08297   -.00775
        |Dispersion parameter for NegBin distribution
ScalParm|     .12469         .04922     1.98  .0281     -.06953    .31836
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+------------------------------------------------
                LNADT     RWYNDINC
--------+------------------------------------------------
LNADT       .3564E-01
RWYNDINC  -.5564E-02   .2940E-02

Implied standard deviations of random parameters

S.D_Beta|              1
--------+---------------
       1|        .188784
       2|       .0542230

Implied correlation matrix of random parameters

--------+----------------
Cor.Mat.|   LNADT RWYNDINC
--------+----------------
   LNADT| 1.00000  -.93776
RWYNDINC| -.93776  1.00000
```

Random Parameter Negative Binomial Model of High Injury Crashes on Small-Urban-Large-Urbanized SPF class roadway segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable               HIINJ
Log likelihood function      -348.70149
Restricted log likelihood    -404.76855
Chi squared [   3 d.f.]       112.13412
Significance level               .00000
McFadden Pseudo R-squared      .1385182
Estimation based on N =   1608, K =  10
Inf.Cr.AIC  =    717.4 AIC/N =     .446
Model estimated: Sep 26, 2018, 14:16:47
Sample is  2 pds and    804 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
   HIINJ|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|    -.00026***   .88112D-04   -2.90  .0037     -.00043   -.00009
   LNLEN|     .96649***      .09168    10.54  .0000      .78679   1.14618
MCVMKSEL|     .00932***      .00277     3.36  .0008      .00389    .01476
  SHWDCR|    -.08533*        .04529    -1.88  .0595     -.17409    .00343
        |Means for random parameters
 MCVCRAN|    -.00036***      .00011    -3.15  .0016     -.00058   -.00013
RWYNDINC|     .04057***      .01208     3.36  .0008      .01687    .06427
        |Diagonal elements of Cholesky matrix
 MCVCRAN|     .04424**       .02215     1.99  .0462      .00078    .08773
RWYNDINC|     .00741**       .00317     2.34  .0192      .00121    .01362
        |Below diagonal elements of Cholesky matrix
lRWY_MCV|     .00577**       .00271     2.13  .0334      .00045    .01109
        |Dispersion parameter for NegBin distribution
ScalParm|     .78309***      .28568     2.74  .0061      .22316   1.34301
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+------------------------------------------------
              MCVCRAN    RWYNDINC
--------+------------------------------------------------
MCVCRAN     .2991E-07
RWYNDINC    .9955E-06   .5526E-04

Implied standard deviations of random parameters

S.D_Beta|              1
--------+---------------
       1|    .172958E-03
       2|      .00939494

Implied correlation matrix of random parameters

--------+----------------
Cor.Mat.| MCVCRAN RWYNDINC
--------+----------------
 MCVCRAN| 1.00000   .61452
RWYNDINC|  .61452  1.00000
```

Random Parameter Negative Binomial Model of Just Injury Crashes on Small-Urban-Large-Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable               JUSTINJ
Log likelihood function       -398.95063
Restricted log likelihood     -486.47671
Chi squared [   3 d.f.]        175.05216
Significance level                .00000
McFadden Pseudo R-squared       .1832146
Estimation based on N =   1608, K =  12
Inf.Cr.AIC  =    822.0 AIC/N =     .511
Model estimated: Sep 25, 2015, 16:56:42
Sample is  2 pds and    804 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
 JUSTINJ|  Coefficient       Error       z    |z|>Z*        Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -3.99895*       2.16591    -1.95  .0645    -8.24405     .24616
    VCVL|    -.00122**       .00054    -2.28  .0226    -.00227    -.00017
RNYWDINC|     .05897***      .01217     4.88  .0000     .03552     .08922
 MCVCRAM|    -.00018**    .85020D-04   -2.14  .0322    -.00035    -.00002
  SMWDCR|    -.18165***      .05246    -3.46  .0005    -.28429    -.07867
   LNADT|     .00018**    .85730D-04    2.06  .0390     .00001     .00035
        |Means for random parameters
   LNLEN|     .86699***      .09303     9.32  .0000     .68465    1.04932
MCVMXSEL|     .00937***      .00311     3.01  .0026     .00328     .01547
        |Diagonal elements of Cholesky matrix
   LNLEN|     .08263***      .03190     2.59  .0096     .02012     .14516
MCVMXSEL|     .00612***      .00236     2.58  .0099     .00147     .01078
        |Below diagonal elements of Cholesky matrix
lMCV_LNL|     .09302**       .04088     2.28  .0229     .01290     .17314
        |Dispersion parameter for NegBin distribution
ScalParm|     .71307***      .22134     3.22  .0013     .27825    1.14489
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------
               LNLEN     MCVMXSEL
--------+--------------------------------------------------------
LNLEN      .2465E-02
MCVMXSEL   .3235E-04   .3793E-04

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|       .0496465
       2|      .00615887

Implied correlation matrix of random parameters

--------+--------------------
Cor.Mat.|   LNLEN MCVMXSEL
--------+--------------------
   LNLEN| 1.00000   .10582
MCVMXSEL|  .10582  1.00000
```

Random Parameter Negative Binomial Model of Low Injury Crashes on Small-Urban-Large-Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                 LOINJ
Log likelihood function      -1104.12622
Restricted log likelihood    -2257.11631
Chi squared [   6 d.f.]       2305.98017
Significance level                .00000
McFadden Pseudo R-squared       .5108249
Estimation based on N =   1608, K =  13
Inf.Cr.AIC  =   2234.3 AIC/N =    1.389
Model estimated: Sep 25, 2015, 16:57:15
Sample is  2 pds and    804 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
   LOINJ|  Coefficient       Error       z    |z|>Z*        Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -2.83510***     1.08608    -2.61  .0090    -4.96380    -.70640
RNYWDINC|     .06713***      .00659    10.19  .0000     .05422     .08004
 MCVCRAM|    -.00021***   .5020D-04    -4.16  .0000    -.00031    -.00011
        |Means for random parameters
   LNLEN|     .86737***      .06349    13.66  .0000     .74293     .99180
MCVMXSEL|     .00732***      .00150     4.87  .0000     .00437     .01027
   LNADT|     .32178***      .11658     2.76  .0058     .09528     .54831
        |Diagonal elements of Cholesky matrix
   LNLEN|     .15471**       .06476     2.39  .0169     .02779     .28163
MCVMXSEL|     .00460**       .00209     2.20  .0280     .00050     .00870
   LNADT|     .01067**       .00514     2.08  .0379     .00060     .02074
        |Below diagonal elements of Cholesky matrix
lMCV_LNL|    -.00486**       .00232    -2.10  .0361    -.00941    -.00032
lLNA_LNL|     .00278         .00177     1.98  .0446    -.00068     .00627
lLNA_MCV|    -.01920*        .01027    -1.87  .0615    -.03933     .00092
        |Dispersion parameter for NegBin distribution
ScalParm|     .59932***      .06849     8.66  .0000     .45909     .72755
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------
               LNLEN     MCVMXSEL        LNADT
--------+--------------------------------------------------------
LNLEN      .2393E-01
MCVMXSEL  -.7522E-03   .4475E-04
LNADT      .3550E-02  -.2102E-03   .1112E-02

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|        .154708
       2|      .00669162
       3|       .0333409

Implied correlation matrix of random parameters

--------+--------------------------
Cor.Mat.|   LNLEN MCVMXSEL    LNADT
--------+--------------------------
   LNLEN| 1.00000  -.72668   .75226
MCVMXSEL| -.72663  1.00000  -.94228
   LNADT|  .75226  -.94228  1.00000
```

Random Parameter Negative Binomial Model of Total Crashes on Metropolitan Rural SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable              TOTALACC
Log likelihood function       -433.42506
Restricted log likelihood     -672.25374
Chi squared [   6 d.f.]       477.65731
Significance level                .00000
McFadden Pseudo R-squared       .3552454
Estimation based on N =   1236, K =  14
Inf.Cr.AIC  =    894.9 AIC/N =     .724
Model estimated: Oct 06, 2015, 16:20:04
Sample is  2 pds and    618 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
TOTALACC|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -2.66645***      .80267    -3.32  .0009    -4.23970  -1.09329
   LNADT|    .31936***       .10001     3.19  .0013      .12236    .51441
    DEXL|   -.02555**        .01209    -2.14  .0323    -.04967   -.00218
MCVOMSEL|    .00295          .00155     1.93  .0671    -.00055    .00650
        |Means for random parameters
   LNLEN|    .77506***       .06723    11.48  .0000      .64211    .90801
     VCR|   3.00562***      1.06717     2.82  .0048      .91401   5.09724
 NOFLINC|    .39522**        .19734     2.02  .0436      .01144    .78501
        |Diagonal elements of Cholesky matrix
   LNLEN|    .13814***       .03981     3.34  .0006      .05512    .21116
     VCR|   3.89048***      1.03148     3.77  .0002     1.86881   8.91214
 NOFLINC|    .14200**        .07144     1.99  .0469      .00195    .28202
        |Below diagonal elements of Cholesky matrix
lVCR_LNL|   -6.19302***     1.91729    -3.23  .0012    -9.95084  -2.43520
lNOF_LNL|    .14353**        .07137     2.01  .0443      .00365    .28341
lNOF_VCR|    .07145          .06124     1.97  .0434     -.04859    .19148

        |Dispersion parameter for NegBin distribution
ScalParm|   1.93656**        .90969     2.13  .0333      .15321   3.71991
--------+--------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+---------------------------------------------------
              LNLEN         VCR     NOFLINC
--------+---------------------------------------------------
LNLEN      .1773E-01
VCR          -.8245       53.49
NOFLINC   -.2946E-01      1.923   .7424E-01

Implied standard deviations of random parameters

S.D_Beta|             1
--------+-------------
       1|       .133139
       2|       7.31364
       3|       .272465

Implied correlation matrix of random parameters

--------+--------------------------
Cor.Mat.|   LNLEN       VCR  NOFLINC
--------+--------------------------
   LNLEN| 1.00000  -.84678  -.81218
     VCR| -.84678  1.00000   .96496
 NOFLINC| -.81218   .96496  1.00000
```

Random Parameter Negative Binomial Model of Property Damage Only Crashes on Metropolitan Rural SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                   PDO
Log likelihood function       -312.77559
Restricted log likelihood     -468.07661
Chi squared [   3 d.f.]       310.59604
Significance level                .00000
McFadden Pseudo R-squared       .3317791
Estimation based on N =   1236, K =   9
Inf.Cr.AIC  =    643.6 AIC/N =     .521
Model estimated: Oct 07, 2015, 15:59:16
Sample is  2 pds and    618 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
     PDO|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -4.37022***      .84460    -5.17  .0000    -6.02599  -2.71445
    DEXL|   -.02699**        .01298    -2.08  .0377    -.05244   -.00153
     VCR|   1.28656**        .60621     2.12  .0338      .09661   2.47670
        |Means for random parameters
   LNLEN|    .94096***       .06868    13.70  .0000      .80633   1.07560
   LNADT|    .55133***       .08334     6.62  .0000      .38735    .71465
        |Diagonal elements of Cholesky matrix
   LNLEN|    .15264***       .04069     3.75  .0002      .07289    .23239
   LNADT|    .09077***       .03521     2.58  .0099      .02177    .15978
        |Below diagonal elements of Cholesky matrix
lLNA_LNL|    .08608**        .03514     2.45  .0143      .01722    .15495
        |Dispersion parameter for NegBin distribution
ScalParm|   1.23810*         .47748     1.96  .0631     -.06876   2.58496

--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+---------------------------------------------------
              LNLEN       LNADT
--------+---------------------------------------------------
LNLEN      .2330E-01
LNADT      .4613E-03   .3998E-04

Implied standard deviations of random parameters

S.D_Beta|             1
--------+-------------
       1|       .152639
       2|     .09165035

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|   LNLEN     LNADT
--------+------------------
   LNLEN| 1.00000    .45739
   LNADT|  .45739   1.00000
```

Random Parameter Negative Binomial Model of Possible Injury Crashes on Metropolitan Rural SPF Class Roadway Segments

```
--------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                  PINJ
Log likelihood function       -113.04820
Restricted log likelihood     -121.78074
Chi squared [   3 d.f.]         17.46507
Significance level                .00058
McFadden Pseudo R-squared       .0714938
Estimation based on N =   1236, K =   9
Inf.Cr.AIC  =    244.1 AIC/N =      .197
Model estimated: Oct 05, 2015, 15:58:37
Sample is  2 pds and    618 individuals
Negative binomial regression model
--------+-----------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
    PINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+-----------------------------------------------------------------
        |Nonrandom parameters
Constant|   -7.60146***     1.79661    -4.23  .0000  -11.12235  -4.08057
   LNADT|     .65506***      .18879     3.53  .0004     .29099   1.01920
     VCR|    3.34078**      1.70306     1.96  .0498     .00280   6.67876
        |Means for random parameters
   LNLEN|     .70354***      .11269     6.23  .0000     .48226    .92480
 HCVCRAN|     .00021**     .8533D-04    2.43  .0150     .00004    .00037
        |Diagonal elements of Cholesky matrix
   LNLEN|     .04052**       .02014     2.01  .0442     .00104    .08000
 HCVCRAN|     .00019**     .9123D-04    2.05  .0405     .00001    .00037
        |Below diagonal elements of Cholesky matrix
lHCV_LNL|    -.22287**       .09118    -2.44  .0145    -.40158   -.04415
        |Dispersion parameter for NegBin distribution
ScalParm|     .03972**       .02024     1.96  .0497     .00006    .07939
--------+-----------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
--------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+------------------------------------------------
               LNLEN      HCVCRAN
--------+------------------------------------------------
LNLEN       .7698E-03
HCVCRAN   -.1797E-05   .3876E-07

Implied standard deviations of random parameters

S.D_Beta|              1
--------+----------------
       1|       .0417481
       2|   .196841E-03

Implied correlation matrix of random parameters

--------+-----------------
Cor.Mat.|   LNLEN  HCVCRAN
--------+-----------------
   LNLEN| 1.00000  -.31806
 HCVCRAN| -.31806  1.00000
```

Random Parameter Negative Binomial Model of Evident Injury Crashes on Metropolitan Rural SPF Class Roadway Segments

```
--------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                   EVI
Log likelihood function       -111.53451
Restricted log likelihood     -116.13088
Chi squared [   1 d.f.]          9.19276
Significance level                .00243
McFadden Pseudo R-squared       .0395792
Estimation based on N =   1236, K =   6
Inf.Cr.AIC  =    235.1 AIC/N =      .190
Model estimated: Oct 12, 2015, 16:30:52
Sample is  2 pds and    618 individuals
Negative binomial regression model
--------+-----------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
     EVI|  Coefficient       Error       z    |z|>Z*         Interval
--------+-----------------------------------------------------------------
        |Nonrandom parameters
Constant|   -5.34463***     1.91722    -2.79  .0053   -9.10232  -1.58695
   LNLEN|     .69825***      .12460     5.60  .0000     .45407    .94249
    VCR2|    -.18783***      .05322    -3.53  .0004    -.29214   -.08352
        |Means for random parameters
   LNADT|     .42089**       .19391     2.15  .0317     .03691    .80488
        |Scale parameters for dists. of random parameters
   LNADT|     .05626**       .02299     2.45  .0144     .01119    .10132
        |Dispersion parameter for NegBin distribution
ScalParm|     .00720***      .00278     2.59  .0095     .00175    .01266
--------+-----------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
--------------------------------------------------------------------------
```

Random Parameter Negative Binomial Model of High Injury Crashes on Metropolitan Rural SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                 HIINJ
Log likelihood function       -143.33493
Restricted log likelihood     -150.57725
Chi squared [   1 d.f.]         14.48465
Significance level                .00014
McFadden Pseudo R-squared       .0480971
Estimation based on N =   1236, K =   5
Inf.Cr.AIC  =    296.7 AIC/N =      .240
Model estimated: Oct 12, 2015, 16:48:15
Sample is  2 pds and    618 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
   HIINJ|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -3.13965***      .58345    -5.38  .0000     -4.28319  -1.99610
 TOTLANE|     .40089***      .12170     3.29  .0010       .16237    .63942
        |Means for random parameters
   LNLEN|     .46523***      .13224     3.52  .0004       .20605    .72446
        |Scale parameters for dists. of random parameters
   LNLEN|     .13694**       .05963     2.30  .0217       .02006    .25382
        |Dispersion parameter for NegBin distribution
ScalParm|     .54013         .39185     1.38  .1681     -.22787   1.30814
--------+--------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

Random Parameter Negative Binomial Model of Just Injury Crashes on Metropolitan Rural SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable               JUSTINJ
Log likelihood function        -63.98065
Restricted log likelihood    -1236.00000
Chi squared [   1 d.f.]       2344.03869
Significance level                .00000
McFadden Pseudo R-squared       .9482257
Estimation based on N =   1236, K =   6
Inf.Cr.AIC  =    140.0 AIC/N =      .113
Model estimated: Oct 13, 2016, 14:12:07
Sample is  2 pds and    618 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
 JUSTINJ|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -11.6545***     4.02966    -2.89  .0038     -19.5529   -3.7562
   LNLEN|    1.00213***      .24379     4.11  .0000       .52432   1.47994
RNYNDDEC|    -.08171**       .03564    -2.29  .0219     -.15156   -.01186
        |Means for random parameters
   LNADT|    1.31206***      .48090     2.73  .0064       .36951   2.25459
        |Scale parameters for dists. of random parameters
   LNADT|     .84631*        .44932     1.88  .0596     -.03434   1.72697
Dispersion parameter for NegBin distribution
ScalParm|     .14524**       .07134     2.04  .0418       .00551    .28516
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

Random Parameter Negative Binomial Model of Low Injury Crashes on Metropolitan Rural SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                LOINJ
Log likelihood function      -361.22506
Restricted log likelihood    -622.58307
Chi squared [   8 d.f.]       542.71603
Significance level               .00000
McFadden Pseudo R-squared      .3470613
Estimation based on N =   1234, K =  12
Inf.Cr.AIC  =    706.5 AIC/N =     .572
Model estimated: Oct 13, 2015, 16:50:20
Sample is  2 pds and    615 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
   LOINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -4.24241***      .89415    -4.74  .0000    -5.99490  -2.48991
   LNADT|     .54465***      .08862     6.15  .0000      .37118    .71855
    DEG1|    -.03793**       .01495    -2.54  .0112     -.06722   -.00863
 VCFARMA|     .14779*        .08503     1.96  .0569     -.02849    .34404
    VCVL|    -.00063*        .00034    -1.87  .0614     -.00130    .00003
 HCVCRAN|     .00011**    .4876D-04     2.29  .0218      .00002    .00021
        |Means for random parameters
   LNLEN|     .97191***      .07587    12.81  .0000      .82321   1.12062
     VCK|    2.69536**      1.29752     2.08  .0378      .15224   5.23848
        |Diagonal elements of Cholesky matrix
   LNLEN|     .12454***      .02782     4.48  .0000      .07002    .17906
     VCK|    2.06274**       .87233     2.35  .0170      .37301   3.75247
        |Below diagonal elements of Cholesky matrix
 lVCK_LNL|  -1.70847***      .63776    -2.68  .0074    -2.95845   -.45849
        |Dispersion parameter for NegBin distribution
ScalParm|    1.92866**       .95243     2.02  .0429      .06192   3.79537
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  Matrix
--------+----------------------------------------------
                   LNLEN          VCK
--------+----------------------------------------------
LNLEN        .1551E-01
VCK            -.2128        7.257

Implied standard deviations of random parameters

S.D_Beta|             1
--------+-------------
       1|       .124539
       2|       2.69382


Implied correlation matrix of random parameters


--------+------------------
Cor.Mat.|    LNLEN      VCK
--------+------------------
   LNLEN| 1.00000  -.63422
     VCK| -.63422  1.00000
```

Random Parameter Negative Binomial Model of Total Crashes on Rural Small Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable             TOTALACC
Log likelihood function     -1431.24447
Restricted log likelihood   -3666.45644
Chi squared [  10 d.f.]      4470.42389
Significance level               .00000
McFadden Pseudo R-squared      .6096382
Estimation based on N =   1452, K =  21
Inf.Cr.AIC  =   2904.5 AIC/N =    2.000
Model estimated: Sep 27, 2015, 23:04:49
Sample is  2 pds and    726 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
TOTALACC|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -7.05125***      .66704   -10.57  .0000    -8.35884  -5.74351
   LNADT|    1.02080***      .08772    11.64  .0000      .84888   1.19272
 HCVLIMI|   -1.73714***      .46441    -3.74  .0002    -2.64736   -.82692
  SHNDRT|    -.04702***      .01324    -5.06  .0000     -.09287   -.04107
 VCFARMA|     .05992**       .02633     2.28  .0228      .00832    .11153
 HCVCRAN| .07695D-04**    .4470D-04     1.96  .0498  .82987D-07  .17531D-03
        |Means for random parameters
   LNLEN|     .89443***      .05556    16.81  .0000      .86965   1.09922
 TOTLANE|    -.02837***      .00775    -3.66  .0003     -.04354   -.01317
    DEG1|    -.00663***      .00202    -3.28  .0010     -.01058   -.00267
 RWYWDINC|    .02751***      .00737     3.73  .0002      .01307    .04194
        |Diagonal elements of Cholesky matrix
   LNLEN|     .32577***      .05508     5.91  .0000      .21780    .43373
 TOTLANE|     .15576***      .05752     2.62  .0088      .03902    .26351
    DEG1|     .01123         .00686     1.96  .0418     -.00222    .02467
 RWYWDINC|    .00634***      .00163     3.88  .0001      .00914    .00954
        |Below diagonal elements of Cholesky matrix
 lTOT_LNL|   -.25409***      .06632    -3.83  .0001     -.38423   -.12407
 lDEG_LNL|   -.01026         .00636    -1.91  .1072     -.02271    .00222
 lDEG_TOT|    .02036***      .00561     3.63  .0003      .00936    .03137
 lRWY_LNL|    .01116         .00726     1.54  .1238     -.00306    .02542
 lRWY_TOT|   -.16149*        .09755    -1.96  .0978     -.35265    .02971
 lRWY_DEG|   -.01003*        .00602    -1.97  .0956     -.02182    .00177
        |Dispersion parameter for NegBin distribution
ScalParm|     .74741***      .06423    11.64  .0000      .62151    .87330
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  Matrix
--------+--------------------------------------------------------------------
               LNLEN      TOTLANE         DEG1     RWYWDINC
--------+--------------------------------------------------------------------
LNLEN           .1061
TOTLANE    -.8276E-01    .8727E-01
DEG1       -.3338E-02    .5675E-02    .6456E-03
RWYWDINC    .5962E-02   -.1127E-01   -.9339E-03    .1646E-02

Implied standard deviations of random parameters

S.D_Beta|             1
--------+-------------
       1|       .325766
       2|       .295418
       3|       .0254088
       4|       .0405675


Implied correlation matrix of random parameters


--------+------------------------------------
Cor.Mat.|    LNLEN  TOTLANE     DEG1 RWYWDINC
--------+------------------------------------
   LNLEN| 1.00000  -.85997  -.40323   .67816
 TOTLANE| -.85997  1.00000   .75576  -.94006
    DEG1| -.40323   .75575  1.00000  -.90604
RWYWDINC|  .67816  -.94006  -.90604  1.00000
```

Random Parameter Negative Binomial Model of Property Damage Only Crashes on Rural Small Urbanized SPF Class Roadway Segments

```
--------------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                   PDO
Log likelihood function      -1187.08774
Restricted log likelihood    -2399.41016
Chi squared [    6 d.f.]      2424.64497
Significance level                .00000
McFadden Pseudo R-squared       .5052555
Estimation based on N =   1452, K =  17
Inf.Cr.AIC  =   2408.2 AIC/N =    1.658
Model estimated: Sep 28, 2015, 14:36:32
Sample is  2 pds and    726 individuals
Negative binomial regression model
--------+-----------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
     PDO|  Coefficient       Error       z    |z|>Z*         Interval
--------+-----------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -7.88393***      .77790   -10.13  .0000    -9.40859   -6.35928
    HCVR|-.27490D-04*      .1511D-04   -1.97  .0589 -.57108D-04  .21266D-05
 TOTLANE|   -.25052***       .09512    -2.63  .0084    -.43694    -.06409
HCVMXSL1|  -24.8436***      5.41333    -4.58  .0000   -35.4779   -14.2494
 HCVGRAN|    .00018***    .4488D-04     2.91  .0037     .00004     .00022
RNYMDINC|    .01583**       .00698      2.27  .0231     .00218     .02959
SHWDRTCR|   -.08311**       .03231     -2.57  .0101    -.14664    -.01977
        |Means for random parameters
   LNADT|   1.07468***      .09534     11.27  .0000     .88781    1.26158
   LNLEN|    .97138***      .06473     15.06  .0000     .74058    1.00218
HCVMXSEL|    .00409**       .00193      2.12  .0337     .00032     .00787
        |Diagonal elements of Cholesky matrix
   LNADT|    .06155***      .02288      2.69  .0072     .01670     .10641
   LNLEN|    .05235*        .02973      1.96  .0585    -.00593     .11062
HCVMXSEL|    .00227***      .00078      2.89  .0038     .00073     .00380
        |Below diagonal elements of Cholesky matrix
lLNL_LNA|    .20060***      .07091      2.83  .0047     .06181     .33949
lMCV_LNA|   -.00101         .00177     -2.57  .0072    -.00448     .00247
lMCV_LNL|   -.00527***      .00147     -3.58  .0003    -.00816    -.00239
        |Dispersion parameter for NegBin distribution
ScalParm|    .65359***      .06323     10.33  .0000     .53162     .77556
--------+-----------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
--------------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------------

                 LNADT         LNLEN     HCVMXSEL
--------+-----------------------------------------------------

LNADT       .3788E-02
LNLEN       .1234E-01    .4294E-01
HCVMXSEL  -.8196E-04  -.4775E-03    .5396E-04

Implied standard deviations of random parameters

S.D_Beta|             1
--------+--------------
       1|      .0615529
       2|       .207221
       3|     .00582724

Implied correlation matrix of random parameters

--------+--------------------------
Cor.Mat.|    LNADT     LNLEN HCVMXSEL
--------+--------------------------
   LNADT| 1.00000    .96787  -.17279
   LNLEN|  .96787  1.00000  -.39571
HCVMXSEL| -.17279  -.39571  1.00000
```

Random Parameter Negative Binomial Model of Possible Injury Crashes on Rural Small Urbanized SPF Class Roadway Segments

```
--------------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                  PINJ
Log likelihood function       -639.57957
Restricted log likelihood     -938.63038
Chi squared [    3 d.f.]       597.90162
Significance level                .00000
McFadden Pseudo R-squared       .3159290
Estimation based on N =   1452, K =  11
Inf.Cr.AIC  =   1301.2 AIC/N =     .897
Model estimated: Sep 29, 2015, 20:24:21
Sample is  2 pds and    726 individuals
Negative binomial regression model
--------+-----------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
    PINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+-----------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -9.06953***     1.42181    -6.38  .0000   -11.85623   -6.28283
   LNADT|   1.00185***      .14383     6.96  .0000      .72034    1.28338
HCVMXSL1|  -35.2226***     7.18629    -4.90  .0000    -49.3076   -21.1377
 HCVGRAN|    .00023***   .6291D-04     3.61  .0003      .00010     .00035
 VCEARMA|    .07880*       .04411      1.99  .0540     -.00785     .16524
        |Means for random parameters
  SHWDCR|   -.07659***      .02440    -3.14  .0017     -.12442    -.02877
   LNLEN|    .88324***      .08349    10.58  .0000      .71980    1.04668
        |Diagonal elements of Cholesky matrix
  SHWDCR|    .04429**       .01808     2.45  .0143      .00855     .07973
   LNLEN|    .09817***      .02342     4.19  .0000      .05226     .14408
        |Below diagonal elements of Cholesky matrix
lLNL_SHW|   -.05859***      .02116    -2.77  .0056     -.10007    -.01712
        |Dispersion parameter for NegBin distribution
ScalParm|    .48068***      .07939     6.05  .0000      .32505     .63628
--------+-----------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
--------------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------------

                 SHWDCR        LNLEN
--------+-----------------------------------------------------

SHWDCR      .1962E-02
LNLEN      -.2595E-02    .1307E-01

Implied standard deviations of random parameters

S.D_Beta|             1
--------+--------------
       1|      .0442921
       2|       .114327

Implied correlation matrix of random parameters

--------+-----------------
Cor.Mat.|  SHWDCR    LNLEN
--------+-----------------
  SHWDCR| 1.00000  -.51250
   LNLEN| -.51250  1.00000
```

Random Parameter Negative Binomial Model of Evident Injury Crashes on Rural Small Urbanized SPF Class Roadway Segments

```
--------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                 EVI
Log likelihood function     -240.41855
Restricted log likelihood   -280.49544
Chi squared [   3 d.f.]       80.15378
Significance level              .00000
McFadden Pseudo R-squared     .1428728
Estimation based on N =   1452, K =   9
Inf.Cr.AIC  =    498.8 AIC/N =    .344
Model estimated: Sep 30, 2015, 17:15:51
Sample is  2 pds and    726 individuals
Negative binomial regression model
--------+-----------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
     EVI|  Coefficient       Error       z    |z|>Z*         Interval
--------+-----------------------------------------------------------------
        |Nonrandom parameters
Constant|    -5.14247***    1.30522   -3.93  .0001    -7.70655  -2.57840
   LNADT|     .49418***      .13762    3.59  .0003      .22445    .76391
 MCVLIMI|    2.04404**      1.03451    1.98  .0482      .01645   4.07164
        |Means for random parameters
HCVMXSL1|   -23.1631*      13.24384   -1.75  .0803   -49.1205    2.7944
   LNLEN|     .98315***      .16001    6.14  .0000      .66954   1.29675
        |Diagonal elements of Cholesky matrix
HCVMXSL1|     .27604**       .11868    2.34  .0191      .04343    .50866
   LNLEN|     .15081***      .05175    2.91  .0036      .04938    .25223
        |Below diagonal elements of Cholesky matrix
lLNL_HCV|    -.13853***      .04688   -2.96  .0031     -.23040   -.04665
        |Dispersion parameter for NegBin distribution
ScalParm|     .31549**       .13732    2.30  .0216      .04635    .58462
--------+-----------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
--------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------
              HCVMXSL1       LNLEN
--------+--------------------------------------------------------
HCVMXSL1        .0762
LNLEN         -.1294    .4189E-01

Implied standard deviations of random parameters

S.D_Beta|             1
--------+--------------
       1|       .333871
       2|       .206773

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|HCVMXSL1    LNLEN
--------+------------------
HCVMXSL1| 1.00000  -.67649
   LNLEN| -.67649  1.00000
```

Random Parameter Negative Binomial Model of Serious Injury Crashes on Rural Small Urbanized SPF Class Roadway Segments

```
--------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                SINJ
Log likelihood function     -111.33072
Restricted log likelihood   -112.67961
Chi squared [   1 d.f.]        2.69778
Significance level              .10049
McFadden Pseudo R-squared     .0119708
Estimation based on N =   1452, K =   5
Inf.Cr.AIC  =    232.7 AIC/N =    .160
Model estimated: Oct 01, 2015, 16:04:04
Sample is  2 pds and    726 individuals
Negative binomial regression model
--------+-----------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
    SINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+-----------------------------------------------------------------
        |Nonrandom parameters
Constant|    -2.22764***     .66233   -3.36  .0008    -3.52578   -.92949
    DEG1|     .02475         .01557    1.59  .1119     -.00576    .05526
        |Means for random parameters
   LNLEN|     .64005***      .23121    2.77  .0056      .18688   1.09324
        |Scale parameters for dists. of random parameters
   LNLEN|     .63117***      .23816    2.64  .0083      .16242   1.09991
        |Dispersion parameter for NegBin distribution
ScalParm|     .09459*        .05066    1.86  .0623     -.00510    .19428
--------+-----------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
--------------------------------------------------------------------------
```

Random Parameter Negative Binomial Model of High Injury Crashes on Rural Small Urbanized SPF Class Roadway Segments

```
----------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                HIINJ
Log likelihood function      -382.95660
Restricted log likelihood    -463.08558
Chi squared [   3 d.f.]       160.13796
Significance level               .00000
McFadden Pseudo R-squared      .1546080
Estimation based on N =   1452, K =  10
Inf.Cr.AIC  =    786.0 AIC/N =     .541
Model estimated: Oct 02, 2015, 15:32:18
Sample is  2 pds and    726 individuals
Negative binomial regression model
--------+-------------------------------------------------------------
        |                Standard            Prob.      95% Confidence
   HIINJ|  Coefficient     Error       z    |z|>Z*         Interval
--------+-------------------------------------------------------------
        |Nonrandom parameters
Constant|   -5.10082***    1.01809   -5.01  .0000   -7.09553  -3.10611
   LNLEN|     .81224***     .11048    7.35  .0000     .59568   1.02880
  SMWDLT|     .09281**      .04102    2.26  .0237     .01241    .17320
HCVMXSL1|  -13.4365*       6.99100   -1.92  .0546   -27.1386    .2656
        |Means for random parameters
   LNADT|     .53227***     .09872    5.39  .0000     .33878    .72576
  SMWDRT|    -.12215***     .03847   -3.18  .0015    -.19756   -.04675
        |Diagonal elements of Cholesky matrix
   LNADT|     .03309**      .01285    2.58  .0100     .00776    .05843
  SMWDRT|     .05492***     .01909    2.88  .0040     .01750    .09234
        |Below diagonal elements of Cholesky matrix
LSMW_LNA|    -.06090***     .02043   -2.98  .0029    -.10095   -.02086
        |Dispersion parameter for NegBin distribution
ScalParm|     .47999***     .12627    3.80  .0001     .23251    .72748
--------+-------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
----------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-------------------------------------------------------------
---
                 LNADT      SMWDRT
--------+-------------------------------------------------------------
---
LNADT      .1095E-02
SMWDRT    -.2015E-02   .6725E-02

Implied standard deviations of random parameters

S.D_Beta|            1
--------+-----------------
       1|     .0330922
       2|     .0820079

Implied correlation matrix of random parameters

--------+-------------------
Cor.Mat.|   LNADT   SMWDRT
--------+-------------------
   LNADT| 1.00000  -.74262
  SMWDRT| -.74262  1.00000
```

Random Parameter Negative Binomial Model of Just Injury Crashes on Rural Small Urbanized SPF Class Roadway Segments

```
----------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable              JUSTINJ
Log likelihood function      -373.48557
Restricted log likelihood    -448.57756
Chi squared [   3 d.f.]       150.18457
Significance level               .00000
McFadden Pseudo R-squared      .1674008
Estimation based on N =   1452, K =  11
Inf.Cr.AIC  =    769.0 AIC/N =     .530
Model estimated: Oct 02, 2015, 16:11:29
Sample is  2 pds and    726 individuals
Negative binomial regression model
--------+-------------------------------------------------------------
        |                Standard            Prob.      95% Confidence
 JUSTINJ|  Coefficient     Error       z    |z|>Z*         Interval
--------+-------------------------------------------------------------
        |Nonrandom parameters
Constant|   -8.84489***    2.09579   -4.22  .0000  -12.95256  -4.73721
   LNADT|     .93569***     .22106    4.23  .0000     .50241   1.36896
HCVMXSL1|  -33.8450***    12.10433   -2.80  .0052   -57.5690  -10.1209
SMWDRTCR|    -.12042        .07522   -1.98  .0134    -.26785    .02702
 HCVCRAN|     .00017        .00011    1.55  .0118    -.00004    .00038
        |Means for random parameters
   LNLEN|     .89202***     .13291    6.71  .0000     .63153   1.15251
  SMWDRT|    -.04861        .02987   -1.57  .0137    -.10716    .00995
        |Diagonal elements of Cholesky matrix
   LNLEN|     .07474**      .03594    2.08  .0376     .00430    .14518
  SMWDRT|     .07061***     .01762    4.01  .0001     .03608    .10514
        |Below diagonal elements of Cholesky matrix
LSMW_LNL|    -.03240***     .01826   -2.87  .0041    -.05818   -.01661
        |Dispersion parameter for NegBin distribution
ScalParm|     .47734***     .12166    3.92  .0001     .23889    .71580
--------+-------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
----------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-------------------------------------------------------------
                 LNLEN      SMWDRT
--------+-------------------------------------------------------------
LNLEN      .5586E-02
SMWDRT    -.3917E-02   .7731E-02

Implied standard deviations of random parameters

S.D_Beta|            1
--------+-----------------
       1|     .0747405
       2|     .0879287

Implied correlation matrix of random parameters

--------+-------------------
Cor.Mat.|   LNLEN   SMWDRT
--------+-------------------
   LNLEN| 1.00000  -.59596
  SMWDRT| -.59596  1.00000
```

Random Parameter Negative Binomial Model of Low Injury Crashes on Rural Small Urbanized SPF Class Roadway Segments

Random Coefficients NegBnReg Model
Dependent variable LOINJ
Log likelihood function -1284.85731
Restricted log likelihood -2862.87024
Chi squared [6 d.f.] 3156.02589
Significance level .00000
McFadden Pseudo R-squared .5496264
Estimation based on N = 1452, K = 16
Inf.Cr.AIC = 2601.7 AIC/N = 1.792
Model estimated: Oct 02, 2015, 16:23:56
Sample is 2 pds and 726 individuals
Negative binomial regression model

LOINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-7.98795***	.80360	-9.94	.0000	-9.56295	-6.41291
LNADT	1.07611***	.09438	11.40	.0000	.89112	1.26109
MCVMXSL1	-21.2087***	4.68854	-4.52	.0000	-30.3980	-12.0143
VCBARMA	.08277***	.02915	2.84	.0045	.02564	.13989
MCVCRAH	.95773D-04**	.4362D-04	2.19	.0288	.98927D-05	.18165D-03
VCK	-3.51821**	1.70734	-2.06	.0394	-6.86571	-.27070
	Means for random parameters					
LNLEN	.84303***	.06228	13.53	.0000	.74094	.96512
SHWDRT	-.04664***	.01409	-3.31	.0009	-.07425	-.01903
NOFLDEC	-.23572*	.12157	-1.94	.0525	-.47398	.00254
	Diagonal elements of Cholesky matrix					
LNLEN	.23282***	.05247	4.44	.0000	.12999	.33565
SHWDRT	.12121***	.01574	7.70	.0000	.09036	.15206
NOFLDEC	.23079***	.05218	4.43	.0000	.12855	.33500
	Below diagonal elements of Cholesky matrix					
lSHW_LNL	-.08527***	.01588	-5.37	.0000	-.11640	-.05415
lNOF_LNL	.48033***	.10041	4.78	.0000	.28354	.67713
lNOF_SHW	-.37127***	.04533	-8.19	.0000	-.46012	-.28243
	Dispersion parameter for NegBin distribution					
ScalParm	.61117***	.05165	11.83	.0000	.50995	.71240

Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==> Significance at 1%, 5%, 10% level.

Implied covariance matrix of random parameters

Covariance matrix

	LNLEN	SHWDRT	NOFLDEC
LNLEN	.5420E-01		
SHWDRT	-.1985E-01	.2196E-01	
NOFLDEC	.1118	-.8596E-01	.3687

Implied standard deviations of random parameters

S.D_Beta	1
1	.232816
2	.148193
3	.607248

Implied correlation matrix of random parameters

Cor.Mat.	LNLEN	SHWDRT	NOFLDEC
LNLEN	1.00000	-.57537	.79100
SHWDRT	-.57537	1.00000	-.95518
NOFLDEC	.79100	-.95518	1.00000

Random Parameter Negative Binomial Model of Total Crashes on Small Urbanized Small Urban SPF Class Roadway Segments

Random Coefficients NegBnReg Model
Dependent variable TOTALACC
Log likelihood function -720.25335
Restricted log likelihood -974.06856
Chi squared [6 d.f.] 507.63101
Significance level .00000
McFadden Pseudo R-squared .2605725
Estimation based on N = 1192, K = 15
Inf.Cr.AIC = 1470.5 AIC/N = 1.234
Model estimated: Oct 14, 2015, 16:06:51
Sample is 2 pds and 596 individuals
Negative binomial regression model

TOTALACC	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-6.16274***	1.19666	-5.15	.0000	-8.51114	-3.82034
LNADT	.90447***	.13503	6.70	.0000	.63981	1.16913
MCVCRAH	.54590D-04**	.2607D-04	2.09	.0363	.34913D-05	.10569D-03
NOFLDEC	-.26446**	.12379	-2.14	.0327	-.50709	-.02183
SHWDRT	-.09002***	.01934	-4.66	.0000	-.12792	-.05212
	Means for random parameters					
VCK	-3.00903*	1.54475	-1.97	.0514	-6.03668	.01861
DEG1	-.02544**	.01188	-2.14	.0322	-.04871	-.00216
LNLEN	.91341***	.06185	14.77	.0000	.79219	1.03464
	Diagonal elements of Cholesky matrix					
VCK	3.92043***	1.45634	2.69	.0071	1.06606	6.77480
DEG1	.04269***	.01072	3.98	.0001	.02168	.06370
LNLEN	.07573***	.01620	4.68	.0000	.04398	.10747
	Below diagonal elements of Cholesky matrix					
lDEG_VCK	-.01967	.01346	-1.46	.0440	-.04608	.00672
lLNL_VCK	-.18592***	.03285	-5.65	.0000	-.25372	-.12611
lLNL_DEG	.11709***	.02512	4.66	.0000	.06790	.16627
	Dispersion parameter for NegBin distribution					
ScalParm	1.70438***	.39829	4.28	.0000	.92374	2.48502

Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==> Significance at 1%, 5%, 10% level.

Implied covariance matrix of random parameters

Covariance matrix

	VCK	DEG1	LNLEN
VCK	15.37		
DEG1	-.7710E-01	.2209E-02	
LNLEN	-.7446	.8731E-02	.6660E-01

Implied standard deviations of random parameters

S.D_Beta	1
1	3.92043
2	.0470040
3	.258085

Implied correlation matrix of random parameters

Cor.Mat.	VCK	DEG1	LNLEN
VCK	1.00000	-.41637	-.80615
DEG1	-.41637	1.00000	.78848
LNLEN	-.80615	.78848	1.00000

Random Parameter Negative Binomial Model of Property Damage Only Crashes on Small Urbanized Small Urban SPF Class Roadway Segments

```
--------------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                 PDO
Log likelihood function     -343.40551
Restricted log likelihood   -471.56653
Chi squared [   3 d.f.]      256.32203
Significance level              .00000
McFadden Pseudo R-squared     .1808359
Estimation based on N =   1192, K =  11
Inf.Cr.AIC  =   1108.8 AIC/N =    .930
Model estimated: Oct 14, 2015, 16:37:13
Sample is  2 pds and    596 individuals
Negative binomial regression model
--------+-----------------------------------------------------------------------
        |                 Standard            Prob.       95% Confidence
     PDO|  Coefficient      Error       z    |z|>Z*          Interval
--------+-----------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -4.73073***      .96791    -4.89  .0000    -6.62780  -2.83367
   LNADT|     .70187***      .09649     7.27  .0000      .51275    .89100
 HCVLINI|   -4.19455***      .98306    -4.27  .0000    -6.12132  -2.26778
RCVMKREL|     .00763***      .00220     3.47  .0005      .00332    .01195
 HCVCRAN|     .00015***    .3666D-04    3.96  .0001      .00007    .00022
        |Means for random parameters
   LNLEN|    1.02998***      .07032    14.65  .0000      .89216   1.16781
    DEG1|    -.05393***      .01655    -3.26  .0011     -.08636   -.02149
        |Diagonal elements of Cholesky matrix
   LNLEN|     .17606***      .01986     8.87  .0000      .13714    .21499
    DEG1|     .04211***      .00983     4.28  .0000      .02284    .06137
        |Below diagonal elements of Cholesky matrix
lDEG_LNL|    -.03793***      .00737    -5.14  .0000     -.05238   -.02348
        |Dispersion parameter for NegBin distribution
ScalParm|    3.24936**      1.39901     2.32  .0202      .50735   5.99137
--------+-----------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
--------------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------------------------
               LNLEN        DEG1
--------+-----------------------------------------------------------------
LNLEN      .3100E-01
DEG1      -.6678E-02   .3212E-02

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|       .176064
       2|      .0566742

Implied correlation matrix of random parameters

--------+-------------------
Cor.Mat.|   LNLEN      DEG1
--------+-------------------
   LNLEN| 1.00000  -.66930
    DEG1| -.66930  1.00000
```

Random Parameter Negative Binomial Model of Possible Injury Crashes on Small Urbanized Small Urban SPF Class Roadway Segments

```
--------------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                PINJ
Log likelihood function     -267.92358
Restricted log likelihood   -290.02267
Chi squared [   8 d.f.]       44.19779
Significance level              .00000
McFadden Pseudo R-squared     .0761972
Estimation based on N =   1192, K =  11
Inf.Cr.AIC  =    557.8 AIC/N =    .468
Model estimated: Oct 16, 2015, 16:25:18
Sample is  2 pds and    596 individuals
Negative binomial regression model
--------+-----------------------------------------------------------------------
        |                 Standard            Prob.       95% Confidence
    PINJ|  Coefficient      Error       z    |z|>Z*          Interval
--------+-----------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -4.60420***     1.53977    -2.99  .0028    -7.62210  -1.58630
   LNADT|     .60060***      .15986     3.76  .0002      .28728    .91392
 VCFARMA|    -.17778**       .08725    -2.04  .0416     -.34884   -.00673
 HCVLINI|   -4.96130D**     2.06223    -2.42  .0167    -9.02320   -.89941
HCVPTCVA|     .01095**       .00431     2.54  .0112      .00249    .01940
        |Means for random parameters
   LNLEN|     .55657***      .11310     7.57  .0000      .63453   1.07525
    DEG1|    -.05692*        .03214    -1.97  .0666     -.11992    .00608
        |Diagonal elements of Cholesky matrix
   LNLEN|     .04601         .03499     1.99  .0455     -.02256    .11459
    DEG1|     .03321*        .02003     1.86  .0673     -.00605    .07247
        |Below diagonal elements of Cholesky matrix
lDEG_LNL|    -.18581**       .09313    -1.99  .0465     -.36818   -.00286
        |Dispersion parameter for NegBin distribution
ScalParm|     .80125**       .38360     2.09  .0367      .04940   1.55310
--------+-----------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
--------------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------------------------
               LNLEN        DEG1
--------+-----------------------------------------------------------------
LNLEN      .2117E-02
DEG1      -.3933E-03   .1178E-02

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|      .0460133
       2|      .0342962

Implied correlation matrix of random parameters

--------+-------------------
Cor.Mat.|   LNLEN      DEG1
--------+-------------------
   LNLEN| 1.00000  -.24921
    DEG1| -.24921  1.00000
```

Random Parameter Negative Binomial Model of Evident Injury Crashes on Small Urbanized Small Urban SPF Class Roadway Segments

```
--------------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                   EVI
Log likelihood function      -147.14591
Restricted log likelihood    -154.13576
Chi squared [   3 d.f.]        14.13971
Significance level               .00276
McFadden Pseudo R-squared      .0457517
Estimation based on N =    1182, K =   9
Inf.Cr.AIC  =    312.3 AIC/N =     .262
Model estimated: Oct 18, 2015, 20:11:33
Sample is  2 pds and    596 individuals
Negative binomial regression model
--------+-----------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
     EVI|  Coefficient       Error         z   |z|>Z*         Interval
--------+-----------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -7.15910***     2.15225    -3.33  .0009   -11.37743  -2.94076
   LNADT|     .80812***      .22126     3.65  .0003      .37447   1.24177
  SMNDRT|    -.16414***      .05325    -3.08  .0021     -.26857   -.05972
        |Means for random parameters
   LNLEN|    1.02065***      .15679     4.51  .0000      .71326   1.32786
    MCVR|    -.00033*        .00017    -2.04  .0121     -.00067    .00000
        |Diagonal elements of Cholesky matrix
   LNLEN|     .15108***      .04835     3.12  .0018      .05632    .24584
    MCVR|     .00617**       .00305     2.00  .0452      .00013    .01221
        |Below diagonal elements of Cholesky matrix
lMCV_LNL|    -.00019*        .00011    -1.96  .0604     -.00042    .00003
        |Dispersion parameter for NegBin distribution
ScalParm|     .00621**       .00270     2.29  .0218      .00091    .01151
--------+-----------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
--------------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------------------
              LNLEN        MCVR
--------+-----------------------------------------------------------
LNLEN      .2269E-01
MCVR      -.2921E-04   .4301E-07

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|        .151083
       2|   .207413E-03

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|   LNLEN      MCVR
--------+------------------
   LNLEN| 1.00000   -.93225
    MCVR| -.93225   1.00000
```

Random Parameter Negative Binomial Model of High Injury Crashes on Small Urbanized Small Urban SPF Class Roadway Segments

```
--------------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                 HIINJ
Log likelihood function      -178.36365
Restricted log likelihood    -186.14321
Chi squared [   3 d.f.]        15.55911
Significance level               .00140
McFadden Pseudo R-squared      .0417934
Estimation based on N =    1182, K =  10
Inf.Cr.AIC  =    376.7 AIC/N =     .319
Model estimated: Oct 21, 2015, 16:53:22
Sample is  2 pds and    596 individuals
Negative binomial regression model
--------+-----------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
   HIINJ|  Coefficient       Error         z   |z|>Z*         Interval
--------+-----------------------------------------------------------------------
        |Nonrandom parameters
Constant|    -.88291*        .52126    -1.95  .0703    -1.90456    .13876
    MCVL|    -.00092***      .00031    -2.62  .0089     -.00148   -.00021
 TOTLANE|     .31006***      .11093     2.79  .0052      .09259    .52752
 MCVCRAH|     .00016**     .7666D-04    2.02  .0432      .00000    .00031
        |Means for random parameters
   LNADT|    1.13993***      .13743     8.30  .0000      .87059   1.40927
 VCVBVCA|    -.00574**       .00283    -2.03  .0425     -.01128   -.00020
        |Diagonal elements of Cholesky matrix
   LNADT|     .12906**       .05272     2.45  .0144      .02573    .23239
 VCVBVCA|     .00534***      .00189     2.82  .0048      .00162    .00905
        |Below diagonal elements of Cholesky matrix
lVCV_LNA|     .00404**       .00159     2.55  .0109      .00093    .00716
        |Dispersion parameter for NegBin distribution
ScalParm|     .45066**       .18990     2.37  .0176      .07847    .82286
--------+-----------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
--------------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------------------
---
              LNLEN     VCVBVCA
--------+-----------------------------------------------------------
---
LNADT      .1666E-01
VCVBVCA    .5217E-03   .4482E-04

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|        .129059
       2|      .00668504

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|   LNLEN   VCVBVCA
--------+------------------
   LNADT| 1.00000    .60384
 VCVBVCA|  .60384   1.00000
```

Random Parameter Negative Binomial Model of Just Injury Crashes on Small Urbanized Small Urban SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable              JUSTINJ
Log likelihood function      -167.95305
Restricted log likelihood    -172.38513
Chi squared [   1 d.f.]         9.20417
Significance level               .00241
McFadden Pseudo R-squared      .0266656
Estimation based on N =   1192, K =   6
Inf.Cr.AIC  =    348.0 AIC/N =     .292
Model estimated: Oct 21, 2015, 14:57:17
Sample is  2 pds and    596 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
 JUSTINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -5.65655***     2.04197   -2.77  .0056   -9.65905  -1.65405
    HCVR|    -.00019*        .00011   -1.95  .0721    -.00042    .00003
   LNLEN|     .71886***      .16045    4.48  .0000     .40439   1.03333
        |Means for random parameters
   LNADT|     .48195**       .19945    2.42  .0157     .09096    .87293
        |Scale parameters for dists. of random parameters
   LNADT|     .05825***      .01663    3.56  .0004     .02666    .09184
        |Dispersion parameter for NegBin distribution
ScalParm|     .60725**       .27512    2.21  .0273     .06801   1.14648
--------+--------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

Random Parameter Negative Binomial Model of Low Injury Crashes on Small Urbanized Small Urban SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable               LOINJ
Log likelihood function      -604.28726
Restricted log likelihood    -753.16352
Chi squared [   6 d.f.]       297.75249
Significance level               .00000
McFadden Pseudo R-squared      .1976679
Estimation based on N =   1192, K =  17
Inf.Cr.AIC  =   1242.6 AIC/N =    1.042
Model estimated: Oct 19, 2015, 17:17:37
Sample is  2 pds and    596 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
   LOINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -6.52606***     1.18832   -5.49  .0000   -8.85732  -4.19559
   LNADT|    1.00078***      .13463    7.43  .0000     .73691   1.26464
 MCVCRAH| .95937D-04**   .37780D-04    2.54  .0111 .21963D-04 .17001D-03
MCVOOKSEL|     .00960***      .00247    3.89  .0001     .00476    .01444
  SHWDRT|    -.07038***      .02002   -3.52  .0004    -.10963   -.03114
    HCVL|    -.00079***      .00019   -4.15  .0000    -.00115   -.00042
 NOFLDEC|    -.33290**       .13546   -2.46  .0140    -.59833   -.06741
        |Means for random parameters
   LNLEN|     .89851***      .06006   14.96  .0000     .78079   1.01622
    DEG1|    -.06478***      .01668   -3.88  .0001    -.09748   -.03209
     VCR|   -5.67381**      2.25186   -2.52  .0117  -10.08733  -1.26028
        |Diagonal elements of Cholesky matrix
   LNLEN|     .07655***      .02523    3.03  .0024     .02710    .12601
    DEG1|     .02820***      .00821    3.43  .0006     .01210    .04429
     VCR|    3.88023***     1.33634    2.90  .0037    1.26108   6.49940
        |Below diagonal elements of Cholesky matrix
 lDEG_LNL|     .03253**       .01342    2.42  .0155     .00624    .05883
 lVCR_LNL|    -.02555**       .01251   -2.04  .0426    -.04986   -.00066
 lVCR_DEG|     .02846**       .01313    2.17  .0302     .00273    .05420
        |Dispersion parameter for NegBin distribution
ScalParm|    2.45933***      .86545    2.85  .0040     .79312   4.15554
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-------------------------------------------------------------------
---
               LNLEN          DEG1           VCR
--------+-------------------------------------------------------------------
---
LNLEN       .5861E-02
DEG1        .2491E-02     .1856E-02
VCR        -.3245E-01     .5988E-01        22.05

Implied standard deviations of random parameters

S.D_Beta|              1
--------+-------------
       1|       .0765540
       2|       .0430526
       3|       4.69612


Implied correlation matrix of random parameters


--------+--------------------------
Cor.Mat.|   LNLEN     DEG1      VCR
--------+--------------------------
   LNLEN| 1.00000   .75570  -.09026
    DEG1|  .75570  1.00000   .29593
     VCR| -.09026   .29593  1.00000
```

Random Parameter Negative Binomial Model of Total Crashes on Metropolitan Small Urban SPF Class Roadway Segments

```
----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable              TOTALACC
Log likelihood function      -1143.37636
Restricted log likelihood    -9092.02706
Chi squared [   6 d.f.]      7897.30143
Significance level                .00000
McFadden Pseudo R-squared        .7784579
Estimation based on N =    878, K =  16
Inf.Cr.AIC  =   2318.8 AIC/N =    2.641
Model estimated: Nov 02, 2015, 16:13:26
Sample is  2 pds and    439 individuals
Negative binomial regression model
--------+-------------------------------------------------------------------
        |                Standard            Prob.       95% Confidence
TOTALACC|  Coefficient     Error       z    |z|>Z*          Interval
--------+-------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -2.96336***     .64462    -4.60  .0000    -4.22679  -1.69994
   LNADT|     .55561***     .06935     8.01  .0000      .41963    .69160
  SHNDCR|     .03749***     .01067     3.51  .0004      .01658    .05840
VCVPTGRA|    -.00659***     .00147    -4.49  .0000     -.00947   -.00371
  SHNDRT|    -.04810***     .01575    -3.05  .0023     -.07903   -.01717
 MCVLIMI|   -1.24064**      .60725    -2.04  .0410    -2.43053   -.05065
        |Means for random parameters
 VCPARMA|     .08202**      .04129     1.99  .0470      .00108    .16295
    DEG1|    -.04237***     .01203    -3.52  .0004     -.06586   -.01879
   LNLEN|     .86206***     .05501    16.03  .0000      .77425    .96990
        |Diagonal elements of Cholesky matrix
 VCPARMA|     .04912        .03173     1.96  .0616     -.01307    .11131
    DEG1|     .04910***     .00794     6.19  .0000      .03354    .06465
   LNLEN|     .03186**      .01545     2.06  .0391      .00159    .06214
        |Below diagonal elements of Cholesky matrix
lDEG_VCP|     .01746        .01882     1.99  .0964     -.00903    .04396
lLNL_VCP|     .02937        .02739     1.97  .0603     -.02432    .08306
lLNL_DEG|     .14706***     .02124     6.92  .0000      .10543    .18869
        |Dispersion parameter for NegBin distribution
ScalParm|     .94547***     .09369    10.09  .0000      .76184   1.12910
--------+-------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-------------------------------------------------------------------
                 VCPARMA         DEG1          LNLEN
--------+-------------------------------------------------------------------
VCPARMA     .2412E-02
DEG1        .8378E-03    .2716E-02
LNLEN       .1443E-02    .7700E-02    .2351E-01

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|       .0491170
       2|       .0521110
       3|        .153314

Implied correlation matrix of random parameters

--------+------------------------------
Cor.Mat.| VCPARMA      DEG1      LNLEN
--------+------------------------------
 VCPARMA| 1.00000    .33512     .19137
    DEG1|  .33512   1.00000     .96796
   LNLEN|  .19137    .96796    1.00000
```

Random Parameter Negative Binomial Model of Property Damage Only Crashes on Metropolitan Small Urban SPF Class Roadway Segments

```
----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                   PDO
Log likelihood function       -948.85690
Restricted log likelihood    -3262.90237
Chi squared [   6 d.f.]      4628.09094
Significance level                .00000
McFadden Pseudo R-squared        .7091868
Estimation based on N =    878, K =  16
Inf.Cr.AIC  =   1929.7 AIC/N =    2.198
Model estimated: Nov 05, 2015, 19:01:52
Sample is  2 pds and    439 individuals
Negative binomial regression model
--------+-------------------------------------------------------------------
        |                Standard            Prob.       95% Confidence
     PDO|  Coefficient     Error       z    |z|>Z*          Interval
--------+-------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -2.10168**      .94331    -2.23  .0259    -3.95053   -.25283
    DEG1|   -1.64702**      .65766    -2.51  .0122    -2.93558   -.35846
   LNADT|     .40717***     .11040     3.69  .0002      .19078    .62356
VCVPTGRA|    -.00662***     .00129    -5.12  .0000     -.00916   -.00409
 MCVLIMI|   -1.78383***     .65235    -2.73  .0063    -3.06355   -.50406
 TOTLANE|     .05261        .05749     1.97  .0507     -.03007    .13530
        |Means for random parameters
  SHNDCR|     .03632***     .01088     3.34  .0008      .01520    .05784
  SHNDLT|    -.04887***     .01884    -2.59  .0095     -.08578   -.01196
   LNLEN|     .87856***     .06171    14.24  .0000      .75762    .99952
        |Diagonal elements of Cholesky matrix
  SHNDCR|     .01914**      .00968     1.98  .0480      .00017    .03811
  SHNDLT|     .03221**      .01441     2.24  .0254      .00398    .06045
   LNLEN|     .04056**      .01830     2.19  .0286      .00419    .07693
        |Below diagonal elements of Cholesky matrix
lSHN_SHN|    -.00681        .01912    -2.28  .0213     -.04278    .03216
lLNL_SHN|    -.08958**      .03895    -2.30  .0215     -.16592   -.01323
lLNL_SHN|     .20982***     .02850     7.36  .0000      .15398    .26566
        |Dispersion parameter for NegBin distribution
ScalParm|     .82502***     .09482     8.70  .0000      .63918   1.01086
--------+-------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-------------------------------------------------------------------
---
                 SHNDCR        SHNDLT         LNLEN
--------+-------------------------------------------------------------------
---
SHNDCR      .3664E-03
SHNDLT     -.1016E-03    .1066E-02
LNLEN      -.1715E-02    .7234E-02    .5368E-01

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|       .0191404
       2|       .0326460
       3|        .231631

Implied correlation matrix of random parameters

--------+------------------------------
Cor.Mat.|  SHNDCR    SHNDLT      LNLEN
--------+------------------------------
  SHNDCR| 1.00000   -.16260    -.38673
  SHNDLT| -.16260   1.00000     .95666
   LNLEN| -.38673    .95666    1.00000
```

Random Parameter Negative Binomial Model of Possible Injury Crashes on Metropolitan Small Urban SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                PINJ
Log likelihood function     -557.72245
Restricted log likelihood   -969.52490
Chi squared [   6 d.f.]      843.60772
Significance level              .00000
McFadden Pseudo R-squared     .4348743
Estimation based on N =    878, K =  14
Inf.Cr.AIC  =   1143.4 AIC/N =    1.302
Model estimated: Nov 05, 2015, 19:21:29
Sample is  2 pds and    439 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
    PINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -4.74682***      .69537    -6.83  .0000    -6.10978  -3.38386
   LNADT|     .54070***      .06195     8.72  .0000      .41922    .66216
VCVPTSRA|    -.00558***      .00206    -2.71  .0068     -.00962   -.00154
 VCPARMA|     .10245**       .05150     1.99  .0466      .00152    .20338
        |Means for random parameters
  SHWDCR|     .01596*        .00875     1.98  .0480     -.00118    .03311
    DEG1|    -.03017**       .01497    -2.01  .0440     -.05962   -.00092
   LNLEN|     .84849***      .05033    16.86  .0000      .75045    .94634
        |Diagonal elements of Cholesky matrix
  SHWDCR|     .02037**       .00886     2.30  .0215      .00301    .03773
    DEG1|     .03703**       .01760     2.10  .0354      .00256    .07152
   LNLEN|     .06945***      .02140     3.24  .0012      .02748    .11139
        |Below diagonal elements of Cholesky matrix
lDEG_SHW|    -.00513**       .00240    -2.14  .0322     -.00983   -.00043
lLNL_SHW|    -.00587         .04252    -2.13  .0365     -.08843    .07530
lLNL_DEG|     .13840***      .03211     4.31  .0000      .07546    .20134
        |Dispersion parameter for NegBin distribution
ScalParm|    3.31789***     1.06242     3.12  .0018     1.23565   5.40031
--------+--------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+------------------------------------------------------------
              SHWDCR        DEG1        LNLEN
--------+------------------------------------------------------------
SHWDCR     .4148E-03
DEG1     -.1906E-03   .1455E-02
LNLEN    -.1184E-03   .5177E-02   .2401E-01

Implied standard deviations of random parameters

S.D_Beta|             1
--------+-------------
       1|      .0203666
       2|      .0381486
       3|       .154944

Implied correlation matrix of random parameters

--------+---------------------------
Cor.Mat.|  SHWDCR     DEG1    LNLEN
--------+---------------------------
  SHWDCR| 1.00000  -.24496  -.03594
    DEG1| -.24496  1.00000   .87454
   LNLEN| -.03594   .87454  1.00000
```

Random Parameter Negative Binomial Model of Evident Injury Crashes on Metropolitan Small Urban SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                 EVI
Log likelihood function     -255.21980
Restricted log likelihood   -309.53967
Chi squared [   3 d.f.]      108.63974
Significance level              .00000
McFadden Pseudo R-squared     .1754860
Estimation based on N =    878, K =  11
Inf.Cr.AIC  =    532.4 AIC/N =     .606
Model estimated: Dec 22, 2015, 13:50:28
Sample is  2 pds and    439 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
     EVI|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -4.50041***      .92753    -4.85  .0000    -6.31906  -2.68178
   LNADT|     .52058***      .08291     6.28  .0000      .35833    .68334
  SHWDLT|    -.28241***      .06587    -4.29  .0000     -.41152   -.15330
  SHWDRT|     .20401***      .06606     3.12  .0018      .07454    .33348
  VCVL1S|   -6.82551**      3.12512    -2.18  .0290   -12.95063   -.70040
        |Means for random parameters
   LNLEN|     .97600***      .06496    15.02  .0000      .84868   1.10332
    DEG1|    -.05973**       .02361    -2.53  .0114     -.10601   -.01345
        |Diagonal elements of Cholesky matrix
   LNLEN|     .08184**       .03639     2.25  .0245      .01051    .15317
    DEG1|     .02415**       .01112     2.17  .0297      .00236    .04597
        |Below diagonal elements of Cholesky matrix
lDEG_LNL|     .04580***      .01709     2.68  .0074      .01230    .07930
        |Dispersion parameter for NegBin distribution
ScalParm|     .18895***      .04402     4.29  .0000      .10268    .27523
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+------------------------------------------------------------
               LNLEN        DEG1
--------+------------------------------------------------------------
LNLEN      .6698E-02
DEG1       .3748E-02   .2347E-02

Implied standard deviations of random parameters

S.D_Beta|             1
--------+-------------
       1|      .0818409
       2|      .0484461

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|   LNLEN     DEG1
--------+------------------
   LNLEN| 1.00000   .94542
    DEG1|  .94542  1.00000
```

Random Parameter Negative Binomial Model of Severe Injury Crashes on Metropolitan Small Urban SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                SINJ
Log likelihood function      -94.03100
Restricted log likelihood    -94.75613
Chi squared [   1 d.f.]        1.45026
Significance level              .22849
McFadden Pseudo R-squared     .0076525
Estimation based on N =    878, K =   5
Inf.Cr.AIC  =    198.1 AIC/N =    .226
Model estimated: Dec 22, 2016, 20:54:09
Sample is  2 pds and    439 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                Standard            Prob.      95% Confidence
    SINJ|  Coefficient      Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -4.00450**     1.86562   -2.15  .0318    -7.66135    -.34826
   LNADT|     .23355        .18490    1.56  .1066    -.12856     .59592
        |Means for random parameters
   LNLEN|     .73353***     .13224    5.55  .0000     .47430     .99276
        |Scale parameters for dists. of random parameters
   LNLEN|     .11246        .07350    1.53  .0520    -.04140     .26633
        |Dispersion parameter for NegBin distribution
ScalParm|     .33540**      .15524    2.16  .0307     .03115     .63967
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

Random Parameter Negative Binomial Model of High Injury Crashes on Metropolitan Small Urban SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable               HIINJ
Log likelihood function     -414.61723
Restricted log likelihood   -650.97066
Chi squared [   1 d.f.]      472.70662
Significance level              .00000
McFadden Pseudo R-squared     .3630783
Estimation based on N =    878, K =   7
Inf.Cr.AIC  =    843.2 AIC/N =    .960
Model estimated: Dec 24, 2016, 16:46:19
Sample is  2 pds and    439 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                Standard            Prob.      95% Confidence
   HIINJ|  Coefficient      Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -6.97536***    1.84088   -3.79  .0002   -10.58609   -3.36733
   LNLEN|   1.73983***      .56568    3.08  .0021     .63112    2.84855
 NOFLINC|    .05874***      .01292    4.54  .0000     .03341     .08407
  VCVL11|  -19.3605***     6.97694   -2.77  .0055   -33.0350    -5.6859
        |Means for random parameters
   LNADT|     .43226**      .21966    1.97  .0491     .00136     .86320
        |Scale parameters for dists. of random parameters
   LNADT|     .06013***     .01301    4.62  .0000     .03463     .08562
        |Dispersion parameter for NegBin distribution
ScalParm|     .17267***     .03208    5.38  .0000     .10977     .23557
--------+--------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

Random Parameter Negative Binomial Model of Just Injury Crashes on Metropolitan Small Urban SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable              LOINJ
Log likelihood function    -898.23400
Restricted log likelihood -3865.48562
Chi squared [   8 d.f.]    5934.49124
Significance level             .00000
McFadden Pseudo R-squared    .7673983
Estimation based on N =    878, K =  11
Inf.Cr.AIC  =   2014.6 AIC/N =    2.295
Model estimated: Dec 24, 2015, 18:58:29
Sample is  2 pds and    439 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                Standard            Prob.       95% Confidence
   LOINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -3.95987***     .58806     -6.73  .0000    -5.11248  -2.80726
  SMMDLT|    -.05503***     .01435     -3.84  .0001     -.08315   -.02690
VCVFTGRB|    -.00459***     .00102     -4.77  .0000     -.00690   -.00258
    HCVR|-.44146D-04***   .1996D-04    -3.91  .0009 -.102090D-03 -.261990D-04
SHWDRTCR|     .05266***     .01685      3.12  .0018      .01957    .08576
        |Means for random parameters
   LNLEN|    1.04930***     .04581     22.90  .0000      .95951   1.13908
   LNADT|     .65548***     .06021     10.89  .0000      .53748    .77348
        |Diagonal elements of Cholesky matrix
   LNLEN|     .46310***     .04096     11.31  .0000      .38282    .54338
   LNADT|     .00999**      .00506      1.97  .0485      .00007    .01990
        |Below diagonal elements of Cholesky matrix
LNA_LNL|     -.04603***     .01238     -3.72  .0002     -.07028   -.02178
        |Dispersion parameter for NegBin distribution
ScalParm|    1.72445***     .22643      7.62  .0000     1.28066   2.16824
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------
                LNLEN        LNADT
--------+--------------------------------------------------------
LNLEN          .2145
LNADT      -.2132E-01    .2219E-02

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|        .463102
       2|       .0471014

Implied correlation matrix of random parameters

--------+----------------
Cor.Mat.|   LNLEN    LNADT
--------+----------------
   LNLEN| 1.00000  -.97727
   LNADT| -.97727  1.00000
```

Random Parameter Negative Binomial Model of Low Injury Crashes on Metropolitan Small Urban SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable            JUSTINJ
Log likelihood function    -387.41985
Restricted log likelihood  -492.65029
Chi squared [   3 d.f.]     210.46088
Significance level             .00000
McFadden Pseudo R-squared    .2136007
Estimation based on N =    878, K =  10
Inf.Cr.AIC  =    794.8 AIC/N =     .905
Model estimated: Dec 24, 2015, 19:04:27
Sample is  2 pds and    439 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                Standard            Prob.       95% Confidence
 JUSTINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -4.95366***     .79965     -6.17  .0000    -6.50094  -3.38637
  SHNDRT|     .18346***     .05360      3.42  .0006      .07841    .28852
  SMMDLT|    -.12923**      .05382     -2.40  .0164     -.23472   -.02373
MCVMSELL|    11.7478**     5.66685      2.07  .0382       .6405   22.8545
        |Means for random parameters
   LNLEN|     .80614***     .05744     14.04  .0000      .69356    .91871
   LNADT|     .47576***     .07600      6.26  .0000      .32680    .62472
        |Diagonal elements of Cholesky matrix
   LNLEN|     .26120***     .05082      5.14  .0000      .16161    .36080
   LNADT|     .06883***     .02632      2.62  .0089      .01725    .12041
        |Below diagonal elements of Cholesky matrix
LNA_LNL|     -.02458**      .01244     -1.98  .0481     -.04896   -.00020
        |Dispersion parameter for NegBin distribution
ScalParm|     .31383***     .06426      4.88  .0000      .18787    .43978
--------+--------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------
                LNLEN        LNADT
--------+--------------------------------------------------------
LNLEN       .6823E-01
LNADT      -.6421E-02    .6461E-03

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|        .261205
       2|       .0254183

Implied correlation matrix of random parameters

--------+----------------
Cor.Mat.|   LNLEN    LNADT
--------+----------------
   LNLEN| 1.00000  -.96708
   LNADT| -.96708  1.00000
```

Random Parameter Negative Binomial Model of Total Crashes on Large Urbanized Small Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable              TOTALACC
Log likelihood function      -1478.36649
Restricted log likelihood    -9002.75452
Chi squared [   6 d.f.]     15048.83605
Significance level                .00000
McFadden Pseudo R-squared       .8357879
Estimation based on N =    856, K =  15
Inf.Cr.AIC  =   2986.7 AIC/N =    3.489
Model estimated: Dec 25, 2015, 22:48:57
Sample is  2 pds and    428 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
TOTALACC|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -8.34022***      .94105    -8.74  .0000    -8.18459  -6.49582
 MCVCRAN| .90898D-04***   .1840D-04     4.94  .0000  .54825D-04 .12697D-03
   VCVL1|   1.37726***       .47268     2.91  .0036      .45083   2.30368
BNVMDINC|     .01422***      .00417     3.41  .0006      .00606    .02238
MCVMXSL1|   -5.71807***     2.19081    -2.61  .0091   -10.01198  -1.42417
        |Means for random parameters
   LNADT|     .81481***      .08126    10.03  .0000      .65555    .97408
  SHWDCR|    -.01646***      .00507    -3.25  .0012     -.02639   -.00652
   LNLEN|     .91898***      .03366    27.30  .0000      .85300    .98495
        |Diagonal elements of Cholesky matrix
   LNADT|     .01818**       .00911     2.00  .0459      .00033    .03603
  SHWDCR|     .01868***      .00413     3.58  .0001      .00856    .02480
   LNLEN|     .04996***      .01071     4.66  .0000      .02896    .07096
        |Below diagonal elements of Cholesky matrix
lSHW_LNA|    -.00989**       .00473    -2.08  .0352     -.01929   -.00069
lLNL_LNA|    -.11962***      .02809    -4.26  .0000     -.17468   -.06457
lLNL_SHW|    -.21925***      .01273   -17.22  .0000     -.24420   -.19430
        |Dispersion parameter for NegBin distribution
ScalParm|    2.51450***      .30755     8.18  .0000     1.91152   3.11708
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
                 LNADT       SHWDCR        LNLEN
--------+--------------------------------------------------------------------
LNADT        .3305E-03
SHWDCR     -.1798E-03   .3761E-03
LNLEN      -.2175E-02  -.2475E-02   .6486E-01

Implied standard deviations of random parameters

S.D_Beta|             1
--------+-------------
       1|      .0181800
       2|      .0193933
       3|       .254708

Implied correlation matrix of random parameters


--------+-----------------------------
Cor.Mat.|    LNADT   SHWDCR    LNLEN
--------+-----------------------------
   LNADT| 1.00000  -.50989  -.46965
  SHWDCR| -.50989  1.00000  -.50101
   LNLEN| -.46965  -.50101  1.00000
```

Random Parameter Negative Binomial Model of Property Damage Only Crashes on Large Urbanized Small Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                   PDO
Log likelihood function      -1256.80317
Restricted log likelihood    -5540.52159
Chi squared [   3 d.f.]      8567.43683
Significance level                .00000
McFadden Pseudo R-squared       .7731620
Estimation based on N =    856, K =  13
Inf.Cr.AIC  =   2539.6 AIC/N =    2.967
Model estimated: Dec 26, 2015, 14:06:29
Sample is  2 pds and    428 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
     PDO|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -7.21802***     1.05256    -6.86  .0000    -9.28158  -5.15445
 MCVCRAN| .84459D-04***   .1920D-04     4.40  .0000  .46834D-04 .12208D-03
  SHWDCR|    -.01777***      .00548    -3.24  .0012     -.02852   -.00703
   LNADT|     .84173***      .09028     9.32  .0000      .66477   1.01869
    VCVL|    -.00047**       .00020    -2.36  .0183     -.00086   -.00008
BNVMDINC|     .01622***      .00429     3.78  .0002      .00782    .02463
 VCPARMA|     .24325***      .05486     4.43  .0000      .13554    .35097
        |Means for random parameters
MCVMXSL1|   -9.56401***     2.51833    -3.80  .0001   -14.49984  -4.62818
   LNLEN|     .90492***      .03674    24.63  .0000      .83292    .97692
        |Diagonal elements of Cholesky matrix
MCVMXSL1|     .01379***      .00492     2.80  .0051      .00414    .02344
   LNLEN|     .21349***      .01296    16.47  .0000      .18809    .23889
        |Below diagonal elements of Cholesky matrix
lLNL_MCV|     .04640***      .01420     3.27  .0011      .01857    .07424
        |Dispersion parameter for NegBin distribution
ScalParm|    2.72830***      .41475     6.58  .0000     1.91539   3.54120
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
             MCVMXSL1        LNLEN
--------+--------------------------------------------------------------------
MCVMXSL1        10.27
LNLEN           .1487   .4773E-01

Implied standard deviations of random parameters

S.D_Beta|             1
--------+-------------
       1|        .01379
       2|       .218478

Implied correlation matrix of random parameters


--------+-------------------
Cor.Mat.|MCVMXSL1    LNLEN
--------+-------------------
MCVMXSL1| 1.00000   .21240
   LNLEN|  .21240  1.00000
```

Random Parameter Negative Binomial Model of Possible Injury Crashes on Large Urbanized Small Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                PINJ
Log likelihood function     -805.85529
Restricted log likelihood  -1879.42148
Chi squared [   3 d.f.]     2147.17238
Significance level              .00000
McFadden Pseudo R-squared     .5712322
Estimation based on N =    856, K =  11
Inf.Cr.AIC  =   1633.7 AIC/N =    1.908
Model estimated: Dec 26, 2015, 19:01:20
Sample is  2 pds and    428 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
    PINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -6.84216***     1.27775   -5.35  .0000    -9.34653  -4.33778
   LNLEN|     .83760***      .03627   23.09  .0000      .76650    .90869
  SHWDRT|    -.03541***      .01267   -3.11  .0019     -.06424   -.01458
 NOFLINC|     .21609**       .09070    2.37  .0177      .03788    .39294
 MCVMXSL1|   -6.73855**     2.99396   -2.25  .0244   -12.60660   -.87050
        |Means for random parameters
 MCVCRAN|     .00015***   .2064D-04    7.15  .0000      .00011    .00019
   LNADT|     .73790***      .11868    6.22  .0000      .50529    .97050
        |Diagonal elements of Cholesky matrix
 MCVCRAN|     .00031***   .3110D-04   10.09  .0000      .00025    .00037
   LNADT|     .02498***      .00427    5.56  .0000      .01662    .03335
        |Below diagonal elements of Cholesky matrix
lLNA_MCV|    -.05902***      .00496  -11.89  .0000     -.06876   -.04929
        |Dispersion parameter for NegBin distribution
ScalParm|    4.89177***     1.40784    3.48  .0005     2.13303   7.65050
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+----------------------------------------
              MCVCRAN        LNADT
--------+----------------------------------------
MCVCRAN     .9842E-07
LNADT      -.1852E-04    .4108E-02

Implied standard deviations of random parameters

S.D_Beta|             1
--------+-------------
       1|   .313715E-03
       2|     .0640948

Implied correlation matrix of random parameters

--------+----------------
Cor.Mat.| MCVCRAN   LNADT
--------+----------------
 MCVCRAN| 1.00000  -.92089
   LNADT| -.92089  1.00000
```

Random Parameter Negative Binomial Model of Evident Injury Crashes on Large Urbanized Small Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                 EVI
Log likelihood function     -347.86379
Restricted log likelihood   -470.29037
Chi squared [   5 d.f.]      244.85315
Significance level              .00000
McFadden Pseudo R-squared     .2603212
Estimation based on N =    856, K =  10
Inf.Cr.AIC  =    715.7 AIC/N =     .836
Model estimated: Dec 26, 2015, 19:54:31
Sample is  2 pds and    428 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
     EVI|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -8.26300***     2.21888   -3.73  .0002   -12.60801  -3.92100
 MCVCRAN| .82613D-04**    .3612D-04    2.29  .0222  .11816D-04  .15341D-03
   LNLEN|     .86423***      .04462   19.37  .0000      .77678    .95169
 MCVMXSEL|    .00011***   .4193D-04    2.62  .0087      .00003    .00019
        |Means for random parameters
   LNADT|     .79192***      .18487    4.28  .0000      .42959   1.15426
 SHWDLTCR|   -.04540**       .02148   -2.11  .0346     -.08753   -.00328
        |Diagonal elements of Cholesky matrix
   LNADT|     .05140***      .00834    6.16  .0000      .03504    .06776
 SHWDLTCR|    .05175***      .01714    3.02  .0026      .01811    .08539
        |Below diagonal elements of Cholesky matrix
lSHW_LNA|     .09705***      .02069    4.69  .0000      .05651    .13760
        |Dispersion parameter for NegBin distribution
ScalParm|    2.19867*       1.13984    1.92  .0548     -.04041   4.42774
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+----------------------------------------
                LNADT    SHWDLTCR
--------+----------------------------------------
LNADT       .2642E-02
SHWDLTCR    .4988E-02   .1210E-01

Implied standard deviations of random parameters

S.D_Beta|             1
--------+-------------
       1|      .0513970
       2|      .109989

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|   LNADT SHWDLTCR
--------+------------------
   LNADT| 1.00000    .88241
 SHWDLTCR|  .88241  1.00000
```

Random Parameter Negative Binomial Model of Serious Injury Crashes on Large Urbanized Small Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                SINJ
Log likelihood function      -79.44696
Restricted log likelihood    -76.24196
Chi squared [   1 d.f.]        5.75623
Significance level              .01615
McFadden Pseudo R-squared     .0378469
Estimation based on N =    556, K =   4
Inf.Cr.AIC  =    158.9 AIC/N =    .156
Model estimated: Dec 27, 2015, 14:41:48
Sample is  2 pds and    428 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                Standard            Prob.       95% Confidence
    SINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|     -.97853**       .38083    -2.57  .0102    -1.72323   -.23242
   VCVLL|     6.57957***     1.78686     3.68  .0002     3.07347  10.08567
   LNLEN|      .97985***      .17989     5.44  .0000      .63906   1.32064
        |Means for random parameters
  SHWDCR|     -.28694**       .13076    -2.21  .0271     -.54322   -.03266
        |Scale parameters for dists. of random parameters
  SHWDCR|      .18850**       .07371     2.56  .0109      .04403    .33297
        |Dispersion parameter for NegBin distribution
ScalParm|     5.37149*       2.79111     1.92  .0543     -.09898  10.84197
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

Random Parameter Negative Binomial Model of High Injury Crashes on Large Urbanized Small Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable               HIINJ
Log likelihood function     -457.55618
Restricted log likelihood   -665.70563
Chi squared [   3 d.f.]      416.34490
Significance level              .00000
McFadden Pseudo R-squared     .3121072
Estimation based on N =    556, K =  10
Inf.Cr.AIC  =    935.1 AIC/N =   1.093
Model estimated: Jan 22, 2016, 18:34:11
Sample is  2 pds and    428 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                Standard            Prob.       95% Confidence
   HIINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -7.48927***     1.96624    -3.81  .0001   -11.34303  -3.63552
   LNLEN|     .87863***      .04496    19.53  .0000      .79047    .96679
  SHWDCR|    -.02398***      .00900    -2.67  .0077     -.04161   -.00635
 VCVLIMI|    1.24903*        .70331     1.98  .0687     -.12942   2.62748
        |Means for random parameters
 HCVCRAN|     .00011***   .2637D-04     4.29  .0000      .00006    .00016
   LNADT|     .74571***      .16417     4.54  .0000      .42394   1.06749
        |Diagonal elements of Cholesky matrix
 HCVCRAN|     .00014***   .2713D-04     5.10  .0000      .00009    .00019
   LNADT|     .01747***      .00567     3.08  .0021      .00635    .02859
        |Below diagonal elements of Cholesky matrix
LLNA_HCV|    -.05929***      .00700    -8.47  .0000     -.07302   -.04557
        |Dispersion parameter for NegBin distribution
ScalParm|    8.49160        4.67191     1.97  .0731    -4.85431  21.84752
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
            HCVCRAN      LNADT
--------+--------------------------------------------------------------------
HCVCRAN     .1912E-07
LNADT     -.8199E-05   .3821E-02

Implied standard deviations of random parameters

S.D_Beta|             1
--------+-------------
       1|  .138294E-03
       2|      .0618138

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.| HCVCRAN    LNADT
--------+------------------
 HCVCRAN| 1.00000  -.95924
   LNADT| -.95924  1.00000
```

Random Parameter Negative Binomial Model of Just Injury Crashes on Large Urbanized Small Urbanized SPF Class Roadway Segments

```
--------------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                 JUSTINJ
Log likelihood function         -501.58681
Restricted log likelihood       -755.71078
Chi squared [   3 d.f.]          508.24787
Significance level                  .00000
McFadden Pseudo R-squared         .3362714
Estimation based on N =     856, K =  10
Inf.Cr.AIC  =   1023.2 AIC/N =     1.195
Model estimated: Jan 20, 2016, 22:03:17
Sample is  2 pds and     428 individuals
Negative binomial regression model
--------+-----------------------------------------------------------------------
        |                  Standard            Prob.        95% Confidence
 JUSTINJ|  Coefficient       Error       z    |z|>Z*           Interval
--------+-----------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -4.41008***     1.51941    -2.90  .0037    -7.38807  -1.43208
 HCVCRAN| .85026D-04***   .2191D-04     3.88  .0001  .42076D-04  .12797D-03
 NOFLINC|     .26570**      .11762     2.26  .0239      .03517    .49622
   LNLEN|     .83500***     .04461    18.71  .0000      .74755    .92246
        |Means for random parameters
   LNADT|     .43632***     .13385     3.26  .0012      .17197    .69667
  SHNDCR|   -.02842***      .00903    -2.82  .0049     -.04912   -.00772
        |Diagonal elements of Cholesky matrix
   LNADT|     .02705***     .00649     4.17  .0000      .01452    .03977
  SHNDCR|     .03675***     .00684     5.38  .0000      .02335    .05015
        |Below diagonal elements of Cholesky matrix
 lSHN_LNA|     .01042        .00621     1.67  .2048     -.00567    .02651
        |Dispersion parameter for NegBin distribution
ScalParm|     .28187***     .04429     6.36  .0000      .19506    .36867
--------+-----------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
--------------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------------------------------
               LNADT      SHNDCR
--------+-----------------------------------------------------------------------
LNADT      .7318E-03
SHNDCR     .2819E-03   .1458E-02

Implied standard deviations of random parameters

S.D_Beta|             1
--------+-------------
       1|      .0270476
       2|      .0382001

Implied correlation matrix of random parameters

--------+-----------------
Cor.Mat.|   LNADT   SHNDCR
--------+-----------------
   LNADT| 1.00000   .27283
  SHNDCR|  .27283  1.00000
```

Random Parameter Negative Binomial Model of Low Injury Crashes on Large Urbanized Small Urbanized SPF Class Roadway Segments

```
--------------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                   LOINJ
Log likelihood function        -1372.55061
Restricted log likelihood      -6903.74432
Chi squared [   3 d.f.]        11061.78741
Significance level                  .00000
McFadden Pseudo R-squared         .8011491
Estimation based on N =     856, K =  13
Inf.Cr.AIC  =   2771.7 AIC/N =     3.238
Model estimated: Dec 27, 2015, 21:17:59
Sample is  2 pds and     428 individuals
Negative binomial regression model
--------+-----------------------------------------------------------------------
        |                  Standard            Prob.        95% Confidence
   LOINJ|  Coefficient       Error       z    |z|>Z*           Interval
--------+-----------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -4.59533***     1.02887    -4.47  .0000    -6.61187  -2.57878
   UCVL1|   -2.02394*       1.10943    -1.94  .0581    -4.19837    .15050
  SHWDCR|    -.01471***      .00535    -2.73  .0065     -.02526   -.00418
   LNLEN|     .84152***      .03476    24.19  .0000      .77335    .90969
 HCVCRAN| .83097D-04***   .1751D-04     4.75  .0000  .48782D-04  .11741D-03
 VCRARMA|     .22245***     .05656     3.93  .0001      .11160    .33331
 HCVMXSL1|   -8.54589***     2.53452    -3.37  .0007   -13.51345  -3.57833
        |Means for random parameters
   LNADT|     .57820***     .09752     5.93  .0000      .38706    .76935
 TOTLANE|     .18380***     .04535     4.05  .0001      .09491    .27268
        |Diagonal elements of Cholesky matrix
   LNADT|     .18795***     .02121     8.58  .0000      .14639    .22952
 TOTLANE|     .04393***     .00677     6.49  .0000      .03065    .05720
        |Below diagonal elements of Cholesky matrix
 lTOT_LNA|     .27274***     .04058     6.72  .0000      .19320    .35228
        |Dispersion parameter for NegBin distribution
ScalParm|    2.09520***     .25350     8.25  .0000     1.60274   2.59866
--------+-----------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
--------------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------------------------------
               LNADT     TOTLANE
--------+-----------------------------------------------------------------------
LNADT      .3533E-01
TOTLANE    .5126E-01   .7632E-01

Implied standard deviations of random parameters

S.D_Beta|             1
--------+-------------
       1|       .187958
       2|       .276256

Implied correlation matrix of random parameters

--------+-----------------
Cor.Mat.|   LNADT  TOTLANE
--------+-----------------
   LNADT| 1.00000   .98728
 TOTLANE|  .98728  1.00000
```

Random Parameter Negative Binomial Model of Total Crashes on Small Urban Metropolitan SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable              TOTALACC
Log likelihood function       -852.53955
Restricted log likelihood    -2528.82388
Chi squared [   3 d.f.]      3695.96860
Significance level                .00000
McFadden Pseudo R-squared       .7300842
Estimation based on N =    550, K =  12
Inf.Cr.AIC  =   1389.7 AIC/N =    2.527
Model estimated: May 15, 2016, 23:41:27
Sample is  2 pds and    275 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
TOTALACC|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|     5.28411***    1.20775     4.38  .0000     2.91697    7.65126
   LNLEN|      .94249***     .07603    12.40  .0000      .79347    1.09150
  SHWDCR|     -.03417        .02339    -1.46  .1442     -.08002     .01168
VCVPTGRA|     -.00399**      .00193    -2.07  .0387     -.00778    -.00021
MCVMXSEL|     -.00401**      .00166    -2.42  .0157     -.00728    -.00074
  SHWDLT|     -.07104***     .02056    -3.45  .0006     -.11134    -.03073
        |Means for random parameters
   LNADT|     -.34943***     .11805    -2.96  .0031     -.58088    -.11797
 TOTLANE|      .33909***     .08688     3.90  .0001      .16874     .50043
        |Diagonal elements of Cholesky matrix
   LNADT|      .06233**      .02447     2.55  .0109      .01437     .11030
 TOTLANE|      .03453**      .01682     2.05  .0401      .00158     .06750
        |Below diagonal elements of Cholesky matrix
ITOT_LNA|      .07423        .05962     1.24  .2146     -.04301     .19147
        |Dispersion parameter for NegBin distribution
ScalParm|      .69581***     .08721     7.98  .0000      .52488     .86673
--------+--------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
             LNADT      TOTLANE
--------+--------------------------------------------------------------------
LNADT      .3586E-02
TOTLANE    .4627E-02   .6702E-02

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|       .0623341
       2|       .0818670

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|   LNADT  TOTLANE
--------+------------------
   LNADT| 1.00000   .90670
 TOTLANE|  .90670  1.00000
```

Random Parameter Negative Binomial Model of Property Damage Only Crashes on Small Urban Metropolitan SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                   PDO
Log likelihood function       -560.49582
Restricted log likelihood    -1488.22009
Chi squared [   3 d.f.]      1855.56536
Significance level                .00000
McFadden Pseudo R-squared       .6234187
Estimation based on N =    550, K =  13
Inf.Cr.AIC  =   1146.9 AIC/N =    2.085
Model estimated: Jun 25, 2016, 16:55:55
Sample is  2 pds and    275 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
     PDO|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|     5.47397***    1.43889     3.81  .0001     2.65549    8.29964
   LNLEN|      .94539***     .08401    11.25  .0000      .78073    1.11005
 TOTLANE|      .27122***     .09313     2.91  .0036      .08870     .45375
MCVMXSEL|     -.00374**      .00180    -2.07  .0384     -.00728    -.00020
  SHWDLT|     -.08098***     .02247    -3.60  .0003     -.12503    -.03693
 VCVEVIA|      .01359*       .00752     1.94  .0523     -.00174     .02893
VCVPTGRA|     -.01962**      .00930    -2.11  .0348     -.03785    -.00140
        |Means for random parameters
   LNADT|     -.38722***     .14539    -2.66  .0077     -.67217    -.10226
  SHWDCR|     -.06163**      .02844    -2.17  .0302     -.11737    -.00589
        |Diagonal elements of Cholesky matrix
   LNADT|      .02561***     .00684     3.75  .0002      .01221     .03901
  SHWDCR|      .03024*       .01655     1.93  .0676     -.00219     .06267
        |Below diagonal elements of Cholesky matrix
lSHW_LNA|     -.03965**      .01859    -2.13  .0328     -.07611    -.00325
        |Dispersion parameter for NegBin distribution
ScalParm|      .68630***     .09822     6.99  .0000      .49378     .87882
--------+--------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
             LNADT      SHWDCR
--------+--------------------------------------------------------------------
LNADT      .6558E-03
SHWDCR    -.1016E-02   .2489E-02

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|       .0256079
       2|       .0498902

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|   LNADT   SHWDCR
--------+------------------
   LNADT| 1.00000  -.79533
  SHWDCR| -.79533  1.00000
```

Random Parameter Negative Binomial Model of Possible Injury Crashes on Small Urban Metropolitan SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                  PINJ
Log likelihood function       -342.97371
Restricted log likelihood     -678.34388
Chi squared [   3 d.f.]        670.74034
Significance level                .00000
McFadden Pseudo R-squared       .4943965
Estimation based on N =    550, K =  13
Inf.Cr.AIC  =    711.9 AIC/N =    1.294
Model estimated: Jun 28, 2016, 19:43:26
Sample is  2 pds and    275 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                Standard            Prob.      95% Confidence
    PINJ|  Coefficient      Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|    3.57941**     1.39767     2.56  .0104      .84000   6.31880
   LMADT|    -.07480***     .02164    -3.47  .0005    -.11702   -.03258
  SHNDRT|    -.05005*       .03011    -1.96  .0470    -.10914    .00905
    VCVL|     .18915**      .07785     2.43  .0152     .03637    .34192
 VCVLIMI|  -994.881**    412.8658    -2.41  .0160  -1804.083  -185.679
 VCVBVCA|    -.03730*       .01942    -1.92  .0546    -.07536    .00076
 HCVMXSEL|   -.00747***     .00246    -3.04  .0024    -.01229   -.00265
        |Means for random parameters
   LNLEN|     .94889***     .11562     8.21  .0000     .72248   1.17530
VCVFTGRA|    -.15425**      .07103    -2.17  .0300    -.29363   -.01494
        |Diagonal elements of Cholesky matrix
   LNLEN|     .07451*       .04279     2.74  .0116    -.00935    .15837
VCVFTGRA|     .00370**      .00147     2.52  .0118     .00082    .00658
        |Below diagonal elements of Cholesky matrix
lVCV_LNL|    -.00117        .00166     -.63  .5277    -.00480    .00246
        |Dispersion parameter for NegBin distribution
ScalParm|     .51707***     .11279     4.58  .0000     .29601    .73814
--------+--------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
              LNLEN    VCVFTGRA
--------+--------------------------------------------------------------------
LNLEN      .5552E-02
VCVFTGRA  -.8707E-04   .1506E-04

Implied standard deviations of random parameters

S.D_Beta|            1
--------+-------------
       1|     .0745097
       2|     .00388125

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|   LNLEN VCVFTGRA
--------+------------------
   LNLEN| 1.00000  -.30107
VCVFTGRA| -.30107  1.00000
```

Random Parameter Negative Binomial Model of Evident Injury Crashes on Small Urban Metropolitan SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                   EVI
Log likelihood function       -135.15960
Restricted log likelihood     -167.59784
Chi squared [   1 d.f.]         64.87647
Significance level                .00000
McFadden Pseudo R-squared       .1935480
Estimation based on N =    550, K =   9
Inf.Cr.AIC  =    288.3 AIC/N =     .524
Model estimated: Jun 28, 2016, 19:59:01
Sample is  2 pds and    275 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                Standard            Prob.      95% Confidence
     EVI|  Coefficient      Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|    5.21021**     2.55325     2.04  .0413      .20588  10.21454
   LNLEN|    1.17942***     .22448     5.25  .0000      .73945   1.61938
 TOTLANE|     .31222*       .17118     1.92  .0681     -.02319    .64763
  SHNDRT|    -.15060***     .05261    -2.85  .0044     -.25411   -.04708
VCVFTGRA|    -.03231***     .01118    -2.89  .0039     -.05422   -.01040
 VCVVPIA|     .02442***     .00929     2.63  .0085      .00622    .04262
        |Means for random parameters
   LMADT|    -.17263***     .05302    -3.26  .0011     -.27654   -.06872
        |Scale parameters for dists. of random parameters
   LMADT|     .03277**      .01585     2.07  .0386      .00172    .06383
        |Dispersion parameter for NegBin distribution
ScalParm|    1.38786**      .69675     1.99  .0470      .01828   2.75744
--------+--------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

Random Parameter Negative Binomial Model of High Injury Crashes on Small Urban Metropolitan SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                  HIINJ
Log likelihood function        -212.00759
Restricted log likelihood      -262.54910
Chi squared [   1 d.f.]         101.08302
Significance level                 .00000
McFadden Pseudo R-squared        .1925670
Estimation based on N =    550, K =  10
Inf.Cr.AIC  =    444.0 AIC/N =     .807
Model estimated: Jun 26, 2016, 20:18:34
Sample is  2 pds and    275 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
   HIINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|    4.48595*       2.38304     2.88  .0098     -.18473   9.15663
   LNADT|    -.46460*        .24814    -1.91  .0560     -.94113    .01194
 TOTLANE|     .29091**       .11590     2.51  .0119      .06388    .53194
VCVPTGRA|    -.02060**       .00939    -2.13  .0282     -.03900   -.00220
 VCVVPIA|     .01548*        .00807     1.92  .0594     -.00058    .03128
NCVMXREL|    -.00393         .00269    -1.86  .0436     -.00921    .00134
  SHNDLT|    -.51402**       .26075    -1.97  .0487    -1.02506   -.00298

        |Means for random parameters
   LNLEN|   1.07016***       .18370     8.00  .0000      .80613   1.33222
        |Scale parameters for dists. of random parameters
   LNLEN|    .11824***       .04571     2.58  .0097      .02864    .20783
        |Dispersion parameter for NegBin distribution
ScalParm|   1.45962**        .73661     1.98  .0478      .01628   2.90299
--------+--------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

Random Parameter Negative Binomial Model of Just Injury Crashes on Small Urban Metropolitan SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                JUSTINJ
Log likelihood function        -206.12353
Restricted log likelihood      -331.52612
Chi squared [   1 d.f.]         250.80459
Significance level                 .00000
McFadden Pseudo R-squared        .3782977
Estimation based on N =    550, K =   8
Inf.Cr.AIC  =    428.2 AIC/N =     .779
Model estimated: Jun 25, 2016, 20:58:04
Sample is  2 pds and    275 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
 JUSTINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|    6.05963*       3.22494     1.89  .0590     -.23113  12.41038
   LNADT|    -.43318**       .18276    -2.38  .0172     -.78942   -.07698
 NOFLDEC|     .60522*        .32000     1.89  .0586     -.02196   1.23241
  SHNDLT|    -.07874**       .03438    -2.29  .0220     -.14614   -.01137
NCVMXREL|    -.07435**       .03792    -1.96  .0499     -.14868   -.00003
        |Means for random parameters
   LNLEN|   1.20904***       .19467     6.22  .0000      .82788   1.59020
        |Scale parameters for dists. of random parameters
   LNLEN|    .25260***       .06932     3.64  .0003      .11674    .38846
        |Dispersion parameter for NegBin distribution
ScalParm|    .49590***       .13168     3.77  .0002      .23827    .75352
--------+--------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

Random Parameter Negative Binomial Model of Low Injury Crashes on Small Urban Metropolitan SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable               LOINJ
Log likelihood function     -605.49917
Restricted log likelihood  -1818.67804
Chi squared [   3 d.f.]     2426.35974
Significance level              .00000
McFadden Pseudo R-squared     .6670669
Estimation based on N =    550, K =  12
Inf.Cr.AIC  =   1235.0 AIC/N =    2.245
Model estimated: Jun 25, 2018, 21:06:45
Sample is  2 pds and    275 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
   LOINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|    5.66943***    1.32812     4.27  .0000     3.06636   8.27249
   LNADT|    -.36786***     .13427    -2.74  .0061     -.63102   -.10470
 NOFLDEC|     .38936***     .12982     3.01  .0026      .13609    .64352
  SHWDLT|    -.10904***     .01849    -5.89  .0000     -.14726   -.07083
VCVPTSRB|    -.00325*       .00182    -1.85  .0646     -.00682    .00032
    DEG1|     .23016***     .06509     3.54  .0004      .10259    .35773
        |Means for random parameters
   LNLEN|     .93756***     .07702    12.17  .0000      .78660   1.08853
MCVMXSEL|    -.00649***     .00233    -2.79  .0053     -.01108   -.00190
        |Diagonal elements of Cholesky matrix
   LNLEN|     .09045***     .02647     3.42  .0006      .03856    .14233
MCVMXSEL|     .00378***     .00103     3.67  .0002      .00176    .00580
        |Below diagonal elements of Cholesky matrix
lMCV_LNL|    -.02365        .01608    -1.47  .1417     -.05519    .00789
        |Dispersion parameter for NegBin distribution
ScalParm|     .75395***     .10762     7.01  .0000      .54303    .96488
--------+--------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
              LNLEN     MCVMXSEL
--------+--------------------------------------------------------------------
LNLEN      .8180E-02
MCVMXSEL  -.7014E-04   .1491E-04

Implied standard deviations of random parameters

S.D_Beta|             1
--------+-------------
       1|      .0904460
       2|     .00386095


Implied correlation matrix of random parameters


--------+----------------
Cor.Mat.|   LNLEN MCVMXSEL
--------+----------------
   LNLEN| 1.00000  -.20066
MCVMXSEL| -.20066  1.00000
```

Random Parameter Negative Binomial Model of Total Crashes on Metropolitan Small Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable            TOTALACC
Log likelihood function     -864.20343
Restricted log likelihood  -6393.10634
Chi squared [   3 d.f.]    11057.80582
Significance level              .00000
McFadden Pseudo R-squared     .8648226
Estimation based on N =    476, K =  14
Inf.Cr.AIC  =   1756.4 AIC/N =    3.690
Model estimated: Jun 25, 2018, 21:36:09
Sample is  2 pds and    238 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
TOTALACC|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -4.32063***    1.16067    -3.72  .0002    -6.59550  -2.04575
   LNLEN|     .93249***     .05211    17.89  .0000      .83035   1.03462
 VCPARMA|    -.21057***     .05702    -3.69  .0002     -.32234   -.09881
MCVMXSEL|     .00781***     .00180     4.34  .0000      .00428    .01134
 TOTLANE|     .25849***     .05971     4.33  .0000      .14146    .37552
  SHWDRT|    -.07054***     .01644    -4.29  .0000     -.10275   -.03832
RNYWDDEC|    -.02339**      .00991    -2.36  .0183     -.04281   -.00397
    DEG1|     .25413***     .06028     4.22  .0000      .13598    .37227
        |Means for random parameters
   LNADT|     .78596***     .13328     5.90  .0000      .52475   1.04716
    HCVL|    -.00087***     .00019    -4.49  .0000     -.00124   -.00050
        |Diagonal elements of Cholesky matrix
   LNADT|     .04090***     .00522     7.83  .0000      .03066    .05114
    HCVL|     .00023**      .00010     2.27  .0229      .00003    .00042
        |Below diagonal elements of Cholesky matrix
lHCV_LNA|     .00022**    .9798D-04    2.27  .0233      .00003    .00041
        |Dispersion parameter for NegBin distribution
ScalParm|    1.17563***     .14098     8.34  .0000      .89929   1.45196
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
              LNADT        HCVL
--------+--------------------------------------------------------------------
LNADT      .1673E-02
HCVL       .9082E-05   .4964E-07

Implied standard deviations of random parameters

S.D_Beta|             1
--------+-------------
       1|      .0408978
       2|   .222804E-03


Implied correlation matrix of random parameters


--------+----------------
Cor.Mat.|   LNADT      HCVL
--------+----------------
   LNADT| 1.00000    .99665
    HCVL|  .99665  1.00000
```

Random Parameter Negative Binomial Model of Property Damage Only Crashes on Metropolitan Small Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                    PDO
Log likelihood function      -758.72896
Restricted log likelihood   -3961.28159
Chi squared [   3 d.f.]      6406.10365
Significance level               .00000
McFadden Pseudo R-squared      .8106816
Estimation based on N =    476, K =  13
Inf.Cr.AIC  =   1533.5 AIC/N =    3.222
Model estimated: Jun 25, 2016, 21:45:35
Sample is  2 pds and    238 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
     PDO|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -3.94663***     1.19085    -3.31  .0009    -6.28066   -1.61241
   LNLEN|     .85564***      .05211    16.39  .0000      .75360     .95768
     VCK|    -.00101**       .00048    -2.13  .0331    -.00196    -.00008
 NOFLDEC|     .38539***      .11545     3.34  .0008     .15912     .61167
RWYNDDEC|    -.02930***      .01022    -2.87  .0041    -.04932    -.00927
VCVFTGRB|    -.00334**       .00131    -2.55  .0107    -.00590    -.00077
 NCVCRAD|    -.00010***   .3950D-04    -2.59  .0095    -.00018    -.00002
        |Means for random parameters
  LNADT|      .67543***      .13327     5.07  .0000      .41423     .93663
 SHWDLT|     -.06501***      .01770    -3.67  .0002    -.09971    -.03032
        |Diagonal elements of Cholesky matrix
  LNADT|      .05208***      .00571     9.12  .0000      .04089     .06327
 SHWDLT|      .15763**       .06574     2.40  .0165      .02877     .28648
        |Below diagonal elements of Cholesky matrix
1SHW_LNA|    -.06275***      .01057    -6.03  .0000    -.08446    -.04303
        |Dispersion parameter for NegBin distribution
ScalParm|    1.40644***      .19915     7.06  .0000     1.01612    1.79677
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
                 LNADT      SHWDLT
--------+--------------------------------------------------------------------
LNADT       .2713E-02
SHWDLT    -.3320E-02   .4156E-02

Implied standard deviations of random parameters

S.D_Beta:            1
--------+--------------
       1|     .0520837
       2|     .0644570

Implied correlation matrix of random parameters

--------+-----------------
Cor.Mat.|   LNADT   SHWDLT
--------+-----------------
   LNADT| 1.00000  -.98897
  SHWDLT| -.98897  1.00000
```

Random Parameter Negative Binomial Model of Possible Injury Crashes on Metropolitan Small Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                   PINJ
Log likelihood function      -476.27871
Restricted log likelihood   -1265.42089
Chi squared [   3 d.f.]      1576.28435
Significance level               .00000
McFadden Pseudo R-squared      .6236203
Estimation based on N =    476, K =  15
Inf.Cr.AIC  =    982.6 AIC/N =    2.064
Model estimated: Jun 25, 2016, 22:44:00
Sample is  2 pds and    238 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
    PINJ|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -7.13223***     1.63043    -4.37  .0000   -10.32781   -3.93664
   LNLEN|     .95800***      .07461    12.84  .0000      .81176    1.10424
NCVFTTYA|    -.00089         .00209     -.42  .6722    -.00499     .00322
 NOFLDEC|     .42283***      .14549     2.55  .0046      .13180     .71386
RWYMDDEC|    -.04114***      .01328    -3.10  .0019    -.06711    -.01517
VCVFTGRB|    -.00585***      .00191    -3.06  .0022    -.00959    -.00210
    DEG1|     .01135         .01536      .74  .4598    -.01875     .04146
NCVDMSEL|     .00362         .00382      .95  .3433    -.00386     .01110
    HCVL|    -.00046**       .00023    -1.98  .0478    -.00090    -.00001
        |Means for random parameters
   LNADT|     .93906***      .17616     5.33  .0000      .59379    1.28434
  SHNDRT|    -.09490***      .02482    -3.82  .0001    -.14355    -.04624
        |Diagonal elements of Cholesky matrix
   LNADT|     .05900***      .00869     6.79  .0000      .04196     .07604
  SHNDRT|     .01983         .01224     1.62  .1053    -.00416     .04383
        |Below diagonal elements of Cholesky matrix
1SHW_LNA|    -.05204***      .01355    -3.84  .0001    -.07861    -.02548
        |Dispersion parameter for NegBin distribution
ScalParm|    1.39237***      .27000     5.16  .0000      .86318    1.92156
--------+--------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
                 LNADT      SHNDRT
--------+--------------------------------------------------------------------
LNADT       .3481E-02
SHNDRT    -.3071E-02   .3102E-02

Implied standard deviations of random parameters

S.D_Beta|            1
--------+--------------
       1|     .0589996
       2|     .0556952

Implied correlation matrix of random parameters

--------+-----------------
Cor.Mat.|   LNADT   SHNDRT
--------+-----------------
   LNADT| 1.00000  -.93444
  SHNDRT| -.93444  1.00000
```

Random Parameter Negative Binomial Model of Evident Injury Crashes on Metropolitan Small Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                   EVI
Log likelihood function      -173.88248
Restricted log likelihood    -221.76137
Chi squared [   3 d.f.]        95.81742
Significance level               .00000
McFadden Pseudo R-squared      .2160979
Estimation based on N =    476, K =  12
Inf.Cr.AIC  =    371.7 AIC/N =     .781
Model estimated: Jun 26, 2016, 15:41:45
Sample is  2 pds and    238 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
     EVI|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -5.46043**      2.72058   -2.01  .0447   -10.79266   -.12820
   LNADT|     .62922**       .28527    2.18  .0281     .06422   1.19422
 VCPARNGA|   -.30741***      .10871   -2.88  .0040    -.51656   -.09827
 TOTLANE|     .37438***      .13230    2.88  .0047     .11604    .63366
RNVNDDEC|    -.05594***      .01900   -2.94  .0032    -.09317   -.01871
    HCVL|    -.00032**       .00016   -2.00  .0457    -.00063   -.00001
        |Means for random parameters
   LNLEN|     .95719***      .11319    8.46  .0000     .73634   1.17804
  SHNDRT|    -.09259***      .03454   -2.68  .0073    -.16028   -.02490
        |Diagonal elements of Cholesky matrix
   LNLEN|     .11608***      .04478    2.59  .0095     .02831    .20386
  SHNDRT|     .03171**       .01483    2.14  .0325     .00265    .06076
        |Below diagonal elements of Cholesky matrix
lSHN_LNL|     .01133         .01023    1.11  .2682    -.00872    .03137
        |Dispersion parameter for NegBin distribution
ScalParm|    1.36966***      .12166    3.06  .0024     .13125    .60806
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
             LNLEN       SHNDRT
--------+--------------------------------------------------------------------
LNLEN      .1348E-01
SHNDRT     .1015E-02   .1194E-02

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|        .116084
       2|       .0336699

Implied correlation matrix of random parameters

--------+-------------------
Cor.Mat.|    LNLEN   SHNDRT
--------+-------------------
   LNLEN| 1.00000    .33638
  SHNDRT|  .33638  1.00000
```

Random Parameter Negative Binomial Model of High Injury Crashes on Metropolitan Small Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                 HIINJ
Log likelihood function      -240.92887
Restricted log likelihood    -358.10932
Chi squared [   3 d.f.]       234.36070
Significance level               .00000
McFadden Pseudo R-squared      .3272186
Estimation based on N =    476, K =  13
Inf.Cr.AIC  =    507.9 AIC/N =    1.067
Model estimated: Jun 26, 2016, 13:55:28
Sample is  2 pds and    238 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
   HIINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -5.18671***     2.00801   -2.58  .0098    -9.12430  -1.24913
   LNADT|     .62729***      .20425    3.07  .0021     .22697   1.02761
 VCPARNGA|   -.18820**       .07633   -2.47  .0137    -.33780   -.03860
 TOTLANE|     .26880**       .10743    2.50  .0123     .05824    .47936
RNVNDDEC|    -.05334***      .01715   -3.11  .0019    -.08695   -.01973
    HCVL|    -.00058**       .00024   -2.41  .0158    -.00105   -.00011
 HCVCRAN|     .00018         .00010    1.96  .0648    -.00008    .00038
        |Means for random parameters
   LNLEN|     .86633***      .07729   11.21  .0000     .71488   1.01753
  SHNDLT|    -.20498**       .09327   -2.20  .0280    -.38780   -.02217
        |Diagonal elements of Cholesky matrix
   LNLEN|     .11943***      .03197    3.74  .0002     .05677    .18208
  SHNDLT|     .03051***      .01188    2.64  .0098     .00782    .05320
        |Below diagonal elements of Cholesky matrix
lSHN_LNL|    -.01435*        .00865   -1.66  .0962    -.03126    .00256
        |Dispersion parameter for NegBin distribution
ScalParm|   1 .57551***      .19692    2.84  .0033     .18258    .96876
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
             LNLEN       SHNDLT
--------+--------------------------------------------------------------------
LNLEN      .1426E-01
SHNDLT    -.1714E-02   .1137E-02

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|        .119426
       2|       .0337155

Implied correlation matrix of random parameters

--------+-------------------
Cor.Mat.|    LNLEN   SHNDLT
--------+-------------------
   LNLEN| 1.00000   -.42563
  SHNDLT| -.42563  1.00000
```

Random Parameter Negative Binomial Model of Just Injury Crashes on Metropolitan Small Urbanized SPF Class Roadway Segments

```
Random Coefficients  NegBnReg Model
Dependent variable                JUSTINJ
Log likelihood function        -201.74188
Restricted log likelihood      -805.81973
Chi squared [    3 d.f.]        408.35570
Significance level                 .00000
McFadden Pseudo R-squared        .4036776
Estimation based on N =    476, K =  13
Inf.Cr.AIC  =    429.5 AIC/N =    1.322
Model estimated: Jun 26, 2016, 14:06:06
Sample is  2 pds and    238 individuals
Negative binomial regression model
```

JUSTINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-5.02226**	2.16659	-2.32	.0204	-9.28870	-.77582
LNADT	.62664***	.23199	2.70	.0069	.17195	1.08134
TOTLANE	.22295**	.11314	1.97	.0488	.00119	.44470
SHNDLT	-.06577*	.03518	-1.97	.0616	-.13472	.00319
RWYNDDEC	-.03226*	.01661	-1.92	.0530	-.06520	.00068
HCVL	-.00058***	.00019	-3.02	.0026	-.00096	-.00020
DEG1	.28463***	.10144	2.81	.0050	.08581	.48346
	Means for random parameters					
LNLEN	.92423***	.10078	9.17	.0000	.72675	1.12171
VCPARMA	-.16571*	.09306	-1.95	.0650	-.34815	.01672
	Diagonal elements of Cholesky matrix					
LNLEN	.15920***	.03666	4.34	.0000	.08738	.23105
VCPARMA	.14695**	.07228	2.03	.0421	.00527	.28862
	Below diagonal elements of Cholesky matrix					
lVCP_LNL	-.05830	.05254	-1.11	.2671	-.16127	.04467
	Dispersion parameter for NegBin distribution					
ScalParm	1.53040***	.45901	3.33	.0009	.63080	2.43025

Note: ***, **, * ==> Significance at 1%, 5%, 10% level.

Implied covariance matrix of random parameters

Covariance matrix

	LNLEN	VCPARMA
LNLEN	.2534E-01	
VCPARMA	-.9291E-02	.2409E-01

Implied standard deviations of random parameters

S.D_Beta	1
1	.159199
2	.155055

Implied correlation matrix of random parameters

Cor.Mat.	LNLEN	VCPARMA
LNLEN	1.00000	-.36879
VCPARMA	-.36879	1.00000

Random Parameter Negative Binomial Model of Low Injury Crashes on Metropolitan Small Urbanized SPF Class Roadway Segments

```
Random Coefficients  NegBnReg Model
Dependent variable                 LOINJ
Log likelihood function        -806.81691
Restricted log likelihood     -4962.44226
Chi squared [    3 d.f.]       8313.24670
Significance level                 .00000
McFadden Pseudo R-squared        .8375150
Estimation based on N =    476, K =  16
Inf.Cr.AIC  =   1641.6 AIC/N =    3.449
Model estimated: Jun 26, 2016, 14:16:48
Sample is  2 pds and    238 individuals
Negative binomial regression model
```

LOINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-4.59122***	1.30015	-3.53	.0004	-7.13947	-2.04297
LNADT	.77706***	.14507	6.36	.0000	.49271	1.06136
VCK2	-.02687**	.01074	-2.50	.0124	-.04793	-.00581
TOTLANE	.23258***	.07272	3.20	.0014	.09005	.37513
SHWDLT	-.06354***	.02009	-3.16	.0016	-.10292	-.02416
RWYMIDDEC	-.02959***	.01066	-2.85	.0050	-.05027	-.00891
HCVL	.00594***	.00185	3.21	.0013	.00231	.00957
VCVFIGRB	-.00356**	.00147	-2.40	.0162	-.00642	-.00065
HCVLIMI	-34.9364***	10.43621	-3.35	.0008	-55.3910	-14.4818
DEG1	.02453**	.01204	2.04	.0416	.00093	.04813
	Means for random parameters					
LNLEN	.91167***	.06064	15.03	.0000	.79282	1.03052
HCVCRAN	-.00013*	.7182D-04	-1.97	.0565	-.00027	.00001
	Diagonal elements of Cholesky matrix					
LNLEN	.11264***	.01729	6.52	.0000	.07877	.14652
HCVCRAN	.79431D-04*	.4247D-04	1.95	.0615	-.38111D-05	.16267D-03
	Below diagonal elements of Cholesky matrix					
lHCV_LNL	.55366D-04**	.2578D-04	2.15	.0318	.48336D-05	.10590D-03
	Dispersion parameter for NegBin distribution					
ScalParm	1.12934***	.14384	7.84	.0000	.84642	1.41026

Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==> Significance at 1%, 5%, 10% level.

Implied covariance matrix of random parameters

Covariance matrix

	LNLEN	HCVCRAN
LNLEN	.1269E-01	
HCVCRAN	.6237E-05	.9375E-08

Implied standard deviations of random parameters

S.D_Beta	1
1	.112653
2	.968233E-04

Implied correlation matrix of random parameters

Cor.Mat.	LNLEN	HCVCRAN
LNLEN	1.00000	.57183
HCVCRAN	.57183	1.00000

Random Parameter Negative Binomial Model of Total Crashes on Small Urbanized Small Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable               TOTALACC
Log likelihood function        -801.69143
Restricted log likelihood     -1708.38127
Chi squared [   3 d.f.]        1813.37928
Significance level                 .00000
McFadden Pseudo R-squared        .5307303
Estimation based on N =    522, K =  14
Inf.Cr.AIC  =   1631.4 AIC/N =    1.985
Model estimated: Jun 27, 2016, 14:37:06
Sample is  2 pds and    411 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                Standard            Prob.      95% Confidence
TOTALACC|  Coefficient     Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -5.83339***    1.45247    -4.02  .0001   -8.68017  -2.98661
   LNADT|     .85390***     .14549     5.87  .0000     .56875   1.13906
 VCFARMA|    -.13204**      .06641    -1.99  .0468    -.26221   -.00187
VCVPTGRA|    -.12867**      .05230    -2.46  .0137    -.23098   -.02636
  VCVLLS|    5.67836*      3.10674     1.83  .0676    -.41076  11.76747
  SMWDRT|    -.05538***     .01787    -3.10  .0019    -.09041   -.02035
RWYWDIMC|    -.01537        .00970    -1.58  .1133    -.03438    .00365
VCVPTGRB|     .12535**      .05246     2.39  .0167     .02272    .22797
        |Means for random parameters
   LNLEN|     .93667***     .07062    13.26  .0000     .79806   1.07455
    HCVL|    -.00056***     .00010    -5.37  .0000    -.00074   -.00035
        |Diagonal elements of Cholesky matrix
   LNLEN|     .16762***     .01908     8.79  .0000     .13023    .20501
    HCVL|     .00019**     .8193D-04    2.28  .0226     .00003    .00035
        |Below diagonal elements of Cholesky matrix
lHCV_LNL|     .00014*      .7065D-04    1.94  .0522     .00000    .00028
        |Dispersion parameter for NegBin distribution
ScalParm|     .72543***     .09163     7.92  .0000     .54585    .90501
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
              LNLEN         HCVL
--------+--------------------------------------------------------------------
LNLEN       .2810E-01
HCVL        .2901E-04    .5374E-07

Implied standard deviations of random parameters

S.D_Beta|             1
--------+--------------
       1|       .167621
       2|   .231817E-03

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|   LNLEN      HCVL
--------+------------------
   LNLEN| 1.00000    .59210
    HCVL|  .59210   1.00000
```

Random Parameter Negative Binomial Model of Property Damage Only Crashes on Small Urbanized Small Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                    PDO
Log likelihood function        -653.47941
Restricted log likelihood     -1076.80436
Chi squared [   3 d.f.]         842.25780
Significance level                 .00000
McFadden Pseudo R-squared        .3910914
Estimation based on N =    522, K =  14
Inf.Cr.AIC  =   1339.4 AIC/N =    1.428
Model estimated: Jun 28, 2016, 15:11:38
Sample is  2 pds and    411 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                Standard            Prob.      95% Confidence
     PDO|  Coefficient     Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -5.03078***    1.50535    -3.34  .0008   -7.98121  -2.08034
   LNADT|     .72067***     .14427     5.00  .0000     .43790   1.00344
 VCFARMA|    -.13907**      .06877    -2.02  .0431    -.27385   -.00428
HCVPTCVA|     .00033**      .00013     2.54  .0112     .00007    .00058
    DEG1|    -.09416***     .03497    -2.69  .0071    -.16269   -.02563
  SMWDRT|    -.04607***     .01727    -2.67  .0077    -.07992   -.01221
VCVPTGRA|    -.13302**      .05377    -2.47  .0134    -.23842   -.02763
VCVPTGRB|     .13126**      .05359     2.45  .0143     .02623    .23629
        |Means for random parameters
   LNLEN|     .87629***     .07159    12.24  .0000     .73597   1.01661
    HCVL|    -.00061***     .00017    -3.53  .0004    -.00095   -.00027
        |Diagonal elements of Cholesky matrix
   LNLEN|     .15535***     .02115     7.34  .0000     .11388    .19481
    HCVL|     .00021**     .8824D-04    2.38  .0173     .00004    .00038
        |Below diagonal elements of Cholesky matrix
lHCV_LNL|     .00018**     .7121D-04    2.51  .0121     .00004    .00032
        |Dispersion parameter for NegBin distribution
ScalParm|     .78863***     .13286     5.94  .0000     .52823   1.04903
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
              LNLEN         HCVL
--------+--------------------------------------------------------------------
LNLEN       .2413E-01
HCVL        .2774E-04    .7610E-07

Implied standard deviations of random parameters

S.D_Beta|             1
--------+--------------
       1|       .155349
       2|   .275856E-03

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|   LNLEN      HCVL
--------+------------------
   LNLEN| 1.00000    .64772
    HCVL|  .64772   1.00000
```

Random Parameter Negative Binomial Model of Possible Injury Crashes on Small Urbanized Small Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                 PINJ
Log likelihood function      -372.40271
Restricted log likelihood    -499.02851
Chi squared [   3 d.f.]       253.25160
Significance level               .00000
McFadden Pseudo R-squared      .2537446
Estimation based on N =    822, K =  13
Inf.Cr.AIC  =    770.8 AIC/N =     .938
Model estimated: Jun 29, 2016, 15:25:36
Sample is  2 pds and    411 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
    PINJ|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -6.08785***     2.25296    -2.67  .0077   -10.56212  -1.61357
   LNADT|     .77356***      .21665     3.57  .0004      .34989   1.19760
 VCPARMA|    -.83455***      .30481    -2.74  .0062    -1.43197   -.23713
  VCVL12|    9.36559**      4.23210     2.21  .0269     1.07058  17.66035
    MCVL|    -.00078***      .00015    -5.06  .0000     -.00108   -.00048
  SHNDRT|    -.05373**       .02675    -2.01  .0449     -.10622   -.00123
VCVPTGRB|     .71066***      .27395     2.59  .0095      .17365   1.24767
        |Means for random parameters
   LNLEN|     .94039***      .09809     9.59  .0000      .74814   1.13264
VCVPTGRA|    -.70655***      .27314    -2.59  .0097    -1.24193   -.17124
        |Diagonal elements of Cholesky matrix
   LNLEN|     .10042***      .03330     3.02  .0026      .03515    .16569
VCVPTGRA|     .00296*        .00156     1.90  .0580     -.00010    .00602
        |Below diagonal elements of Cholesky matrix
lVCV_LNL|     .00241*        .00139     1.73  .0835     -.00032    .00514
        |Dispersion parameter for NegBin distribution
ScalParm|     .96920***      .27981     3.34  .0004      .44079   1.50762
--------+--------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
              LNLEN    VCVPTGRA
--------+--------------------------------------------------------------------
LNLEN     .1008E-01
VCVPTGRA  .2421E-03   .1458E-04

Implied standard deviations of random parameters

S.D_Beta|            1
--------+--------------
       1|       .100424
       2|     .00381816

Implied correlation matrix of random parameters

--------+----------------
Cor.Mat.|   LNLEN VCVPTGRA
--------+----------------
   LNLEN| 1.00000   .63136
VCVPTGRA|  .63134  1.00000
```

Random Parameter Negative Binomial Model of Evident Injury Crashes on Small Urbanized Small Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                  EVI
Log likelihood function      -149.41820
Restricted log likelihood    -150.80460
Chi squared [   1 d.f.]         2.77280
Significance level               .09588
McFadden Pseudo R-squared      .0091934
Estimation based on N =    822, K =   7
Inf.Cr.AIC  =    312.8 AIC/N =     .381
Model estimated: Jun 28, 2016, 16:48:42
Sample is  2 pds and    411 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
     EVI|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -5.64975**      2.43373    -2.32  .0203   -10.41977   -.87972
   LNLEN|     .94196***      .14320     6.58  .0000      .66130   1.22262
  SHNDRT|    -.00035**       .00017    -2.06  .0391     -.00068   -.00002
    MCVL|    -.00035**       .00018    -1.97  .0482     -.00070    .00000
        |Means for random parameters
   LNADT|     .55703**       .23231     2.40  .0165      .10171   1.01235
        |Scale parameters for dists. of random parameters
   LNADT|     .55705***      .21574     2.58  .0098      .13421    .97989
        |Dispersion parameter for NegBin distribution
ScalParm|    5.55227**      2.20076     2.54  .0112    -8.88568  -1.26886
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

Random Parameter Negative Binomial Model of High Injury Crashes on Small Urbanized Small Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable               HIINJ
Log likelihood function     -215.49593
Restricted log likelihood   -243.11622
Chi squared [   3 d.f.]       55.23546
Significance level              .00000
McFadden Pseudo R-squared     .1135959
Estimation based on N =    822, K =  13
Inf.Cr.AIC  =    457.0 AIC/N =    .556
Model estimated: Jun 28, 2016, 19:02:18
Sample is  2 pds and    411 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
   HIINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|    -6.14507**     2.71236    -2.27  .0235  -11.46123   -.82880
   LNADT|     .78076***      .25515     2.95  .0032     .25476   1.26678
 VCPARMA|    -.25858         .16424    -1.56  .0646    -.58083    .06252
  SHNDRT|    -.04646         .03671    -1.97  .0566    -.11941    .02549
    HCVL|    -.00097***      .00024    -4.09  .0000    -.00143   -.00050
VCVPTGRB|     .23571*        .12687     1.86  .0626    -.01237    .48379
MCVBMXSEL|    .01164***      .00349     3.33  .0009     .00479    .01549
        |Means for random parameters
   LNLEN|     .94772***      .14041     6.75  .0000     .67263   1.22282
VCVPTGRA|    -.23068*        .12429    -1.93  .0672    -.47818    .01684
        |Diagonal elements of Cholesky matrix
   LNLEN|     .10036**       .04505     2.23  .0260     .01159    .18872
VCVPTGRA|     .00434*        .00231     1.96  .0601    -.00018    .00887
        |Below diagonal elements of Cholesky matrix
lVCV_LNL|     .00944***      .00188     5.02  .0000     .00575    .01312
        |Dispersion parameter for NegBin distribution
ScalParm|    1.75705        1.37482     1.28  .2012    -.93752   4.45163
--------+--------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
              LNLEN    VCVPTGRA
--------+--------------------------------------------------------------------
LNLEN      .1007E-01
VCVPTGRA   .9469E-03   .1079E-03

Implied standard deviations of random parameters

S.D_Beta|             1
--------+--------------
       1|       .100356
       2|       .0103875

Implied correlation matrix of random parameters

--------+-----------------
Cor.Mat.|   LNLEN VCVPTGRA
--------+-----------------
   LNLEN| 1.00000   .90535
VCVPTGRA|  .90535  1.00000
```

Random Parameter Negative Binomial Model of Just Injury Crashes on Small Urbanized Small Urbanized SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable              JUSTINJ
Log likelihood function     -216.35634
Restricted log likelihood   -230.20969
Chi squared [   3 d.f.]       27.70251
Significance level              .00000
McFadden Pseudo R-squared     .0601680
Estimation based on N =    822, K =  11
Inf.Cr.AIC  =    454.7 AIC/N =    .553
Model estimated: Jun 28, 2016, 19:36:09
Sample is  2 pds and    411 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
 JUSTINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|    -7.25504***    2.68690    -2.70  .0069  -12.52126  -1.98882
   LNLEN|     .82305***      .11587     7.10  .0000     .59576   1.05035
 NOFLDEC|     .61243**       .29014     2.11  .0348     .04377   1.18110
  SHWDRT|    -.06107**       .03006    -2.03  .0421    -.11996   -.00218
  VCVL12|    5.92127        4.30446     1.38  .0689   -2.61532  14.35786
        |Means for random parameters
   LNADT|     .59426**       .27627     2.15  .0315     .05259   1.13592
MCVMXSEL|    -.01472***      .00399    -3.69  .0002    -.02255   -.00689
        |Diagonal elements of Cholesky matrix
   LNADT|     .04640**       .02338     1.98  .0472     .00058    .09223
MCVMXSEL|     .00253*        .00145     1.96  .05611    -.00031    .00537
        |Below diagonal elements of Cholesky matrix
lMCV_LNA|    -.00305         .00284    -1.07  .2825    -.00863    .00252
        |Dispersion parameter for NegBin distribution
ScalParm|    2.77785        3.25927     2.83  .0041   -3.61019   9.16590
--------+--------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
              LNADT    MCVMXSEL
--------+--------------------------------------------------------------------
LNADT      .2153E-02
MCVMXSEL  -.1417E-03   .1571E-04

Implied standard deviations of random parameters

S.D_Beta|             1
--------+--------------
       1|       .0464043
       2|       .00396382

Implied correlation matrix of random parameters

--------+-----------------
Cor.Mat.|   LNADT MCVMXSEL
--------+-----------------
   LNADT| 1.00000  -.77027
MCVMXSEL| -.77027  1.00000
```

Random Parameter Negative Binomial Model of Low Injury Crashes on Small Urbanized Small Urbanized SPF Class Roadway Segments

```
Random Coefficients  NegBnReg Model
Dependent variable                  LOINJ
Log likelihood function        -716.31448
Restricted log likelihood     -1315.88937
Chi squared [   3 d.f.]        1198.94179
Significance level                 .00000
McFadden Pseudo R-squared        .4555165
Estimation based on N =    822, K =  13
Inf.Cr.AIC  =   1458.6 AIC/N =    1.774
Model estimated: Jun 28, 2016, 18:47:30
Sample is  2 pds and    411 individuals
Negative binomial regression model
```

LOINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-5.54916***	1.47611	-3.76	.0002	-8.44228	-2.65604
LNLEN	.83752***	.07041	11.90	.0000	.69952	.97592
SMNDRT	-.05199***	.01750	-2.97	.0030	-.08628	-.01769
DEGL	-.05870***	.01854	-3.17	.0015	-.09503	-.02236
VCVPTGRA	-.14164**	.05929	-2.39	.0169	-.25784	-.02544
VCVPTGRB	.13973**	.05917	2.36	.0182	.02376	.25569
HCVL	-.00055***	.00011	-5.02	.0000	-.00076	-.00033
	Means for random parameters					
LNADT	.75614***	.14055	5.38	.0000	.48107	1.03121
VCPARMA	-.15687**	.07446	-2.11	.0352	-.30284	-.01090
	Diagonal elements of Cholesky matrix					
LNADT	.03958***	.00646	6.12	.0000	.02691	.05225
VCPARMA	.10553***	.04159	2.63	.0085	.02600	.18105
	Below diagonal elements of Cholesky matrix					
lVCP_LNA	.05342	.04205	1.27	.2040	-.02900	.13583
	Dispersion parameter for NegBin distribution					
ScalParm	.62503***	.05182	8.55	.0000	.44565	.80761

Note: ***, **, * ==> Significance at 1%, 5%, 10% level.

Implied covariance matrix of random parameters

Covariance matrix

	LNADT	VCPARMA
LNADT	.1567E-02	
VCPARMA	.2115E-02	.1488E-01

Implied standard deviations of random parameters

S.D_Beta	1
1	.0395822
2	.121861

Implied correlation matrix of random parameters

Cor.Mat.	LNADT	VCPARMA
LNADT	1.00000	.43840
VCPARMA	.43840	1.00000

Random Parameter Negative Binomial Model of Total Crashes on Metropolitan Metropolitan SPF Class Roadway Segments

```
Random Coefficients  NegBnReg Model
Dependent variable               TOTALACC
Log likelihood function        -738.49970
Restricted log likelihood    -10724.54732
Chi squared [   3 d.f.]       19972.10725
Significance level                 .00000
McFadden Pseudo R-squared        .9311399
Estimation based on N =    426, K =  12
Inf.Cr.AIC  =   1501.0 AIC/N =    3.523
Model estimated: Jun 27, 2016, 00:07:48
Sample is  2 pds and    213 individuals
Negative binomial regression model
```

TOTALACC	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-7.69094***	.79849	-9.63	.0000	-9.25595	-6.12592
HCVR	.69472D-04**	.33400D-04	2.08	.0375	.40157D-05	.13493D-03
HCVPTTYA	-.00289***	.00108	-2.67	.0077	-.00502	-.00077
RWYWIDEC	-.00945	.00577	-1.64	.0617	-.02077	.00187
SHNDLTCR	.19786**	.10004	1.98	.0478	.00179	.39393
SHNDRTCR	-.09310*	.05021	-1.85	.0637	-.19152	.00531
	Means for random parameters					
LNADT	1.03384***	.07429	13.92	.0000	.88434	1.18334
LNLEN	.92833***	.04396	21.12	.0000	.84218	1.01449
	Diagonal elements of Cholesky matrix					
LNADT	.01148	.00706	1.62	.0751	-.00240	.02536
LNLEN	.05064***	.01715	2.95	.0032	.01702	.08426
	Below diagonal elements of Cholesky matrix					
lLNL_LNA	.12061***	.02481	4.86	.0000	.07199	.16924
	Dispersion parameter for NegBin distribution					
ScalParm	2.98024***	.42406	7.03	.0000	2.14910	3.81139

Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==> Significance at 1%, 5%, 10% level.

Implied covariance matrix of random parameters

Covariance matrix

	LNADT	LNLEN
LNADT	.1318E-03	
LNLEN	.1385E-02	.1711E-01

Implied standard deviations of random parameters

S.D_Beta	1
1	.0114800
2	.130815

Implied correlation matrix of random parameters

Cor.Mat.	LNADT	LNLEN
LNADT	1.00000	.92202
LNLEN	.92202	1.00000

Random Parameter Negative Binomial Model of Property Damage Only Crashes on Metropolitan Metropolitan SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                 PDO
Log likelihood function     -622.74296
Restricted log likelihood  -6618.81281
Chi squared [   3 d.f.]    11991.93881
Significance level              .00000
McFadden Pseudo R-squared     .9059089
Estimation based on N =    426, K =  12
Inf.Cr.AIC  =   1269.5 AIC/N =   2.980
Model estimated: Jun 27, 2016, 00:11:46
Sample is  2 pds and    213 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
     PDO|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -7.18534***     1.17348    -6.13  .0000    -9.48571  -4.88488
RWYWDDEC|    -.00875         .00705    -1.24  .0645    -.02257    .00507
SHNDLTCR|     .22539**       .09814     2.30  .0216     .03304    .41773
SHNDRTCR|    -.10037**       .05014    -2.00  .0453    -.19864   -.00209
 VCVEVCA|     .00218***      .00081     2.70  .0069     .00060    .00376
    VCVL|    -.00070**       .00033    -2.14  .0322    -.00134   -.00006
        |Means for random parameters
   LNADT|     .99435***      .10944     9.09  .0000     .77958   1.20683
   LNLEN|     .97224***      .04552    21.36  .0000     .88303   1.06145
        |Diagonal elements of Cholesky matrix
   LNADT|     .23592**       .09918     2.38  .0174     .04153    .43031
   LNLEN|     .04133**       .01973     2.09  .0362     .00266    .08001
        |Below diagonal elements of Cholesky matrix
ILNL_LNA|     .07758***      .02594     2.99  .0028     .02679    .12842
        |Dispersion parameter for NegBin distribution
ScalParm|    3.58190***      .57947     6.18  .0000    2.44616   4.71765
--------+--------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
              LNADT        LNLEN
--------+--------------------------------------------------------------------
LNADT     .6653E-04
LNLEN     .6342E-03   .7727E-02

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|     .00817656
       2|      .0879045

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|   LNADT    LNLEN
--------+------------------
   LNADT| 1.00000   .88256
   LNLEN|  .88256  1.00000
```

Random Parameter Negative Binomial Model of Possible Injury Crashes on Metropolitan Metropolitan SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                PINJ
Log likelihood function     -410.74201
Restricted log likelihood  -2069.84644
Chi squared [   3 d.f.]     3318.20887
Significance level              .00000
McFadden Pseudo R-squared     .8015592
Estimation based on N =    426, K =  11
Inf.Cr.AIC  =    843.5 AIC/N =   1.980
Model estimated: Jun 27, 2016, 00:18:28
Sample is  2 pds and    213 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
    PINJ|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -8.23416***     1.21421    -6.78  .0000   -10.61387  -5.85455
SHNULTCR|     .08386*        .04546     1.84  .0651    -.00524    .17296
 VCVEVCA|     .00135*        .00070     1.92  .0548    -.00003    .00273
    HCVR|     .00217**       .00103     2.11  .0350     .00015    .00419
MCVDDLSEL|   -.08895**       .04261    -2.09  .0368    -.17247   -.00543
        |Means for random parameters
   LNADT|     .94022***      .10594     8.88  .0000     .73259   1.14786
   LNLEN|    1.02771***      .05432    18.92  .0000     .92123   1.13418
        |Diagonal elements of Cholesky matrix
   LNADT|     .01018         .00644     1.58  .0735    -.00244    .02280
   LNLEN|     .00199**       .00078     2.56  .0104     .00047    .00352
        |Below diagonal elements of Cholesky matrix
ILNL_LNA|     .16505***      .03486     4.74  .0000     .09674    .23337
        |Dispersion parameter for NegBin distribution
ScalParm|    5.48522***     1.81829     3.02  .0026    1.92143   9.04901
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
              LNADT        LNLEN
--------+--------------------------------------------------------------------
LNADT     .1037E-03
LNLEN     .1681E-02   .2920E-01

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|      .0101827
       2|       .170869

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|   LNADT    LNLEN
--------+------------------
   LNADT| 1.00000   .96587
   LNLEN|  .96587  1.00000
```

Random Parameter Negative Binomial Model of Total Crashes on Two lane SPF Class Roadway Segments

```
--------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable               TOTALACC
Log likelihood function      -35082.17489
Restricted log likelihood    -48526.43221
Chi squared [   8 d.f.]       26885.63065
Significance level                 .00000
McFadden Pseudo R-squared        .2965153
Estimation based on N = 144136, K =  19
Inf.Cr.AIC  =  70142.4 AIC/N =     .487
Model estimated: May 25, 2016, 17:03:01
Sample is  2 pds and  72069 individuals
Negative binomial regression model
--------+-----------------------------------------------------------------
        |                 Standard            Prob.      95% Confidence
TOTALACC|  Coefficient      Error        z    |z|>Z*        Interval
--------+-----------------------------------------------------------------
        |Nonrandom parameters
Constant|   -8.58940***     .09029   -95.13  .0000    -8.76636  -8.41245
    DEG1|     .00289***     .00085     3.40  .0007      .00122    .00455
 VCVLIMI|   -1.17876***     .17724    -6.65  .0000    -1.52615   -.83138
  SHWDCR|    -.13020***     .02160    -6.03  .0000    -.17253    -.08787
 VCPARMA|     .03220***     .00724     4.45  .0000      .01801    .04640
 HCVLIMI|   -1.36952***     .09004   -15.21  .0000    -1.54598  -1.19305
  RHWDRT|    -.02568***     .00347    -7.40  .0000    -.03248    -.01887
 HCVCRAN| .84982D-04***  .4764D-05    18.26  .0000  .77644D-04 .96320D-04
VCVPTGRA|     .00054**      .00025     2.21  .0265      .00006    .00103
        |Means for random parameters
   LNADT|    1.05939***     .01104    95.93  .0000     1.03674   1.08004
RWYWDINC|     .03370***     .00257    13.13  .0000      .02867    .03873
   LNLEN|     .94097***     .00856   109.68  .0000      .92416    .95779
        |Diagonal elements of Cholesky matrix
   LNADT|     .01497***     .00473     3.17  .0015      .00570    .02424
RWYWDINC|     .00326**      .00166     1.97  .0464      .00002    .00649
   LNLEN|     .01600***     .00305     5.24  .0000      .01001    .02198
        |Below diagonal elements of Cholesky matrix
1RWY_LNA|     .00067        .00292      .23  .8199     -.00506    .00639
1LNL_LNA|     .10100***     .00952    10.61  .0000      .08234    .11966
1LNL_RWY|     .06679***     .00712     9.38  .0000      .05283    .08075
        |Dispersion parameter for NegBin distribution
ScalParm|     .76032***     .01987    38.27  .0000      .72138    .79926
--------+-----------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------
                  LNADT     RWYWDINC        LNLEN
--------+--------------------------------------------------------------
LNADT      .2242E-03
RWYWDINC   .9959E-05    .1104E-04
LNLEN      .1512E-02    .2546E-03    .1492E-01

Implied standard deviations of random parameters

S.D_Beta|            1
--------+-------------
       1|     .0149722
       2|    .00332295
       3|      .122137

Implied correlation matrix of random parameters

--------+----------------------------
Cor.Mat.|    LNADT RWYWDINC     LNLEN
--------+----------------------------
   LNADT| 1.00000    .20018    .82692
RWYWDINC|  .20018  1.00000    .70132
   LNLEN|  .82692    .70132  1.00000
```

Random Parameter Negative Binomial Model of Property Damage Only Crashes on Two lane SPF Class Roadway Segments

```
--------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                    PDO
Log likelihood function      -25467.53531
Restricted log likelihood    -33238.61876
Chi squared [   3 d.f.]       15541.96093
Significance level                 .00000
McFadden Pseudo R-squared        .2337944
Estimation based on N = 144136, K =  16
Inf.Cr.AIC  =  50967.1 AIC/N =     .354
Model estimated: May 26, 2016, 12:17:14
Sample is  2 pds and  72069 individuals
Negative binomial regression model
--------+-----------------------------------------------------------------
        |                 Standard            Prob.      95% Confidence
     PDO|  Coefficient      Error        z    |z|>Z*        Interval
--------+-----------------------------------------------------------------
        |Nonrandom parameters
Constant|   -9.21762***     .11126   -82.85  .0000    -9.43568  -8.99957
   LNLEN|     .90136***     .00869   103.68  .0000      .88432    .91840
    DEG1|     .00287***     .00093     3.07  .0022      .00103    .00470
   VCVL1|    -.77840***     .19706    -3.95  .0001    -1.16466   -.39214
  SHWDCR|    -.13093***     .02397    -5.46  .0000    -.17711    -.08354
 HCVLIMI|   -1.29280***     .11863   -10.90  .0000    -1.52535  -1.06025
  SHWDRT|    -.02084***     .00410    -5.08  .0000    -.02888    -.01281
RWYWDINC|     .04197***     .00255    16.44  .0000      .03697    .04696
VCVPTGRA|     .00118***     .00028     4.18  .0000      .00062    .00173
 HCVCRAN| .77526D-04***  .5730D-05    13.53  .0000  .66295D-04 .88756D-04
        |Means for random parameters
   LNADT|    1.06373***     .01352    78.66  .0000     1.03722   1.09023
     VCH|    -.74592***     .21239    -3.55  .0004    -1.16820   -.33265
        |Diagonal elements of Cholesky matrix
   LNADT|     .02415***     .00111    21.83  .0000      .02198    .02632
     VCH|     .36473**      .18070     2.02  .0435      .01057    .71890
        |Below diagonal elements of Cholesky matrix
1VCH_LNA|    -.35305***     .12385    -2.85  .0044     -.59579   -.11032
        |Dispersion parameter for NegBin distribution
ScalParm|     .77700***     .02710    28.67  .0000      .72388    .83011
--------+-----------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------
                  LNADT         VCH
--------+--------------------------------------------------------------
LNADT      .5831E-03
VCH       -.8528E-02        .2577

Implied standard deviations of random parameters

S.D_Beta|            1
--------+-------------
       1|     .0241482
       2|      .507614

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|    LNADT      VCH
--------+------------------
   LNADT| 1.00000   -.69550
     VCH| -.69550   1.00000
```

Random Parameter Negative Binomial Model of Possible Injury Crashes on Two lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                  PINJ
Log likelihood function     -10577.44039
Restricted log likelihood   -11978.94243
Chi squared [   5 d.f.]      2802.00407
Significance level               .00000
McFadden Pseudo R-squared      .1169871
Estimation based on N = 144138, K =  16
Inf.Cr.AIC  =  21186.9 AIC/N =     .147
Model estimated: May 26, 2016, 16:55:46
Sample is  2 pds and  72069 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
    PINJ|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -12.4684***      .20940   -59.54  .0000    -12.8789  -12.0580
   LNADT|   1.30924***       .02464    53.14  .0000     1.26095   1.35752
 VCVL1MI|   -.04189***       .01485    -2.82  .0048     -.07099   -.01278
 VCFARMA|    .04060***       .01421     2.86  .0043      .01276    .06844
 HCVL1MI|  -12.3229***      2.97706    -4.14  .0000    -18.1578   -6.4880
  SHWDRT|   -.03039***       .00719    -4.22  .0000     -.04461   -.01424
RNFVMDINC|   .03938***       .00482     8.17  .0000      .02994    .04883
HCVCRAN| .54584D-04***    .1207D-04     4.52  .0000  .30936D-04 .78232D-04
    HCVL|    .00203***       .00056     3.63  .0003      .00094    .00313
    HCVR|-.21914D-04**    .10650D-04   -1.96  .0495 -.42588D-04 -.43520D-07
        |Means for random parameters
   LNLEN|    .90304***       .01529    59.06  .0000      .87307    .93300
  SHNDCR|   -.34778***       .06985    -4.98  .0000     -.48468   -.21088
        |Diagonal elements of Cholesky matrix
   LNLEN|    .10299***       .00570    18.07  .0000      .09182    .11417
  SHNDCR|    .14017**        .06876     2.04  .0415      .00541    .27494
        |Below diagonal elements of Cholesky matrix
lSHW_LNL|    -.61805*        .32111    -1.92  .0543    -1.24741    .01132
        |Dispersion parameter for NegBin distribution
ScalParm|    .52511***       .03581    14.62  .0000      .45472    .59549
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+------------------------------------------------
               LNLEN       SHNDCR
--------+------------------------------------------------
LNLEN       .1061E-01
SHNDCR      .3465E-02   .2078E-01

Implied standard deviations of random parameters

S.D_Beta|             1
--------+--------------
       1|       .102994
       2|       .144154

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|   LNLEN   SHNDCR
--------+------------------
   LNLEN| 1.00000   .23339
  SHNDCR|  .23339  1.00000
```

Random Parameter Negative Binomial Model of Evident Injury Crashes on Two lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                   EVI
Log likelihood function      -8418.40258
Restricted log likelihood    -8873.07270
Chi squared [   3 d.f.]       909.34028
Significance level               .00000
McFadden Pseudo R-squared      .0512416
Estimation based on N = 144138, K =  13
Inf.Cr.AIC  =  16862.8 AIC/N =     .117
Model estimated: May 27, 2016, 13:28:11
Sample is  2 pds and  72069 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
     EVI|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -8.01749***      .19401   -41.33  .0000    -8.39774  -7.63724
   LNLEN|    .90815***       .01623    56.03  .0000      .87641    .93988
    DEG1|    .00544***       .00188     2.89  .0038      .00176    .00912
  SHWDCR|   -.09878**        .04176    -2.37  .0180     -.18062   -.01693
 HCVL1MI|  -1.36650***       .16511    -8.28  .0000    -1.69012  -1.04289
  SHWDRT|   -.03827***       .00800    -4.78  .0000     -.05395   -.02259
 HCVCRAN| .89763D-04***    .1129D-04     7.95  .0000  .67636D-04 .11189D-03
        |Means for random parameters
   LNADT|    .80442***       .02362    34.05  .0000      .75812    .85072
     VCK|   -.69066**        .33204    -2.08  .0375    -1.34145   -.03987
        |Diagonal elements of Cholesky matrix
   LNADT|    .01228***       .00211     5.79  .0000      .00809    .01647
     VCK|    .87289***       .29827     2.93  .0034      .28829   1.45700
        |Below diagonal elements of Cholesky matrix
lVCK_LNA|   -.09831**        .04185    -2.35  .0188     -.18033   -.01628
        |Dispersion parameter for NegBin distribution
ScalParm|    .83002***       .10313     8.05  .0000      .62788   1.03216
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------
               LNADT           VCK
--------+--------------------------------------------------------------
LNADT       .1495E-03
VCK        -.5068E-03        .7637

Implied standard deviations of random parameters

S.D_Beta|             1
--------+--------------
       1|      .0122279
       2|       .873877

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|   LNADT      VCK
--------+------------------
   LNADT| 1.00000  -.04743
     VCK| -.04743  1.00000
```

Random Parameter Negative Binomial Model of Serious Injury Crashes on Two lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                SINJ
Log likelihood function    -2733.35471
Restricted log likelihood  -2801.43566
Chi squared [   1 d.f.]      136.16789
Significance level              .00000
McFadden Pseudo R-squared     .0243032
Estimation based on N = 144138, K =   8
Inf.Cr.AIC  =   5486.7 AIC/N =    .038
Model estimated: May 28, 2016, 20:49:51
Sample is  2 pds and  72069 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
    SINJ|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -8.49307***     .39673   -21.41  .0000    -9.27068  -7.71549
   LNADT|     .66583***     .04705    14.16  .0000      .57365    .75800
   LNLEN|     .81638***     .02491    33.34  .0000      .76364    .86913
    DEGL|     .00597        .00423     1.91  .0881     -.00232    .01425
 MCVLIMI|   -2.04531***     .52595    -3.87  .0001    -3.08200  -1.00863
 MCVCRAN|     .00016***   .2023D-04    8.70  .0000      .00010    .00018
        |Means for random parameters
  SHNDLT|    -.05112***     .01747    -2.93  .0034     -.08535   -.01689
        |Scale parameters for dists. of random parameters
  SHNDLT|     .01964**      .00895     2.19  .0283      .00209    .03719
        |Dispersion parameter for NegBin distribution
ScalParm|     .34522***     .11476     3.01  .0026      .12028    .57014
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

Random Parameter Negative Binomial Model of Fatal Injury Crashes on Two lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable               FATAL
Log likelihood function    -1015.96171
Restricted log likelihood  -1022.44544
Chi squared [   1 d.f.]       12.96746
Significance level              .00032
McFadden Pseudo R-squared     .0063414
Estimation based on N = 144138, K =   8
Inf.Cr.AIC  =   2047.9 AIC/N =    .014
Model estimated: May 27, 2016, 15:41:20
Sample is  2 pds and  72069 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
   FATAL|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -8.39934***     .88837    -9.45  .0000   -10.14053  -6.65816
   LNLEN|     .91964***     .05130    17.93  .0000      .81910   1.02019
SHNDLTCR|     .15752        .11274     1.90  .0323     -.06344    .37848
RWYWDINC|    -.11508**      .05171    -2.22  .0261     -.21635   -.01370
 MCVCRAN| .87014D-04***   .3385D-04    2.59  .0095  .21248D-04  .15278D-03
        |Means for random parameters
   LNADT|     .66786***     .08898     7.51  .0000      .49346    .84225
        |Scale parameters for dists. of random parameters
   LNADT|     .05004***     .00965     5.19  .0000      .03113    .06895
        |Dispersion parameter for NegBin distribution
ScalParm|     .05690**      .02460     2.31  .0207      .00868    .10512
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

Random Parameter Negative Binomial Model of Unknown Injury Crashes on Two lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable              UNKNOWN
Log likelihood function     -1539.23043
Restricted log likelihood   -1569.42556
Chi squared [    3 d.f.]       60.39025
Significance level               .00000
McFadden Pseudo R-squared      .0192421
Estimation based on N = 144136, K =  10
Inf.Cr.AIC  =   3098.5 AIC/N =     .021
Model estimated: May 29, 2016, 18:11:54
Sample is  2 pds and  72069 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
 UNKNOWN|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -9.71618***      .54722  -17.76  .0000   -10.79071  -8.64566
  BRNDLT|    -.09522***      .02411   -3.95  .0001    -.14247   -.04797
 HCVLIMI|  -1.67594**        .73482   -2.28  .0226   -3.11615   -.23573
 HCVCRAH|    .00011***    .2920D-04    3.78  .0002     .00005    .00017
        |Means for random parameters
   LNADT|    .79652***       .06078   12.11  .0000     .66767    .92547
   LNLEN|    .95188***       .04105   23.19  .0000     .87143   1.03233
        |Diagonal elements of Cholesky matrix
   LNADT|    .01746**        .00874    2.00  .0458     .00033    .03460
   LNLEN|    .07460***       .02496    2.99  .0028     .02567    .12353
        |Below diagonal elements of Cholesky matrix
 lLNL_LNA|    .04808*        .02808    1.43  .0983    -.00692    .10308
        |Dispersion parameter for NegBin distribution
ScalParm|    .44541**        .19144    2.33  .0200     .07019    .82063
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------
               LNADT       LNLEN
--------+--------------------------------------------------------------
LNADT       .3050E-03
LNLEN       .6394E-03   .7876E-02

Implied standard deviations of random parameters

S.D_Beta|             1
--------+--------------
       1|      .0174650
       2|      .0887491

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|   LNADT    LNLEN
--------+------------------
   LNADT| 1.00000   .54176
   LNLEN|  .54176  1.00000
```

Random Parameter Negative Binomial Model of High Injury Crashes on Two lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                HIINJ
Log likelihood function    -10762.53848
Restricted log likelihood  -11484.72523
Chi squared [    3 d.f.]     1444.37350
Significance level               .00000
McFadden Pseudo R-squared      .0628824
Estimation based on N = 144136, K =  14
Inf.Cr.AIC  =  21553.1 AIC/N =     .150
Model estimated: May 30, 2016, 17:25:35
Sample is  2 pds and  72069 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
   HIINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -6.70781***      .17643  -38.02  .0000   -7.05361   -6.36201
   LNLEN|    .88311***       .01267   69.72  .0000     .85828    .90793
    DEG1|    .00375*         .00213    1.96  .0550    -.00045    .00795
HCVHOUREL|   .00315***       .00056    5.63  .0000     .00204    .00425
  BRNDCR|   -.09514**        .03920   -2.43  .0152    -.17196   -.01832
  BRNDRT|   -.03604***       .00757   -4.76  .0000    -.05088   -.02120
RWYWDINC|   -.01443***       .00655   -2.88  .0098    -.02901   -.00355
    HCVR|-.28235D-04***   .7883D-05   -3.58  .0003 -.43685D-04  -.12790D-04
        |Means for random parameters
   LNADT|    .72687***       .02173   33.55  .0000     .68401    .77112
 HCVLIMI|   -.63655***       .18193   -3.52  .0008   -1.01205   -.26071
        |Diagonal elements of Cholesky matrix
   LNADT|    .02038***       .00200   10.17  .0000     .01646    .02431
 HCVLIMI|    .39921**        .15586    2.56  .0104     .09373    .70469
        |Below diagonal elements of Cholesky matrix
 lHCV_LNA|   -.56057***       .11831   -4.77  .0000    -.79288   -.33208
        |Dispersion parameter for NegBin distribution
ScalParm|   1.00572***       .11405    8.82  .0000     .78218   1.22926
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------
               LNADT     HCVLIMI
--------+--------------------------------------------------------------
LNADT       .4156E-03
HCVLIMI   -.1150E-01       .4774

Implied standard deviations of random parameters

S.D_Beta|             1
--------+--------------
       1|      .0203846
       2|       .690965

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|   LNADT  HCVLIMI
--------+------------------
   LNADT| 1.00000  -.81621
 HCVLIMI| -.81621  1.00000
```

Random Parameter Negative Binomial Model of Just Injury Crashes on Two lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable              JUSTINJ
Log likelihood function     -5905.31335
Restricted log likelihood   -6322.38284
Chi squared [   3 d.f.]       834.13858
Significance level               .00000
McFadden Pseudo R-squared      .0659671
Estimation based on N = 144138, K =  13
Inf.Cr.AIC  =  11836.6 AIC/N =     .082
Model estimated: May 30, 2016, 14:03:47
Sample is  2 pds and  72069 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
 JUSTINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -13.6105***      .30667   -44.38  .0000   -14.2115  -13.0094
   LNLEN|     .86336***      .02073    41.65  .0000     .82273    .90398
  SHWDLT|    -.05006***      .00905    -5.32  .0000    -.06785   -.03227
 HCVLIMI|   -2.19908***      .30470    -7.21  .0000   -2.79827  -1.60089
SHNDRTCR|    -.31842***      .10096    -3.16  .0016    -.51738   -.12161
RWYMDDEC|     .03445***      .00622     5.54  .0000     .02225    .04665
    DEG1|     .00697***      .00193     3.61  .0003     .00318    .01076
        |Means for random parameters
   LNADT|    1.34324***      .03441    39.03  .0000    1.27578   1.41069
 HCVCRAN|     .00011***   .1269D-04     8.69  .0000     .00009    .00014
        |Diagonal elements of Cholesky matrix
   LNADT|     .02354***      .00273     8.44  .0000     .01807    .02901
 HCVCRAN| .19854D-04*     .1006D-04     1.97  .0449 -.35914D-06  .39067D-04
        |Below diagonal elements of Cholesky matrix
lHCV_LNA|-.13872D-04      .6772D-05    -1.85  .1138 -.31065D-04  .33222D-05
        |Dispersion parameter for NegBin distribution
ScalParm|     .41307***      .04448     9.29  .0000     .32590    .50024
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+------------------------------------------------------
                 LNADT      HCVCRAN
--------+------------------------------------------------------
LNADT       .5541E-03
HCVCRAN    -.3265E-06   .5670E-09

Implied standard deviations of random parameters

S.D_Beta|             1
--------+--------------
       1|      .0235399
       2|    .238116E-04


Implied correlation matrix of random parameters


--------+------------------
Cor.Mat.|   LNADT  HCVCRAN
--------+------------------
   LNADT| 1.00000  -.58256
 HCVCRAN| -.58256  1.00000
```

Random Parameter Negative Binomial Model of Low Injury Crashes on Two lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                LOINJ
Log likelihood function    -28190.30633
Restricted log likelihood  -38367.63642
Chi squared [   6 d.f.]     20355.06838
Significance level               .00000
McFadden Pseudo R-squared      .2652620
Estimation based on N = 144138, K =  20
Inf.Cr.AIC  =  56420.6 AIC/N =     .391
Model estimated: Jun 01, 2016, 14:01:31
Sample is  2 pds and  72069 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
   LOINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -11.1068***      .15999   -69.42  .0000   -11.4204  -10.7932
  SHWDLT|    -.02662***      .00378    -7.03  .0000    -.03409   -.01920
 HCVLIMI|   -1.31128***      .11261   -11.64  .0000   -1.53200  -1.09056
 HCVCRAN| .77054D-04***   .5676D-05    13.83  .0000  .66188D-04  .88011D-04
  SHWDCR|    -.13014***      .02363    -5.51  .0000    -.17645   -.08383
RWYMDDEC|     .04502***      .00307    14.66  .0000     .03899    .05102
VCVPTGRA|     .00069**       .00028     2.43  .0149     .00013    .00124
 VCVLIMI|   -1.37758***      .20471    -6.73  .0000   -1.77879   -.97636
 VCPARMA|     .02677***      .00647     4.34  .0000     .02016    .03338
 NOFLINC|    1.64973***      .11537    14.30  .0000    1.42361   1.87585
        |Means for random parameters
   LNADT|    1.11238***      .01271    87.52  .0000    1.08747   1.13729
    DEG1|     .00223**       .00100     2.24  .0254     .00028    .00419
   LNLEN|     .95010***      .02967    35.27  .0000     .93118    .96905
        |Diagonal elements of Cholesky matrix
   LNADT|     .00909***      .00310     2.93  .0034     .00301    .01517
    DEG1|     .00197         .00121     1.97  .0741    -.00040    .00434
   LNLEN|     .01526***      .00355     4.33  .0000     .00835    .02217
        |Below diagonal elements of Cholesky matrix
lDEG_LNA|    -.00090         .00135     -.66  .5064    -.00355    .00175
lLNL_LNA|     .08681***      .00932     9.31  .0000     .06854    .10508
lLNL_DEG|     .07707***      .00470    16.41  .0000     .06786    .08627
        |Dispersion parameter for NegBin distribution
ScalParm|     .73414***      .02254    32.57  .0000     .68997    .77831
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------
               LNADT         DEG1         LNLEN
--------+--------------------------------------------------------------
LNADT       .8264E-04
DEG1       -.8160E-05   .4673E-05
LNLEN       .7891E-03   .7337E-04   .1371E-01

Implied standard deviations of random parameters

S.D_Beta|             1
--------+--------------
       1|     .00909039
       2|     .00216180
       3|       .117080


Implied correlation matrix of random parameters


--------+--------------------------
Cor.Mat.|   LNADT     DEG1    LNLEN
--------+--------------------------
   LNADT| 1.00000  -.41625   .74144
    DEG1| -.41625  1.00000   .25988
   LNLEN|  .74144   .25988  1.00000
```

Random Parameter Negative Binomial Model of Total Crashes on Three lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable              TOTALACC
Log likelihood function      -2893.37081
Restricted log likelihood    -4881.62268
Chi squared [   6 d.f.]       4676.50448
Significance level                .00000
McFadden Pseudo R-squared       .4538478
Estimation based on N =   4306, K =  20
Inf.Cr.AIC  =   5026.7 AIC/N =    1.167
Model estimated: May 31, 2016, 13:38:58
Sample is  2 pds and   2153 individuals
Negative binomial regression model
-----------------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
TOTALACC|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -10.9822***      .63808   -17.18  .0000    -12.2347   -9.7297
   LNLEN|      .86062***     .04836    17.03  .0000      .76387    .95736
    DES1|     -.01611        .00820    -1.95  .1099     -.01631    .00408
 MCVLIMI|   -2.03014***      .59186    -3.43  .0006    -3.19017   -.87010
 RNYWDINC|     .02364***     .00533     4.43  .0000      .01319    .03410
    VCVL|    -.00417***      .00112    -3.72  .0002     -.00636   -.00197
 MCVCRAN| .98124D-04***   .1815D-04     5.41  .0000  .62553D-04 .13370D-03
RNYWDDEC|     .01431**       .00603     2.47  .0134      .00303    .02674
   VCVL1|    18.8005***     6.38799     2.97  .0030     6.3796    31.2214
MCVRMSL1|   -16.7642***     5.83019    -2.88  .0040    -28.1911   -5.3372
        |Means for random parameters
   LNADT|    1.29799***      .07201    18.03  .0000     1.15682   1.43909
  VCPARMA|     .09562***     .03590     2.66  .0077      .02526    .16599
  SMNDLT|    -.04318***      .01148    -3.76  .0002     -.06348   -.02087
        |Diagonal elements of Cholesky matrix
   LNADT|     .03142***      .00816     3.85  .0001      .01544    .04741
  VCPARMA|     .06563***     .02347     2.80  .0052      .01964    .11163
  SMNDLT|     .01335***      .00507     2.63  .0085      .00341    .02330
        |Below diagonal elements of Cholesky matrix
 lVCP_LNA|    -.02596        .03556     -.73  .4651     -.09623    .04432
 lSMN_LNA|    -.00422        .01036     -.41  .6835     -.02452    .01608
 lSMN_VCP|    -.01165        .00737    -1.58  .1139     -.02609    .00279
        |Dispersion parameter for NegBin distribution
ScalParm|     .31131***      .01857    16.07  .0000      .27335    .34927
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+----------------------------------------------------
              LNADT       VCPARMA       SMNDLT
--------+----------------------------------------------------
LNADT       .9875E-03
VCPARMA   -.8156E-03    .4991E-02
SMNDLT    -.1327E-03  -.6549E-03    .3318E-03

Implied standard deviations of random parameters

S.D_Beta|             1
--------+-------------
       1|      .0314240
       2|      .0706792
       3|      .0182151

Implied correlation matrix of random parameters

--------+---------------------------
Cor.Mat.|   LNADT  VCPARMA   SMNDLT
--------+---------------------------
   LNADT| 1.00000  -.36775  -.23182
 VCPARMA| -.36775  1.00000  -.50843
  SMNDLT| -.23182  -.50843  1.00000
```

Random Parameter Negative Binomial Model of Property Damage Only Crashes on Three lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                   PDO
Log likelihood function      -1949.49353
Restricted log likelihood    -3317.58302
Chi squared [   8 d.f.]       2736.17897
Significance level                .00000
McFadden Pseudo R-squared       .4123754
Estimation based on N =   4306, K =  18
Inf.Cr.AIC  =   3935.0 AIC/N =     .914
Model estimated: May 31, 2016, 13:56:04
Sample is  2 pds and   2153 individuals
Negative binomial regression model
-----------------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
     PDO|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -10.9368***      .72677   -15.05  .0000    -12.3610   -9.5121
   LNLEN|      .82125***     .05693    14.43  .0000      .70987    .93264
 MCVLIMI|   -2.72480***      .69614    -3.91  .0001    -4.08920  -1.36039
 RNYWDINC|     .01666***     .00561     3.05  .0021      .00605    .02727
    VCVL|    -.00071***      .00020    -3.62  .0003     -.00109   -.00032
  VCVL13|    2.95264*       1.67016     1.97  .0571     -.32077   6.22605
MCVRMSL1|   -14.5798**      6.71486    -2.17  .0300    -27.7848   -1.4128
  SMNDCR|     .02768**       .01338     2.07  .0386      .00146    .05391
        |Means for random parameters
   LNADT|    1.31904***      .08111    16.26  .0000     1.16006   1.47802
 MCVCRAN| .82975D-04***   .2533D-04     3.28  .0011  .33321D-04 .13263D-03
  SMNDLT|    -.04425***      .01264    -3.50  .0005     -.06901   -.01948
        |Diagonal elements of Cholesky matrix
   LNADT|     .03740***      .00880     4.25  .0000      .02016    .05464
 MCVCRAN| .55356D-04**    .2264D-04     2.45  .0144  .11006D-04 .98760D-04
  SMNDLT|     .02042***      .00721     2.83  .0046      .00629    .03455
        |Below diagonal elements of Cholesky matrix
 lMCV_LNA| .98065D-04***   .3155D-04     3.11  .0019  .36232D-04 .15990D-03
 lSMN_LNA|    -.01622        .01192    -1.36  .1736     -.03959    .00714
 lSMN_MCV|    -.00910        .00842    -1.08  .2796     -.02559    .00739
        |Dispersion parameter for NegBin distribution
ScalParm|     .27517***      .02065    13.45  .0000      .23773    .31560
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+----------------------------------------------------
              LNADT       MCVCRAN       SMNDLT
--------+----------------------------------------------------
LNADT       .1399E-02
MCVCRAN     .3666E-05    .1268E-07
SMNDLT    -.6068E-03  -.2055E-05    .7830E-03

Implied standard deviations of random parameters

S.D_Beta|             1
--------+-------------
       1|      .0374010
       2|   .112626E-03
       3|      .0278218

Implied correlation matrix of random parameters

--------+---------------------------
Cor.Mat.|   LNADT  MCVCRAN   SMNDLT
--------+---------------------------
   LNADT| 1.00000   .87074  -.58737
 MCVCRAN|  .87074  1.00000  -.67344
  SMNDLT| -.58797  -.67344  1.00000
```

Random Parameter Negative Binomial Model of Possible Injury Crashes on Three lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                  PINJ
Log likelihood function       -904.37218
Restricted log likelihood    -1157.66441
Chi squared [   6 d.f.]       506.58446
Significance level               .00000
McFadden Pseudo R-squared      .2187824
Estimation based on N =   4306, K =  14
Inf.Cr.AIC  =   1836.7 AIC/N =     .427
Model estimated: May 31, 2016, 16:31:05
Sample is  2 pds and   2153 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
    PINJ|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -13.5913***     1.26220  -10.77  .0000   -16.0652  -11.1175
RNYWDINC|     .01469*        .00780    1.88  .0597    -.00060    .02997
 VCVPTIA|    -.00389***      .00102   -3.82  .0001    -.00589   -.00189
  SHWDLT|    -.05415***      .02010   -2.69  .0071    -.09356   -.01475
        |Means for random parameters
   LNADT|    1.41921***      .14256    9.96  .0000    1.13980   1.69862
 HCVCRAN|    -.00010**    .4987D-04   -2.01  .0442    -.00020    .00000
   LNLEN|     .71620***      .09068    7.90  .0000     .53847    .89392
        |Diagonal elements of Cholesky matrix
   LNADT|     .05025*        .02722    1.85  .0649    -.00310    .10360
 HCVCRAN|     .00016***   .5935D-04    2.66  .0078     .00004    .00028
   LNLEN|     .09432***      .02092    4.51  .0000     .05331    .13532
        |Below diagonal elements of Cholesky matrix
lNCV_LNA|-.66878D-04      .63480D-04   -2.06  .0314 -.19140D-03  .27447D-04
lLNL_LNA|     .11921         .08463    1.41  .1590    -.04668    .28509
lLNL_HCV|    -.11051***      .03258   -3.39  .0007    -.17436   -.04665
        |Dispersion parameter for NegBin distribution
ScalParm|     .21531***      .02939    7.33  .0000     .15770    .27291
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
                 LNADT      HCVCRAN        LNLEN
--------+--------------------------------------------------------------------
LNADT       .2526E-02
HCVCRAN   -.3366E-05   .2974E-07
LNLEN       .5991E-02  -.2555E-04   .3532E-01

Implied standard deviations of random parameters

S.D_Beta|             1
--------+----------------
       1|      .0502546
       2|   .172453E-03
       3|       .187931

Implied correlation matrix of random parameters

--------+---------------------------
Cor.Mat.|    LNADT  HCVCRAN    LNLEN
--------+---------------------------
   LNADT| 1.00000  -.38837   .63430
 HCVCRAN| -.38837  1.00000  -.78823
   LNLEN|  .63430  -.78823  1.00000
```

Random Parameter Negative Binomial Model of Evident Injury Crashes on Three lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                   EVI
Log likelihood function       -535.27322
Restricted log likelihood     -558.17139
Chi squared [   3 d.f.]        45.79634
Significance level               .00000
McFadden Pseudo R-squared      .0410239
Estimation based on N =   4306, K =  11
Inf.Cr.AIC  =   1092.5 AIC/N =     .254
Model estimated: Jun 02, 2016, 19:26:55
Sample is  2 pds and   2153 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
     EVI|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -8.32582***     1.26553   -6.58  .0000   -10.80621  -5.84543
   LNLEN|     .83527***      .07415   11.26  .0000     .68994    .98061
HCVMXSL1|   -17.7510        12.04954   -1.97  .0712   -41.3477    5.8456
  SHWDLT|    -.04478**       .02096   -2.14  .0326    -.08585   -.00370
VCVPTSMA|    -.00545***      .00192   -2.83  .0046    -.00922   -.00168
        |Means for random parameters
   LNADT|     .71944***      .14255    5.05  .0000     .44004    .99883
RNYWDINC|     .03589***      .00949    3.78  .0002     .01729    .05448
        |Diagonal elements of Cholesky matrix
   LNADT|     .11688***      .02073    5.64  .0000     .07625    .15750
RNYWDINC|     .00771**       .00310    2.49  .0130     .00163    .01379
        |Below diagonal elements of Cholesky matrix
lRWY_LNA|    -.02964***      .00647   -4.58  .0000    -.04233   -.01695
        |Dispersion parameter for NegBin distribution
ScalParm|    1.25867**       .60583    2.08  .0377     .07128   2.44607
--------+--------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
                 LNADT     RNYWDINC
--------+--------------------------------------------------------------------
LNADT       .1366E-01
RNYWDINC  -.3464E-02   .9380E-03

Implied standard deviations of random parameters

S.D_Beta|             1
--------+----------------
       1|       .116876
       2|      .0306272

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|    LNADT RNYWDINC
--------+------------------
   LNADT| 1.00000  -.96782
RNYWDINC| -.96782  1.00000
```

Random Parameter Negative Binomial Model of Serious Injury Crashes on Three lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                 SINJ
Log likelihood function      -169.04257
Restricted log likelihood   -4305.99999
Chi squared [   9 d.f.]      8273.91488
Significance level               .00000
McFadden Pseudo R-squared      .9607428
Estimation based on N =   4306, K =   9
Inf.Cr.AIC  =    356.1 AIC/N =     .083
Model estimated: Jun 02, 2016, 20:12:12
Sample is  2 pds and   2153 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
    SINJ|  Coefficient       Error        z    |z|>Z*        Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|    -9.55599***    2.33749    -4.09  .0000   -14.13738   -4.97460
 VCPARMA|     .18686**       .09198     2.03  .0422      .00656     .36716
    VCVL|    -.00109        .00071    -1.92  .0777     -.00249     .00031
        |Means for random parameters
   LNADT|     .69264***     .25660     2.70  .0069      .18971    1.19556
   LNLEN|     .88855***     .14682     6.02  .0001      .30177     .87533
        |Diagonal elements of Cholesky matrix
   LNADT|     .11374***     .04169     2.73  .0064      .03205     .19544
   LNLEN|     .12909**      .05987     2.16  .0311      .01174     .24644
        |Below diagonal elements of Cholesky matrix
lLNL_LNA|     .27731**      .11085     2.50  .0124      .06035     .49436
        |Dispersion parameter for NegBin distribution
ScalParm|     .25218***     .10569     2.40  .0036      .04924     .45512
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
                 LNADT        LNLEN
--------+--------------------------------------------------------------------
LNADT      .1294E-01
LNLEN      .3154E-01    .9346E-01

Implied standard deviations of random parameters

S.D_Beta|               1
--------+---------------
       1|         .113739
       2|         .305883

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|   LNADT    LNLEN
--------+------------------
   LNADT| 1.00000   .90658
   LNLEN|  .90658  1.00000
```

Random Parameter Negative Binomial Model of Fatal Injury Crashes on Three lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                FATAL
Log likelihood function      -170.30009
Restricted log likelihood   -4305.99999
Chi squared [   9 d.f.]      8271.39980
Significance level               .00000
McFadden Pseudo R-squared      .9604505
Estimation based on N =   4306, K =   9
Inf.Cr.AIC  =    358.6 AIC/N =     .083
Model estimated: Jun 03, 2016, 19:20:02
Sample is  2 pds and   2153 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
   FATAL|  Coefficient       Error        z    |z|>Z*        Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|    -9.34832***    2.46773    -3.79  .0002   -14.18302   -4.50362
   LNLEN|     .60608***     .17961     3.38  .0007      .25606     .96011
MCVPTTVA|     .00315        .00309     1.31  .2250     -.00231     .00862
        |Means for random parameters
   LNADT|     .73679**      .29360     2.51  .0121      .16134    1.31224
    DES1|    -.07832        .06719    -1.67  .0636     -.21002     .05338
        |Diagonal elements of Cholesky matrix
   LNADT|     .03692*       .01935     1.91  .0561     -.00096     .07481
    DES1|     .04995        .03793     1.32  .1878     -.02435     .12429
        |Below diagonal elements of Cholesky matrix
lDES_LNA|     .01271        .03159      .40  .6874     -.04920     .07462
        |Dispersion parameter for NegBin distribution
ScalParm|     .03736*       .01949     1.92  .0552     -.00083     .07555
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
                 LNADT        DES1
--------+--------------------------------------------------------------------
LNADT      .1363E-02
DES1       .4693E-03    .2657E-02

Implied standard deviations of random parameters

S.D_Beta|               1
--------+---------------
       1|        .0369247
       2|        .0515445

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|   LNADT     DES1
--------+------------------
   LNADT| 1.00000   .24656
    DES1|  .24656  1.00000
```

Random Parameter Negative Binomial Model of Unknown Injury Crashes on Three lane SPF Class Roadway Segments

```
--------------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable              UNKNOWN
Log likelihood function      -132.15967
Restricted log likelihood   -4305.99999
Chi squared [   1 d.f.]      8347.68066
Significance level               .00000
McFadden Pseudo R-squared      .9693080
Estimation based on N =   4306, K =   5
Inf.Cr.AIC  =    274.3 AIC/N =     .064
Model estimated: Jun 02, 2016, 20:24:03
Sample is  2 pds and   2153 individuals
Negative binomial regression model
--------+-----------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
 UNKNOWN|  Coefficient       Error         z   |z|>Z*        Interval
--------+-----------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -14.6681***     3.28986    -4.46  .0000   -21.1161   -8.2201
   LNADT|   1.10567***       .33530     3.30  .0010     .44849   1.76284
        |Means for random parameters
   LNLEN|      .29060        .22458     1.29  .1957    -.14958    .73077
        |Scale parameters for dists. of random parameters
   LNLEN|      .19301**      .07612     2.54  .0112     .04382    .34220
        |Dispersion parameter for NegBin distribution
Scalfarm|      .05490        .03531     1.55  .1819    -.02019    .12998
--------+-----------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
--------------------------------------------------------------------------------
```

Random Parameter Negative Binomial Model of High Injury Crashes on Three lane SPF Class Roadway Segments

```
--------------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                HIINJ
Log likelihood function      -609.71996
Restricted log likelihood    -661.67167
Chi squared [   6 d.f.]       103.90343
Significance level               .00000
McFadden Pseudo R-squared      .0785158
Estimation based on N =   4306, K =  12
Inf.Cr.AIC  =   1243.4 AIC/N =     .289
Model estimated: Jun 02, 2016, 22:18:04
Sample is  2 pds and   2153 individuals
Negative binomial regression model
--------+-----------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
   HIINJ|  Coefficient       Error         z   |z|>Z*        Interval
--------+-----------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -9.30673***     1.11802    -8.32  .0000  -11.49807  -7.11352
  SMNDRT|   -.05423**        .02233    -2.43  .0152    -.09801   -.01048
        |Means for random parameters
   LNLEN|     .86411***      .08320    10.39  .0000     .70104   1.02718
   LNADT|     .94560***      .12936     7.31  .0000     .69206   1.19914
VCVPTGRB|   -.00715***       .00202    -3.54  .0004    -.01111   -.00320
        |Diagonal elements of Cholesky matrix
   LNLEN|     .21333**       .08963     2.57  .0100     .08143    .37924
   LNADT|     .06794***      .02149     3.16  .0016     .02550    .11006
VCVPTGRB|     .00123         .00116     2.19  .0276    -.00209    .00284
        |Below diagonal elements of Cholesky matrix
lLNA_LNL|   -.12408***       .03334    -3.72  .0002    -.18942   -.05875
lVCV_LNL|     .00690**       .00295     2.34  .0193     .00112    .01268
lVCV_LNA|   -.00663***       .00236    -2.81  .0050    -.01126   -.00201
        |Dispersion parameter for NegBin distribution
ScalParm|     .37913***      .10462     3.62  .0003     .17839    .58008
--------+-----------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
--------------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------------------------
              LNLEN         LNADT    VCVPTGRB
--------+-----------------------------------------------------------------
LNLEN       .4637E-01
LNADT     -.2672E-01   .2001E-01
VCVPTGRB   .1465E-02  -.1307E-02   .9164E-06

Implied standard deviations of random parameters

S.D_Beta|            1
--------+--------------
       1|      .213331
       2|      .141463
       3|    .00957309

Implied correlation matrix of random parameters

--------+--------------------------
Cor.Mat.|   LNLEN    LNADT VCVPTGRB
--------+--------------------------
   LNLEN| 1.00000  -.87714   .72083
   LNADT| -.87714  1.00000  -.96482
VCVPTGRB|  .72083  -.96482  1.00000
```

Random Parameter Negative Binomial Model of Just Injury Crashes on Three lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable               JUSTINJ
Log likelihood function      -591.43479
Restricted log likelihood    -656.31822
Chi squared [   6 d.f.]       129.76686
Significance level               .00000
McFadden Pseudo R-squared      .0988597
Estimation based on N =   4306, K =  16
Inf.Cr.AIC  =   1210.9 AIC/N =     .281
Model estimated: Jun 02, 2016, 22:39:24
Sample is  2 pds and   2153 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                 Standard            Prob.      95% Confidence
 JUSTINJ|  Coefficient      Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -13.4502***    1.38839    -9.37  .0000   -16.3942  -10.6063
VCVPTGRA|    -.00455**      .00210    -2.17  .0303    -.00867   -.00043
    MCVL|    -.00061**      .00025    -2.47  .0136    -.00108   -.00013
RNYWDINC|     .03141***     .00868     3.54  .0004     .01404    .04878
        |Means for random parameters
   LNLEN|     .66435***     .10027     6.63  .0000     .46782    .86088
   LNADT|    1.24697***     .15082     8.30  .0000     .95235   1.54159
SHNDRTCR|    -.28335**      .14093    -2.01  .0442    -.55974   -.00736
        |Diagonal elements of Cholesky matrix
   LNLEN|     .01136        .10236     2.23  .0260     .02732    .42555
   LNADT|     .02313*       .01212     1.91  .0566    -.00063    .04689
SHNDRTCR|     .22157**      .09562     2.32  .0205     .03416    .40897
        |Below diagonal elements of Cholesky matrix
lLNA_LNL|    -.06121*       .03557    -1.72  .0853    -.13093    .00851
lSHW_LNL|    -.09990        .18048     -.55  .5799    -.45365    .25356
lSHW_LNA|    -.27125**      .13521    -2.01  .0448    -.53626   -.00624
        |Dispersion parameter for NegBin distribution
ScalParm|     .27460***     .07161     3.83  .0001     .13425    .41495
--------+--------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------
               LNLEN       LNADT    SHNDRTCR
--------+--------------------------------------------------------------
LNLEN       .1290E-03
LNADT      -.4931E-03   .4282E-02
SHNDRTCR   -.1134E-02  -.1581E-03       .1326

Implied standard deviations of random parameters

S.D_Beta|            1
--------+-------------
       1|     .0113586
       2|     .0654368
       3|      .364208

Implied correlation matrix of random parameters

--------+---------------------------
Cor.Mat.|    LNLEN     LNADT SHNDRTCR
--------+---------------------------
   LNLEN| 1.00000  -.93545  -.27428
   LNADT| -.93545  1.00000  -.00668
SHNDRTCR| -.27428  -.00668  1.00000
```

Random Parameter Negative Binomial Model of Low Injury Crashes on Three lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                 LOINJ
Log likelihood function      -2147.39609
Restricted log likelihood    -3902.12685
Chi squared [   6 d.f.]       3509.46146
Significance level                .00000
McFadden Pseudo R-squared       .4496857
Estimation based on N =   4306, K =  16
Inf.Cr.AIC  =   4326.8 AIC/N =    1.005
Model estimated: Jun 03, 2016, 21:25:24
Sample is  2 pds and   2153 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                 Standard            Prob.      95% Confidence
   LOINJ|  Coefficient      Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -11.4447***     .67272   -17.01  .0000   -12.8632  -10.0262
VCVPTGRA|    -.00389***     .00098    -3.96  .0001    -.00582   -.00195
    MCVL|    -.00064***     .00012    -5.14  .0000    -.00088   -.00039
RNYWDINC|     .01684***     .00489     3.44  .0006     .00725    .02643
MCVCRAN|      .00014***   .2048D-04    6.81  .0000     .00010    .00018
MCVNRBL1|   -13.1274**     6.22624    -2.11  .0350   -25.3306   -.9242
        |Means for random parameters
   LNLEN|     .85008***     .05476    15.52  .0000     .74275    .95740
   LNADT|    1.37595***     .07803    18.34  .0000    1.22889   1.52302
  SHNDLT|    -.04050***     .01228    -3.30  .0010    -.06456   -.01643
        |Diagonal elements of Cholesky matrix
   LNLEN|     .31023***     .05093     6.09  .0000     .21040    .41006
   LNADT|     .05712***     .00982     5.82  .0000     .03787    .07638
  SHNDLT|     .00975*       .00558     1.39  .0606    -.00120    .02070
        |Below diagonal elements of Cholesky matrix
lLNA_LNL|    -.12511***     .02297    -5.45  .0000    -.17012   -.08009
lSHW_LNL|    -.01991        .01405    -1.42  .1565    -.04746    .00763
lSHW_LNA|     .01241        .01252      .99  .3215    -.01213    .03696
        |Dispersion parameter for NegBin distribution
ScalParm|     .31044***     .02255    13.76  .0000     .26623    .35464
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------
               LNLEN       LNADT      SHNDLT
--------+--------------------------------------------------------------
LNLEN       .9624E-01
LNADT      -.3881E-01   .1891E-01
SHNDLT     -.6178E-02   .3200E-02   .6458E-03

Implied standard deviations of random parameters

S.D_Beta|            1
--------+-------------
       1|      .310229
       2|      .137530
       3|     .0254118

Implied correlation matrix of random parameters

--------+---------------------------
Cor.Mat.|    LNLEN     LNADT   SHNDLT
--------+---------------------------
   LNLEN| 1.00000  -.90966  -.78362
   LNADT| -.90966  1.00000   .91574
  SHNDLT| -.78362   .91574  1.00000
```

Random Parameter Negative Binomial Model of Total Crashes on Four lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable             TOTALACC
Log likelihood function    -25586.14157
Restricted log likelihood  -69601.55178
Chi squared [   8 d.f.]     74030.81953
Significance level               .00000
McFadden Pseudo R-squared      .5979000
Estimation based on N =  25432, K =  25
Inf.Cr.AIC  =  51179.3 AIC/N =    1.500
Model estimated: Jun 04, 2016, 17:47:18
Sample is  2 pds and  14216 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
TOTALACC|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -6.72573***      .21609   -31.12  .0000    -7.14928  -6.30222
   LNLEN|     .81272***      .01159    70.15  .0000      .79001    .83542
    DES1|     .00232**       .00096     2.46  .0141      .00047    .00418
  RCVLIMI|  -1.24201***      .07995   -15.53  .0000    -1.39871  -1.08530
 VCVPTSRB|    .03773***      .00756     4.99  .0000      .02291    .05256
    VCVL|   -.03557***       .00764    -4.66  .0000     -.05054   -.02060
  RCVCRAN| .90365D-04***   .63025D-05   14.34  .0000  .78033D-04 .10274D-03
 RWYMDDEC|    .01068***      .00198     5.37  .0000      .00674    .01464
   VCVL1|   184.305***     40.30723     4.57  .0000    105.304   263.306
 RCVMMXL1|  -6.00774***      .84026    -7.15  .0000    -7.65423  -4.36124
  VCVEVCA|   -.00080***      .00029    -2.73  .0064     -.00137   -.00022
 SMNDLTCR|   -.01764***      .00627    -2.81  .0049     -.02994   -.00534
  VCVL16|   1.82432***       .34221     5.33  .0000     1.15360   2.49504
        |Means for random parameters
   LNADT|     .91110***      .02117    43.03  .0000      .86960    .95259
  VCPARMA|    .08418***      .00985     8.54  .0000      .06487    .10350
   SMNDLT|   -.08237***      .00300   -27.46  .0000     -.08823   -.07649
        |Diagonal elements of Cholesky matrix
   LNADT|     .06574***      .00219    30.02  .0000      .06146    .07003
  VCPARMA|    .03154***      .00848     3.72  .0002      .01492    .04817
   SMNDLT|    .00397***      .00147     2.70  .0070      .00108    .00686
        |Below diagonal elements of Cholesky matrix
 lVCP_LNA|   -.05760***      .01023    -5.63  .0000     -.07764   -.03755
 lSMN_LNA|    .04121***      .00311    13.26  .0000      .03511    .04730
 lSMN_VCP|   -.02036***      .00218    -9.36  .0000     -.02463   -.01610
        |Dispersion parameter for NegBin distribution
ScalParm|     .41373***      .00754    54.84  .0000      .39894    .42852
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------
               LNADT       VCPARMA       SMNDLT
--------+--------------------------------------------------------------
LNADT       .4324E-02
VCPARMA   -.3787E-02    .4312E-02
SMNDLT      .2710E-02  -.3018E-02    .2128E-02

Implied standard deviations of random parameters

S.D_Beta|             1
--------+-------------
       1|      .0657568
       2|      .0656653
       3|      .0461333

Implied correlation matrix of random parameters

--------+--------------------------
Cor.Mat.|    LNADT  VCPARMA   SMNDLT
--------+--------------------------
   LNADT| 1.00000  -.87708   .89319
 VCPARMA| -.87708  1.00000  -.99542
  SMNDLT|  .89319  -.99542  1.00000
```

Random Parameter Negative Binomial Model of Property Damage Only Crashes on Four lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                  PDO
Log likelihood function    -20521.45056
Restricted log likelihood  -41480.99362
Chi squared [   6 d.f.]     41919.08554
Significance level               .00000
McFadden Pseudo R-squared      .5052806
Estimation based on N =  25432, K =  22
Inf.Cr.AIC  =  41086.9 AIC/N =    1.448
Model estimated: Jun 04, 2016, 18:48:03
Sample is  2 pds and  14216 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
     PDO|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -7.53677***      .24730   -30.48  .0000    -8.02147  -7.05206
   LNLEN|     .80661***      .01296    62.26  .0000      .78121    .83200
    DES1|     .00601*        .00325     1.85  .0646     -.00036    .01238
   VCVL1|   -3.34225***      .38578    -8.66  .0000    -4.09837  -2.58613
  RCVLIMI|  -1.12451***      .10321   -10.91  .0000    -1.32880   -.92421
 RWYMDDEC|    .01056***      .00231     4.56  .0000      .00602    .01509
 VCVPTGRB|    .00214***      .00048     4.46  .0000      .00120    .00309
  RCVCRAN| .87579D-04***   .81400D-05    8.30  .0000  .51825D-04 .83533D-04
  VCVEVCA|   -.00085**       .00033    -2.57  .0102     -.00150   -.00020
  VCPARMA|    .08532***      .01177     7.31  .0000      .06526    .11139
 RCVMMXL1|  -6.84921***      .98612    -6.37  .0000    -8.29755  -4.39286
  VCVL16|   1.49733***       .37741     3.97  .0001      .75762   2.23704
        |Means for random parameters
   LNADT|     .95295***      .02463    38.68  .0000      .90465   1.00126
     VCK|   -.13823**        .06803    -2.00  .0452     -.26956   -.00289
   SMNDRT|   -.08928***      .00296   -30.13  .0000     -.09509   -.08347
        |Diagonal elements of Cholesky matrix
   LNADT|     .05539***      .00221    25.11  .0000      .05107    .05972
     VCK|     .29577**       .11891     2.49  .0127      .06376    .53379
   SMNDRT|    .00583***      .00182     3.20  .0014      .00226    .00939
        |Below diagonal elements of Cholesky matrix
 lVCK_LNA|   -.19397         .13508    -1.44  .1512     -.45868    .07088
 lSMN_LNA|    .02925***      .00349     8.39  .0000      .02242    .03609
 lSMN_VCK|   -.01311***      .00254    -5.16  .0000     -.02370   -.01452
        |Dispersion parameter for NegBin distribution
ScalParm|     .39661***      .00861    46.07  .0000      .37973    .41348
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------
               LNADT          VCK       SMNDRT
--------+--------------------------------------------------------------
LNADT       .3069E-02
VCK       -.1074E-01        .1269
SMNDRT      .1620E-02  -.1138E-01    .1255E-02

Implied standard deviations of random parameters

S.D_Beta|             1
--------+-------------
       1|      .0553945
       2|       .356162
       3|      .0354226

Implied correlation matrix of random parameters

--------+--------------------------
Cor.Mat.|    LNADT      VCK   SMNDRT
--------+--------------------------
   LNADT| 1.00000  -.54433   .82578
     VCK| -.54433  1.00000  -.90205
  SMNDRT|  .82578  -.90205  1.00000
```

Random Parameter Negative Binomial Model of Possible Injury Crashes on Four lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients   NegBnReg Model
Dependent variable                  PINJ
Log likelihood function    -10843.21665
Restricted log likelihood  -15726.75610
Chi squared [    6 d.f.]     9765.07890
Significance level               .00000
McFadden Pseudo R-squared      .3104804
Estimation based on N =  28432, K =  21
Inf.Cr.AIC  =  21728.4 AIC/N =     .764
Model estimated: Jun 06, 2016, 18:42:37
Sample is  2 pds and  14216 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                Standard            Prob.      95% Confidence
    PINJ|  Coefficient     Error        z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -8.23557***    .37760   -21.82  .0000    -8.97585  -7.49579
   LNLEN|     .76281***    .01819    41.93  .0000     .72715    .79847
 NCVLIMI|   -2.40555***    .17457   -13.64  .0000   -2.78442  -2.06246
     VCR|    -.25168***    .07751    -3.25  .0012    -.40360   -.09996
    VCVL|    -.02928***    .01072    -2.73  .0065    -.05030   -.00827
 MCVCRAS| .57623D-04***  .12810-04    4.48  .0000  .32322D-04  .82823D-04
  SHMDLT|    -.09972***    .00481   -20.75  .0000    -.10914   -.09030
HCVMXAEL|     .00341***    .00051     6.64  .0000     .00241    .00442
 VCVEVCA|    -.00285***    .00052    -5.51  .0000    -.00382   -.00186
    MCVR|-.20101D-04***  .6001D-05   -3.35  .0008 -.31863D-04  -.83393D-05
 VCVLIMI|    153.704***  56.65518     2.71  .0066    42.702    264.936
        |Means for random parameters
   LNADT|     .97224***    .03701    26.27  .0000     .89970   1.04479
VCVFTGRA|     .03469***    .01063     3.26  .0011     .01385    .05552
  SHMDCR|    -.02238***    .00581    -3.85  .0001    -.03376   -.01100
        |Diagonal elements of Cholesky matrix
   LNADT|     .03249***    .00298    11.06  .0000     .02669    .03818
VCVFTGRA|     .00291***    .00038     7.66  .0000     .00217    .00365
  SHMDCR|     .01126***    .00436     2.58  .0098     .00272    .01981
        |Below diagonal elements of Cholesky matrix
1VCV_LNA|     .00050           .00053      .94  .3455    -.00054    .00155
lSHM_LNA|     .06377***    .00774     8.24  .0000     .04860    .07894
lSHM_VCV|     .03170***    .00608     5.22  .0000     .01978    .04361
        |Dispersion parameter for NegBin distribution
ScalParm|     .32569***    .01180    27.55  .0000     .30556    .35183
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
              LNADT     VCVFTGRA      SHMDCR
--------+--------------------------------------------------------------------
LNADT      .1062E-02
VCVFTGRA   .1610E-04   .8714E-05
SHMDCR     .2068E-02   .1239E-03   .5198E-02

Implied standard deviations of random parameters

S.D_Beta|            1
--------+--------------
       1|     .0324812
       2|    .00295202
       3|     .0720970

Implied correlation matrix of random parameters

--------+--------------------------
Cor.Mat.|    LNADT VCVFTGRA   SHMDCR
--------+--------------------------
   LNADT| 1.00000   .16819   .88449
VCVFTGRA|  .16818 1.00000   .56213
  SHMDCR|  .88449   .56213 1.00000
```

Random Parameter Negative Binomial Model of Evident Injury Crashes on Four lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients   NegBnReg Model
Dependent variable                   EVI
Log likelihood function     -5864.44734
Restricted log likelihood   -6382.73454
Chi squared [    3 d.f.]     1036.17442
Significance level               .00000
McFadden Pseudo R-squared      .0811701
Estimation based on N =  28432, K =  14
Inf.Cr.AIC  =  11737.3 AIC/N =     .414
Model estimated: Jun 06, 2016, 17:15:50
Sample is  2 pds and  14216 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                Standard            Prob.      95% Confidence
     EVI|  Coefficient     Error        z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -5.47814***    .47200   -11.61  .0000    -6.40324  -4.55304
   LNLEN|     .78013***    .02245    34.75  .0000     .73613    .82413
    DEG1|     .01074**     .00501     2.14  .0322     .00091    .02057
   VCVL1|   -1.17497***    .34742    -3.38  .0007   -1.85680   -.49344
 HCVLIMI|   -18287.0**   8806.914    -2.08  .0379   -35548.3   -1025.8
    MCVL|    3.46332**    1.66735     2.08  .0379     .18414   6.73250
VCVFTGRA|     .00213***    .00061     3.46  .0005     .00092    .00333
HCVMXSEL|   -3.45995**    1.66754    -2.07  .0380   -6.72859   -.19107
        |Means for random parameters
   LNADT|     .57928***    .04668    12.41  .0000     .48776    .67080
  SHMDRT|    -.06363***    .00600   -10.60  .0000    -.07540   -.05187
        |Diagonal elements of Cholesky matrix
   LNADT|     .02913***    .00300     9.49  .0000     .02324    .03501
  SHMDRT|     .00903**     .00373     2.42  .0154     .00172    .01634
        |Below diagonal elements of Cholesky matrix
lSHM_LNA|     .04072***    .00422     9.64  .0000     .03244    .04899
        |Dispersion parameter for NegBin distribution
ScalParm|     .53868***    .04889    11.78  .0000     .44569    .62870
--------+--------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Covariance  matrix
--------+--------------------------------------------------------------------
              LNADT      SHMDRT
--------+--------------------------------------------------------------------
LNADT      .8483E-03
SHMDRT     .1186E-02   .1739E-02

Implied standard deviations of random parameters

S.D_Beta|            1
--------+--------------
       1|     .0291251
       2|     .0417043

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|    LNADT   SHMDRT
--------+------------------
   LNADT| 1.00000   .97627
  SHMDRT|  .97627  1.00000
```

Random Parameter Negative Binomial Model of Serious Injury Crashes on Four lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                 SINJ
Log likelihood function     -1418.95234
Restricted log likelihood   -1438.75846
Chi squared [   9 d.f.]        39.66823
Significance level               .00000
McFadden Pseudo R-squared      .0137653
Estimation based on N =  28432, K =  11
Inf.Cr.AIC  =   2859.9 AIC/N =     .101
Model estimated: Jun 06, 2016, 20:42:54
Sample is  2 pds and  14216 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                Standard            Prob.      95% Confidence
    SINJ|  Coefficient      Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -5.94367***     1.01572    -5.85  .0000    -7.93445  -3.95289
   LNLEN|     .80728***      .05288    15.28  .0000      .70371    .91085
 MCVLINE|   -1.91603***      .60745    -3.15  .0016    -3.10667   -.72550
RNYMDDEC|    -.02320*        .01222    -1.90  .0575     -.04715    .00074
MCVMKSEL|     .00499***      .00154     3.24  .0012      .00197    .00801
        |Means for random parameters
   LNADT|     .48869***      .10038     4.88  .0000      .29295    .68444
  SMWDCR|    -.07831***      .01705    -4.59  .0000     -.11173   -.04459
        |Diagonal elements of Cholesky matrix
   LNADT|     .02879***      .00540     5.33  .0000      .01819    .03938
  SMWDCR|     .02117*        .01285     1.95  .0488     -.00398    .04632
        |Below diagonal elements of Cholesky matrix
LSMW_LNA|     .06111***      .01180     5.18  .0000      .03799    .08423
        |Dispersion parameter for NegBin distribution
ScalParm|     .48555**       .21381     2.27  .0230      .06707    .90402
--------+--------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
              LNADT       SMWDCR
--------+--------------------------------------------------------------------
LNADT      .8256E-03
SMWDCR     .1759E-02   .4182E-02

Implied standard deviations of random parameters

S.D_Beta|             1
--------+-------------
       1|      .0287853
       2|      .0646709

Implied correlation matrix of random parameters

--------+-----------------
Cor.Mat.|   LNADT   SMWDCR
--------+-----------------
   LNADT| 1.00000   .94490
  SMWDCR|  .94490  1.00000
```

Random Parameter Negative Binomial Model of Fatal Injury Crashes on Four lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                FATAL
Log likelihood function      -520.47456
Restricted log likelihood  -28431.99996
Chi squared [   1 d.f.]     55823.05076
Significance level               .00000
McFadden Pseudo R-squared      .9816941
Estimation based on N =  28432, K =   8
Inf.Cr.AIC  =   1056.9 AIC/N =     .037
Model estimated: Jun 08, 2016, 13:21:23
Sample is  2 pds and  14216 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                Standard            Prob.      95% Confidence
   FATAL|  Coefficient      Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -7.26959***     1.69308    -4.29  .0000   -10.58798  -3.95121
   LNLEN|     .77513***      .11712     6.62  .0000      .54559   1.00468
SMWDRTCR|     .06715         .04574     1.57  .0621     -.02250    .15680
HCVMKSL1|   -13.7728*       7.42993    -1.95  .0638    -28.3350     .7894
  VCVL15|    5.26175***     1.96770     2.67  .0075     1.40512   9.11837
        |Means for random parameters
   LNADT|     .35750**       .17301     2.07  .0388      .01541    .69959
        |Scale parameters for dists. of random parameters
   LNADT|     .03937***      .01230     3.20  .0014      .01527    .06348
        |Dispersion parameter for NegBin distribution
ScalParm|     .35750**       .17301     2.07  .0388      .01541    .69959
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

Random Parameter Negative Binomial Model of Unknown Injury Crashes on Four lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable               UNKNOWN
Log likelihood function      -1027.73535
Restricted log likelihood    -1050.86399
Chi squared [   3 d.f.]         46.25729
Significance level                .00000
McFadden Pseudo R-squared       .0220092
Estimation based on N =  28432, K =  12
Inf.Cr.AIC  =   2079.5 AIC/N =      .073
Model estimated: Jun 09, 2016, 19:59:14
Sample is  2 pds and  14216 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
 UNKNOWN|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -6.15546***     1.52503     -4.03  .0001     -9.15046  -3.16047
   LNLEN|     .79844***      .05764     13.76  .0000       .69046    .90642
HCVMXSEL|     .00589***      .00168      3.50  .0005       .00260    .00919
    HCVL|    -.00048***   .7525D-04     -6.40  .0000      -.00063   -.00033
  SHWDRT|    -.09162***      .02068     -4.43  .0000      -.13215   -.05110
 SHWDINC|    -.04901***      .01856     -2.64  .0083      -.08538   -.01264
        |Means for random parameters
   LNADT|     .58004***      .13837      4.19  .0000       .30884    .85124
SHWDRTCR|    -.14384**       .05797     -2.48  .0131      -.25746   -.03022
        |Diagonal elements of Cholesky matrix
   LNADT|     .01281**       .00638      2.01  .0446       .00031    .02531
SHWDRTCR|     .03838         .02739      1.89  .0642      -.01570    .09245
        |Below diagonal elements of Cholesky matrix
LSHW_LNA|     .21451***      .03745      5.73  .0000       .14110    .28791
        |Dispersion parameter for NegBin distribution
ScalParm|     .27536***      .09576      2.88  .0040       .08768    .46305
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
              LNADT     SHWDRTCR
--------+--------------------------------------------------------------------
LNADT      .1641E-03
SHWDRTCR   .2748E-02   .4749E-01

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|       .0128087
       2|        .217914

Implied correlation matrix of random parameters


--------+------------------
Cor.Mat.|   LNADT SHWDRTCR
--------+------------------
   LNADT| 1.00000   .98437
SHWDRTCR|  .98437  1.00000
```

Random Parameter Negative Binomial Model of High Injury Crashes on Four lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                 HIINJ
Log likelihood function      -6754.19010
Restricted log likelihood    -7467.43023
Chi squared [   3 d.f.]       1426.48025
Significance level                .00000
McFadden Pseudo R-squared       .0955135
Estimation based on N =  28432, K =  15
Inf.Cr.AIC  =  13538.4 AIC/N =      .476
Model estimated: Jun 09, 2016, 13:56:25
Sample is  2 pds and  14216 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
   HIINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -4.95066***      .52726     -9.39  .0000     -5.98407  -3.91725
   LNLEN|     .80053***      .01983     40.38  .0000       .76167    .83939
    HCVL|    -.00013***   .2658D-04     -4.94  .0000      -.00018   -.00008
 HOFLDEC|    -.42471**       .18761     -2.26  .0236      -.79243   -.05700
SHWDRTCR|     .15114***      .03798      3.98  .0001       .07670    .22558
    DEG1|     .01036**       .00498      2.08  .0372       .00061    .02012
  SHWDRT|    -.05963***      .00591    -10.09  .0000      -.07122   -.04804
HCVMXSEL|     .00315***      .00059      5.32  .0000       .00199    .00431
    HCVR|-.19411D-04***   .6423D-05     -3.02  .0025 -.31999D-04 -.65234D-05
        |Means for random parameters
   LNADT|     .61548***      .03828     16.07  .0000       .54041    .69051
  SHWDCR|    -.07176***      .02052     -3.50  .0004      -.11159   -.03193
        |Diagonal elements of Cholesky matrix
   LNADT|     .02878***      .00215     13.37  .0000       .02456    .03300
  SHWDCR|     .01520***      .00485      3.14  .0017       .00571    .02470
        |Below diagonal elements of Cholesky matrix
LSHW_LNA|     .04663***      .00422     11.06  .0000       .03837    .05489
        |Dispersion parameter for NegBin distribution
ScalParm|     .72632***      .05776     12.57  .0000       .61310    .83953
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
              LNADT       SHWDCR
--------+--------------------------------------------------------------------
LNADT      .8281E-03
SHWDCR     .1342E-02   .2405E-02

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|       .0287760
       2|       .0490445

Implied correlation matrix of random parameters


--------+------------------
Cor.Mat.|   LNADT   SHWDCR
--------+------------------
   LNADT| 1.00000   .95073
  SHWDCR|  .95073  1.00000
```

Random Parameter Negative Binomial Model of Just Injury Crashes on Four lane SPF Class Roadway Segments

```
Random Coefficients  NegBnReg Model
Dependent variable               JUSTINJ
Log likelihood function     -6928.63096
Restricted log likelihood   -8433.99941
Chi squared [   3 d.f.]      3010.73690
Significance level               .00000
McFadden Pseudo R-squared      .1784661
Estimation based on N =  28432, K =  20
Inf.Cr.AIC  =  13897.3 AIC/N =     .489
Model estimated: Jun 11, 2016, 15:05:44
Sample is  2 pds and  14216 individuals
Negative binomial regression model
```

JUSTINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-8.31143***	.51383	-16.18	.0000	-9.31852	-7.30434
LNLEN	.75201***	.02340	32.13	.0000	.70614	.79788
SRNDCR	-.11385***	.03188	-3.57	.0004	-.17633	-.05137
SRNDRTCR	.20079***	.05921	3.39	.0007	.08475	.31683
DEG1	.01499***	.00556	2.70	.0070	.00409	.02588
VCVL1	-17.2172***	3.63857	-4.73	.0000	-24.3492	-10.0851
VCVL16	1.48926**	.65526	2.27	.0230	.20498	2.77354
MCVMXSL1	-5.23454**	2.08924	-2.51	.0122	-9.32935	-1.13970
VCE	-.95572***	.25878	-3.69	.0002	-1.46291	-.44853
SRNDLT	-.03232***	.01036	-3.12	.0018	-.05261	-.01204
MCVL	-.00034***	.4766D-04	-7.15	.0000	-.00044	-.00025
VCVL	.00284***	.00062	4.61	.0000	.00168	.00408
SRNDRT	-.07995***	.01010	-7.92	.0000	-.09974	-.06017
MCVR	-.26816D-04***	.6833D-05	-3.90	.0001	-.40010D-04	-.13223D-04
	Means for random parameters					
LNADT	.92575***	.05180	18.00	.0000	.82762	1.02388
MCVMXSEL	.00419***	.00067	6.28	.0000	.00288	.00550
	Diagonal elements of Cholesky matrix					
LNADT	.01761***	.00270	6.53	.0000	.01232	.02290
MCVMXSEL	.00246***	.00035	7.02	.0000	.00177	.00315
	Below diagonal elements of Cholesky matrix					
1MCV_LNA	-.00238***	.00038	-6.26	.0000	-.00312	-.00163
	Dispersion parameter for NegBin distribution					
ScalParm	.30061***	.01611	18.66	.0000	.26903	.33218

Implied covariance matrix of random parameters

Covariance matrix

	LNADT	MCVMXSEL
LNADT	.3102E-03	
MCVMXSEL	-.4184E-04	.1169E-04

Implied standard deviations of random parameters

S.D_Beta	1
1	.0176182
2	.00341959

Implied correlation matrix of random parameters

Cor.Mat.	LNADT	MCVMXSEL
LNADT	1.00000	-.69472
MCVMXSEL	-.69472	1.00000

Random Parameter Negative Binomial Model of Low Injury Crashes on Four lane SPF Class Roadway Segments

```
Random Coefficients  NegBnReg Model
Dependent variable                LOINJ
Log likelihood function    -22355.67176
Restricted log likelihood  -49297.22976
Chi squared [   6 d.f.]     53883.11599
Significance level               .00000
McFadden Pseudo R-squared      .5465126
Estimation based on N =  28432, K =  24
Inf.Cr.AIC  =  44759.3 AIC/N =    1.574
Model estimated: Jun 09, 2016, 20:35:00
Sample is  2 pds and  14216 individuals
Negative binomial regression model
```

LOINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-7.20569***	.23995	-30.04	.0000	-7.67597	-6.73540
LNLEN	.81801***	.01281	63.85	.0000	.79290	.84312
MCVMXSEL	-5.86076***	.90289	-6.49	.0000	-7.63049	-4.09106
MCVL	5.86473***	.90288	6.50	.0000	4.09512	7.63434
SRNDRT	-.08410***	.00281	-29.85	.0000	-.08951	-.07859
RWYWIDEC	.00940***	.00218	4.30	.0000	.00512	.01369
VCVL	-.00067***	.6797D-04	-9.85	.0000	-.00080	-.00054
VCVRVCA	-.00086***	.00032	-2.71	.0067	-.00148	-.00024
MCVCRAN	.52927D-04***	.7564D-05	7.00	.0000	.38102D-04	.67752D-04
MCVFITYA	-.00115***	.00033	-3.52	.0004	-.00179	-.00051
VCFARMA	.09261***	.01098	8.93	.0000	.07132	.11390
MCVL1MI	-30967.1***	4767.192	-6.50	.0000	-40310.6	-21623.6
VCVL16	1.49973***	.36704	4.09	.0000	.78035	2.21911
DEG1	-.00269**	.00118	-2.28	.0226	-.00500	-.00038
	Means for random parameters					
LNADT	.96439***	.02347	41.08	.0000	.91838	1.01040
SRNDLTCR	-.02568***	.00707	-3.63	.0003	-.03953	-.01183
VCVFTGRA	.00343***	.00048	7.10	.0000	.00248	.00437
	Diagonal elements of Cholesky matrix					
LNADT	.04107***	.00192	21.37	.0000	.03730	.04483
SRNDLTCR	.04422***	.00753	5.87	.0000	.02947	.05898
VCVFTGRA	.00036*	.00019	1.99	.0488	-.00001	.00073
	Below diagonal elements of Cholesky matrix					
1SRN_LNA	.02406***	.00868	2.77	.0056	.00706	.04107
1VCV_LNA	-.00678***	.00032	-21.37	.0000	-.00740	-.00615
1VCV_SRN	-.00370***	.00024	-15.37	.0000	-.00418	-.00323
	Dispersion parameter for NegBin distribution					
ScalParm	.40400***	.00827	48.82	.0000	.38778	.42022

Implied covariance matrix of random parameters

Covariance matrix

	LNADT	SRNDLTCR	VCVFTGRA
LNADT	.1686E-02		
SRNDLTCR	.9881E-03	.2534E-02	
VCVFTGRA	-.2783E-03	-.3268E-03	.5976E-04

Implied standard deviations of random parameters

S.D_Beta	1
1	.0410666
2	.0503437
3	.00773046

Implied correlation matrix of random parameters

Cor.Mat.	LNADT	SRNDLTCR	VCVFTGRA
LNADT	1.00000	.47792	-.87650
SRNDLTCR	.47792	1.00000	-.83978
VCVFTGRA	-.87650	-.83978	1.00000

Random Parameter Negative Binomial Model of Total Crashes on Five lane SPF Class Roadway Segments

Random Coefficients NegBnReg Model
Dependent variable TOTALACC
Log likelihood function -2806.33527
Restricted log likelihood -8567.49290
Chi squared [6 d.f.] 11518.30926
Significance level .00000
McFadden Pseudo R-squared .6722100
Estimation based on N = 2246, K = 18
Inf.Cr.AIC = 5652.7 AIC/N = 2.517
Model estimated: Jun 12, 2016, 18:59:06
Sample is 2 pds and 1123 individuals
Negative binomial regression model

TOTALACC	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-6.02263***	.72078	-8.36	.0000	-7.43535	-4.60990
LNLEN	.85801***	.03887	22.07	.0000	.78182	.93419
HCVLIMI	-1.95320***	.40765	-4.81	.0000	-2.75824	-1.16016
SMWDRT	-.06140***	.01881	-3.25	.0012	-.09847	-.02433
VCVL1	-.00039***	.00014	-2.70	.0069	-.00067	-.00011
VCPARMA	.09541***	.03115	3.06	.0022	.03435	.15647
SMWDLTCR	.04079***	.01580	2.58	.0099	.00981	.07176
HCVMXSL1	-5.35864**	2.43812	-2.20	.0277	-10.13260	-.58709
	Means for random parameters					
LNADT	.90781***	.06922	13.11	.0000	.77214	1.04348
SMWDLT	-.07238***	.01953	-3.71	.0002	-.11065	-.03411
HCVCRAN	.00012***	.3107D-04	3.90	.0001	.00006	.00018
	Diagonal elements of Cholesky matrix					
LNADT	.07915***	.00507	15.61	.0000	.06921	.08909
SMWDLT	.03272***	.00768	4.26	.0000	.01766	.04779
HCVCRAN	.42789D-04**	.2078D-04	2.06	.0394	.19740D-05	.83401D-04
	Below diagonal elements of Cholesky matrix					
lSMW_LNA	.05057***	.01077	4.70	.0000	.02947	.07167
lHCV_LNA	.81279D-04**	.3993D-04	2.04	.0418	.30233D-05	.15953D-03
lHCV_SMW	-.63958D-04**	.2675D-04	-2.39	.0168	-.11638D-03	-.11596D-04
	Dispersion parameter for NegBin distribution					
ScalParm	.65548***	.03890	16.85	.0000	.57923	.73172

Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==> Significance at 1%, 5%, 10% level.

Implied covariance matrix of random parameters

Covariance matrix

	LNADT	SMWDLT	HCVCRAN
LNADT	.6265E-02		
SMWDLT	.4002E-02	.3623E-02	
HCVCRAN	.6433E-05	.2017E-05	.1252E-07

Implied standard deviations of random parameters

S.D_Beta	1
1	.0791490
2	.0602335
3	.111908E-03

Implied correlation matrix of random parameters

Cor.Mat.	LNADT	SMWDLT	HCVCRAN
LNADT	1.00000	.83955	.72630
SMWDLT	.83955	1.00000	.29927
HCVCRAN	.72630	.29927	1.00000

Random Parameter Negative Binomial Model of Property Damage Only Crashes on Five lane SPF Class Roadway Segments

Random Coefficients NegBnReg Model
Dependent variable PDO
Log likelihood function -2322.01655
Restricted log likelihood -5556.01361
Chi squared [6 d.f.] 6467.99405
Significance level .00000
McFadden Pseudo R-squared .5820715
Estimation based on N = 2246, K = 21
Inf.Cr.AIC = 4686.0 AIC/N = 2.086
Model estimated: Jun 11, 2016, 21:25:20
Sample is 2 pds and 1123 individuals
Negative binomial regression model

PDO	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-4.79525***	.83977	-5.71	.0000	-6.44520	-3.15536
LNLEN	.89394***	.04372	20.45	.0000	.80829	.97963
DEG1	.01698***	.00564	3.01	.0026	.00592	.02805
VCVL1	-3.06848***	.79650	-3.85	.0001	-4.62959	-1.50737
HCVLIMI	-1.33507***	.43890	-3.04	.0024	-2.19531	-.47484
VCVPTGRS	.00208**	.00090	2.30	.0216	.00031	.00385
HCVR	-.25202D-04**	.1249D-04	-2.02	.0436	-.49685D-04	-.71948D-06
VCPARMA	.11570***	.03645	3.17	.0015	.04425	.18714
HCVPTCVA	.00223***	.00067	3.33	.0009	.00092	.00354
SMWDCR	.11038**	.04376	2.52	.0117	.02460	.19615
RWYWDINC	-.01384**	.00603	-2.31	.0269	-.02616	-.00152
	Means for random parameters					
LNADT	.87319***	.07840	11.14	.0000	.71953	1.02685
RWYWDDEC	-.01548**	.00525	-2.55	.0107	-.02584	-.00314
SMWDRT	-.13196***	.01312	-10.05	.0000	-.15768	-.10623
	Diagonal elements of Cholesky matrix					
LNADT	.04359***	.01487	2.92	.0035	.01634	.06264
RWYWDDEC	.00576***	.00170	3.38	.0007	.00242	.00909
SMWDRT	.01146*	.00681	1.98	.0724	-.00189	.02481
	Below diagonal elements of Cholesky matrix					
lRWY_LNA	.00434	.00490	.89	.3754	-.00026	.01395
lSMW_LNA	.05827***	.01226	4.75	.0000	.03424	.08230
lSMW_RWY	.02578***	.00964	2.65	.0075	.00689	.04467
	Dispersion parameter for NegBin distribution					
ScalParm	.72346***	.05407	13.38	.0000	.61748	.82944

Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==> Significance at 1%, 5%, 10% level.

Implied covariance matrix of random parameters

Covariance matrix

	LNADT	RWYWDDEC	SMWDRT
LNADT	.2459E-02		
RWYWDDEC	.2134E-03	.5198E-04	
SMWDRT	.2890E-02	.4018E-03	.4132E-02

Implied standard deviations of random parameters

S.D_Beta	1
1	.0495911
2	.00721071
3	.0647434

Implied correlation matrix of random parameters

Cor.Mat.	LNADT	RWYWDDEC	SMWDRT
LNADT	1.00000	.60235	.90006
RWYWDDEC	.60235	1.00000	.56002
SMWDRT	.90006	.56002	1.00000

Random Parameter Negative Binomial Model of Possible Injury Crashes on Five lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                  PINJ
Log likelihood function     -1335.56851
Restricted log likelihood   -2131.17166
Chi squared [   6 d.f.]      1591.20671
Significance level               .00000
McFadden Pseudo R-squared      .3733173
Estimation based on N =   2246, K =  16
Inf.Cr.AIC  =   2703.1 AIC/N =    1.204
Model estimated: Jun 12, 2016, 19:17:40
Sample is  2 pds and   1123 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
    PINJ|  Coefficient       Error       z    |z|>Z*        Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -6.17706***     1.06697    -5.87  .0000    -8.31143  -4.04273
   LNLEN|     .82754***      .05315    15.57  .0000      .72338    .93170
    DEG1|     .02238**       .01029     2.17  .0298      .00221    .04254
HCVPTCVA|     .00182*        .00109     1.97  .0653     -.00032    .00397
    HCVL|    -.00040***      .00012    -3.20  .0014     -.00064   -.00015
RWYWDINC|    -.01709**       .00817    -2.09  .0366     -.03310   -.00108
        |Means for random parameters
   LNADT|     .90776***      .10846     8.37  .0000      .69517   1.12034
RWYWDDEC|    -.01863**       .00791    -2.36  .0185     -.03413   -.00313
  SHWDRT|    -.14855***      .01614    -5.25  .0000     -.18513   -.11403
        |Diagonal elements of Cholesky matrix
   LNADT|     .00368**       .00155     2.37  .0176      .00064    .00673
RWYWDDEC|     .01039***      .00230     4.50  .0000      .00583    .01489
  SHWDRT|     .02633***      .00897     2.93  .0033      .00875    .04391
        |Below diagonal elements of Cholesky matrix
lRWY_LNA|     .00873         .00771     1.13  .2578     -.00638    .02384
lSHW_LNA|     .01078         .01960      .55  .5823     -.02764    .04921
lSHW_RWY|     .05028***      .01442     3.49  .0005      .02202    .07855
        |Dispersion parameter for NegBin distribution
ScalParm|     .54977***      .05990     9.27  .0000      .43355    .66598
--------+--------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------
            LNADT       RWYWDDEC       SHWDRT
--------+--------------------------------------------
LNADT      .4197E-05
RWYWDDEC   .1789E-04   .1830E-03
SHWDRT     .2209E-04   .6137E-03   .3338E-02

Implied standard deviations of random parameters

S.D_Beta|            1
--------+--------------
       1|    .00367890
       2|     .0135257
       3|     .0577747

Implied correlation matrix of random parameters

--------+--------------------------
Cor.Mat.|   LNADT RWYWDDEC   SHWDRT
--------+--------------------------
   LNADT| 1.00000   .64546   .18663
RWYWDDEC|  .64546  1.00000   .78523
  SHWDRT|  .18663   .78523  1.00000
```

Random Parameter Negative Binomial Model of Evident Injury Crashes on Five lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                   EVI
Log likelihood function     -1257.41432
Restricted log likelihood   -1390.45937
Chi squared [   6 d.f.]       266.09130
Significance level               .00000
McFadden Pseudo R-squared      .0956716
Estimation based on N =   2246, K =  18
Inf.Cr.AIC  =   2550.8 AIC/N =     .471
Model estimated: Jun 20, 2016, 20:49:45
Sample is  2 pds and   2709 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
     EVI|  Coefficient       Error       z    |z|>Z*        Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|     .47986        1.87555     2.30  .0207    -2.60813   3.56789
HCVLIMI |   -3.70270***      .84139    -4.40  .0000    -5.35180  -2.05360
HCVMKSEL|     .00391**       .00163     2.39  .0168      .00071    .00711
RWYWDINC|    -.03929***      .00995    -3.95  .0001     -.05880   -.01978
  VCVL13|   -4.94121***     1.31474    -3.76  .0002    -7.51806  -2.36437
NOFLDEC |   -1.48823***      .39546    -3.76  .0002    -2.26333   -.71314
    DEG1|    -.02362**       .01012    -2.33  .0196     -.04344   -.00379
        |Means for random parameters
   LNADT|     .65064***      .09162     6.95  .0000      .48106    .82022
  SHWDRT|    -.15622***      .01321   -11.82  .0000     -.18212   -.13033
   LNLEN|     .86143***      .04519    19.06  .0000      .77286    .95001
        |Diagonal elements of Cholesky matrix
   LNADT|     .02863**       .01347     2.13  .0335      .00224    .05502
  SHWDRT|     .02312**       .01112     2.08  .0376      .00132    .04491
   LNLEN|     .06081***      .01898     2.76  .0057      .01478    .08684
        |Below diagonal elements of Cholesky matrix
lSHW_LNA|     .03151*        .01644     1.92  .0553     -.00071    .06373
lLNL_LNA|    -.09475*        .05618    -1.75  .0801     -.20088    .01138
lLNL_SHW|     .01280         .03151      .41  .6845     -.04886    .07456
        |Dispersion parameter for NegBin distribution
ScalParm|    1.35907***      .36485     3.73  .0002      .64335   2.07415
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------
            LNADT        SHWDRT        LNLEN
--------+--------------------------------------------
LNADT      .8198E-03
SHWDRT     .9023E-03   .1527E-02
LNLEN     -.2713E-02  -.2690E-02   .1172E-01

Implied standard deviations of random parameters

S.D_Beta|            1
--------+--------------
       1|     .0286321
       2|     .0390822
       3|      .108273

Implied correlation matrix of random parameters

--------+--------------------------
Cor.Mat.|   LNADT   SHWDRT    LNLEN
--------+--------------------------
   LNADT| 1.00000   .80631  -.87509
  SHWDRT|  .80631  1.00000  -.63565
   LNLEN| -.87509  -.63565  1.00000
```

Random Parameter Negative Binomial Model of Serious Injury Crashes on Five lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                SINJ
Log likelihood function     -139.70752
Restricted log likelihood   -145.98040
Chi squared [   1 d.f.]       12.54576
Significance level              .00040
McFadden Pseudo R-squared     .0428707
Estimation based on N =   2246, K =   8
Inf.Cr.AIC  =    295.4 AIC/N =    .132
Model estimated: Jun 12, 2016, 14:13:22
Sample is  2 pds and   1123 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
    SINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|    1.01682***      .24266     4.19  .0000      .54160   1.49203
   LNADT|     .00648**       .00305     2.12  .0338      .00051    .01246
  SHNDLT|    -.14501**       .05926    -2.45  .0144     -.26116   -.02886
SHNDRTCR|    -.28528         .17368    -1.83  .0828     -.62369    .05712
SHNDLTCR|     .25960**       .12861     2.02  .0434      .00772    .51147
        |Means for random parameters
   LNLEN|    1.03507***      .26033     3.98  .0001      .52483   1.54531
        |Scale parameters for dists. of random parameters
   LNLEN|     .12253*        .06672     1.98  .0646     -.01218    .25722
        |Dispersion parameter for NegBin distribution
ScalParm|     .25193**       .12818     1.97  .0494      .00070    .50316
--------+--------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

Random Parameter Negative Binomial Model of Unknown Injury Crashes on Five lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  Poisson  Model
Dependent variable             UNKNOWN
Log likelihood function      -83.86093
Restricted log likelihood  -2246.00000
Chi squared [   1 d.f.]     4324.27814
Significance level              .00000
McFadden Pseudo R-squared     .9626621
Estimation based on N =   2246, K =   4
Inf.Cr.AIC  =    175.7 AIC/N =    .078
Model estimated: Jun 12, 2016, 22:28:31
Sample is  2 pds and   1123 individuals
POISSON regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
 UNKNOWN|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -2.12884**       .87747    -2.43  .0152    -3.84968   -.41002
  SHNDRT|    -.14937**       .06028    -2.48  .0132     -.26753   -.03122
        |Means for random parameters
   LNLEN|     .63656***      .23976     2.65  .0079      .16666   1.10645
        |Scale parameters for dists. of random parameters
   LNLEN|    1.63070**       .25132     2.51  .0121      .13812   1.12325
--------+--------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

Random Parameter Negative Binomial Model of High Injury Crashes on Five lane SPF Class Roadway Segments

```
--------------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                 HIINJ
Log likelihood function       -702.75831
Restricted log likelihood     -814.35544
Chi squared [   6 d.f.]        223.19426
Significance level                .00000
McFadden Pseudo R-squared       .1370348
Estimation based on N =   2246, K =  13
Inf.Cr.AIC  =   1431.6 AIC/N =      .637
Model estimated: Jun 12, 2016, 22:58:04
Sample is  2 pds and   1123 individuals
Negative binomial regression model
--------+-----------------------------------------------------------------------
        |                 Standard            Prob.      95% Confidence
   HIINJ|  Coefficient      Error        z    |z|>Z*        Interval
--------+-----------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -7.83720***     1.37126     -5.72  .0000   -10.52453  -5.14558
  SHWDRT|    -.07965***      .01782     -4.47  .0000     -.11459   -.04472
    HCVR|    -.00015***   .4681D-04     -3.20  .0014     -.00024   -.00006
        |Means for random parameters
   LNLEN|     .85330***      .06803     12.54  .0000      .71998    .98664
   LNADT|     .86374***      .12690      6.81  .0000      .61502   1.11246
HCVMKSEL|     .00427**       .00200      2.13  .0329      .00035    .00819
        |Diagonal elements of Cholesky matrix
   LNLEN|     .05723         .05680      2.02  .0394     -.05312    .16787
   LNADT|     .02624**       .01135      2.31  .0208      .00399    .04849
HCVMKSEL|     .00219**       .00094      2.33  .0200      .00035    .00404
        |Below diagonal elements of Cholesky matrix
lLNA_LNL|    -.02657         .02391     -1.11  .2666     -.07343    .02030
lHCV_LNL|     .00635***      .00208      3.06  .0022      .00228    .01042
lHCV_LNA|    -.00189         .00185     -1.02  .3075     -.00553    .00174
        |Dispersion parameter for NegBin distribution
ScalParm|    1.08039***      .29096      3.71  .0002      .51012   1.65065
--------+-----------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
--------------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------------------------------
                 LNLEN        LNADT     HCVMKSEL
--------+-----------------------------------------------------------------------
LNLEN       .3275E-02
LNADT      -.1620E-02   .1584E-02
HCVMKSEL    .9635E-03  -.2164E-03   .4874E-04

Implied standard deviations of random parameters

S.D_Beta|             1
--------+--------------
       1|      .0572244
       2|      .0573401
       3|     .00698187

Implied correlation matrix of random parameters

--------+-------------------------
Cor.Mat.|    LNLEN     LNADT HCVMKSEL
--------+-------------------------
   LNLEN| 1.00000  -.71144   .90978
   LNADT| -.71144  1.00000  -.83774
HCVMKSEL|  .90978  -.83774  1.00000
```

Random Parameter Negative Binomial Model of Just Injury Crashes on Five lane SPF Class Roadway Segments

```
--------------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable               JUSTINJ
Log likelihood function       -526.23322
Restricted log likelihood    -1074.34630
Chi squared [   6 d.f.]        496.21616
Significance level                .00000
McFadden Pseudo R-squared       .2308331
Estimation based on N =   2246, K =  16
Inf.Cr.AIC  =   1684.5 AIC/N =      .750
Model estimated: Jun 12, 2016, 23:08:05
Sample is  2 pds and   1123 individuals
Negative binomial regression model
--------+-----------------------------------------------------------------------
        |                 Standard            Prob.      95% Confidence
 JUSTINJ|  Coefficient      Error        z    |z|>Z*        Interval
--------+-----------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -5.04651***     1.43556     -3.51  .0005    -7.86663  -2.22640
HCVMKSL1|  -11.4440**       4.78427     -2.39  .0168   -20.8248   -2.0631
    HCVL|    -.00035**       .00015     -2.26  .0240     -.00065   -.00005
RWYMDINC|    -.02229**       .00956     -2.33  .0197     -.04102   -.00356
     VCR|   -2.22005        1.37875     -1.91  .0574    -4.92246    .48225
 HCVCRAW|     .00018***   .1697D-04      3.22  .0012      .00007    .00030
        |Means for random parameters
   LNLEN|     .85461***      .07745     11.03  .0000      .70274   1.00647
   LNADT|     .69578***      .13481      5.10  .0000      .42862    .96294
  SHWDLT|    -.16209***      .01962     -8.26  .0000     -.20055   -.12362
        |Diagonal elements of Cholesky matrix
   LNLEN|     .24374***      .07120      3.42  .0006      .10420    .38328
   LNADT|     .02725**       .01277      2.13  .0328      .00223    .05228
  SHWDLT|     .02737**       .01206      2.27  .0232      .00374    .05100
        |Below diagonal elements of Cholesky matrix
lLNA_LNL|    -.05561*        .03082     -1.80  .0712     -.11602    .00480
lSHW_LNL|    -.01015         .03087      -.33  .7431     -.07065    .05035
lSHW_LNA|     .04722**       .02380      1.98  .0473      .00057    .09387
        |Dispersion parameter for NegBin distribution
ScalParm|     .48960***      .08082      6.06  .0000      .33121    .64800
--------+-----------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
--------------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------------------------------
                 LNLEN        LNADT       SHWDLT
--------+-----------------------------------------------------------------------
LNLEN       .5941E-01
LNADT      -.1355E-01   .3835E-02
SHWDLT     -.2474E-02   .1851E-02   .3082E-02

Implied standard deviations of random parameters

S.D_Beta|             1
--------+--------------
       1|       .243736
       2|      .0619273
       3|      .0555125

Implied correlation matrix of random parameters

--------+-------------------------
Cor.Mat.|    LNLEN     LNADT   SHWDLT
--------+-------------------------
   LNLEN| 1.00000  -.69785  -.18282
   LNADT| -.69785  1.00000   .53851
  SHWDLT| -.18282   .53851  1.00000
```

Random Parameter Negative Binomial Model of Low Injury Crashes on Five lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable               LOINJ
Log likelihood function    -2518.12030
Restricted log likelihood  -6666.33414
Chi squared [   6 d.f.]     8296.42768
Significance level              .00000
McFadden Pseudo R-squared     .6222681
Estimation based on N =   2246, K =  20
Inf.Cr.AIC  =   5076.2 AIC/N =    2.260
Model estimated: Jun 13, 2016, 18:38:15
Sample is  2 pds and   1123 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
   LOINJ|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -4.47850***      .82804     -5.41  .0000     -6.10143  -2.85558
MCVMXSL1|   -4.81168*       2.54727     -1.89  .0489     -9.80442    .18067
    MCVL|    -.00046***   .8280D-04     -5.60  .0000      -.00063   -.00030
RWYMDDEC|    -.01114**       .00454     -2.45  .0141      -.02003   -.00224
     VCM|   -1.24594**       .51778     -2.41  .0161     -2.26077   -.23111
  SHWDRT|    -.06747***      .01955     -3.45  .0006      -.10579   -.02918
MCVPTTYA|     .00173**       .00076      2.27  .0229       .00024    .00323
  SHWDLT|    -.07252***      .02038     -3.56  .0001      -.11543   -.03561
 MCVGRAN|     .00011***   .3114D-04      3.57  .0004       .00005    .00017
VCVPTGRE|     .00224***      .00076      2.95  .0031       .00075    .00372
        |Means for random parameters
   LNLEN|     .91675***      .04424     20.72  .0000       .83004   1.00345
   LNADT|     .82019***      .07928     10.35  .0000       .66480    .97558
  SHWDCR|     .01827*        .00948      1.97  .0540      -.00031    .03684
        |Diagonal elements of Cholesky matrix
   LNLEN|     .28809***      .04438      6.49  .0000       .20112    .37507
   LNADT|     .02183***      .00472      4.63  .0000       .01259    .03108
  SHWDCR|     .02296***      .00849      2.70  .0068       .00632    .03960
        |Below diagonal elements of Cholesky matrix
lLNA_LNL|    -.05816***      .01758     -3.32  .0009      -.09252   -.02380
lSHW_LNL|    -.00608         .01377      -.44  .6590      -.03307    .02091
lSHW_LNA|     .02628**       .01033      2.54  .0109       .00604    .04652
        |Dispersion parameter for NegBin distribution
ScalParm|     .70148***      .04734     14.82  .0000       .60867    .79428
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==> Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
              LNLEN        LNADT       SHWDCR
--------+--------------------------------------------------------------------
LNLEN       .8300E-01
LNADT      -.1675E-01   .8859E-02
SHWDCR     -.1751E-02   .9272E-03   .1255E-02

Implied standard deviations of random parameters

S.D_Beta|              1
--------+---------------
       1|       .288084
       2|       .0621198
       3|       .0354211


Implied correlation matrix of random parameters


--------+---------------------------
Cor.Mat.|    LNLEN    LNADT   SHWDCR
--------+---------------------------
   LNLEN| 1.00000  -.93619  -.17157
   LNADT| -.93619  1.00000   .42141
  SHWDCR| -.17157   .42141  1.00000
```

Random Parameter Negative Binomial Model of Total Crashes on Six lane SPF Class Roadway Segments

```
Random Coefficients  NegBnReg Model
Dependent variable            TOTALACC
Log likelihood function    -6022.47524
Restricted log likelihood -19514.31303
Chi squared [   6 d.f.]    26983.66568
Significance level              .00000
McFadden Pseudo R-squared     .6919815
Estimation based on N =   5418, K =  21
Inf.Cr.AIC  =  12087.0 AIC/N =    2.231
Model estimated: Jun 15, 2016, 22:01:29
Sample is  2 pds and   2709 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
TOTALACC|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -5.01825***      .41842    -11.99  .0000     -5.83835  -4.19816
   LNLEN|     .91388***      .02002     45.65  .0000       .87460    .95307
 HCVL1MI|   -2.92927***      .28492    -10.28  .0000     -3.48771  -2.37083
 HCVGRAN| .85598D-04***   .1568D-04      5.26  .0000   .52998D-04 .11468D-03
   VCVL1|   -2.53173***      .47968     -5.28  .0000     -3.47228  -1.59118
VCPARMA|      .09202***      .01988      4.63  .0000       .05306    .13097
MCVMXSEL|     .00334***      .00078      4.55  .0000       .00180    .00479
RWYMDDEC|    -.02915***      .00483     -6.03  .0000      -.03862   -.01968
 VCVL16|    1.26527***       .46626      2.73  .0063       .35537   2.17516
 VCVL11|    3.39912**       1.43643      2.37  .0178       .58775   6.21049
    DEG1|    -.01007***      .00383     -2.63  .0087      -.01758   -.00255
        |Means for random parameters
   LNADT|     .94193***      .04013     23.47  .0000       .86327   1.02059
  SHWDRT|    -.12645***      .00602    -21.00  .0000      -.13826   -.11465
SHWDLTCR|    -.02577***      .00734     -3.51  .0004      -.04014   -.01139
        |Diagonal elements of Cholesky matrix
   LNADT|     .04592***      .00420     10.93  .0000       .03769    .05416
  SHWDRT|     .01115**       .00487      2.29  .0220       .00161    .02070
SHWDLTCR|     .01306***      .00470      2.78  .0055       .00384    .02226
        |Below diagonal elements of Cholesky matrix
lSHW_LNA|    -.02542***      .00704     -3.61  .0003      -.03921   -.01163
lSHW_LNA|     .02411**       .00983      2.45  .0142       .00484    .04338
lSHW_SHW|    -.04910***      .00848     -5.79  .0000      -.06573   -.03247
        |Dispersion parameter for NegBin distribution
ScalParm|     .70486***      .02883     24.45  .0000       .64835    .76137
--------+--------------------------------------------------------------------
```

```
Covariance  matrix
--------+--------------------------------------------------------------------
              LNADT       SHWDRT     SHWDLTCR
--------+--------------------------------------------------------------------
LNADT       .2109E-02
SHWDRT     -.1167E-02   .7708E-03
SHWDLTCR    .4024E-03  -.3462E-03   .3698E-03

Implied standard deviations of random parameters

S.D_Beta|              1
--------+---------------
       1|       .0459228
       2|       .0277599
       3|       .0192247


Implied correlation matrix of random parameters


--------+---------------------------
Cor.Mat.|    LNADT   SHWDRT SHWDLTCR
--------+---------------------------
   LNADT| 1.00000  -.91571   .45577
  SHWDRT| -.91571  1.00000  -.64871
SHWDLTCR|  .45577  -.64871  1.00000


-------------------------------------------------------------
```

Random Parameter Negative Binomial Model of Property Damage Only Crashes on Six lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                  PDO
Log likelihood function     -4927.61070
Restricted log likelihood  -12410.02428
Chi squared [   6 d.f.]     14964.82718
Significance level               .00000
McFadden Pseudo R-squared      .6029530
Estimation based on N =   5418, K =  20
Inf.Cr.AIC  =   9895.2 AIC/N =    1.826
Model estimated: Jun 16, 2016, 19:37:16
Sample is  2 pds and   2700 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
     PDO|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -5.97102***     .47915   -12.46  .0000    -6.91014  -5.03190
   LNLEN|     .89579***     .02219    40.37  .0000      .85230    .93928
 MCVLIMI|   -2.25446***     .30125    -7.48  .0000    -2.84489  -1.66404
 MCVCRAN| .62296D-04***  .15490D-04    3.57  .0008  .28051D-04  .85561D-04
  SHNDCR|    -.01085***     .00401    -2.70  .0068     -.01872   -.00299
   VCVL1|   -1.14085***     .37591    -3.04  .0024    -1.87646   -.40524
 VCPARMA|     .08151***     .02004     4.07  .0000      .04223    .12079
SHYNDINC|    -.03556***     .00498    -7.13  .0000     -.04552   -.02579
    DES1|    -.00086**      .00038    -2.28  .0246     -.00161   -.00011

 VCVEVCA|    -.00077**      .00038    -2.03  .0429     -.00152   -.00002
        |Means for random parameters
   LNADT|     .98979***     .04462    22.18  .0000      .90229   1.07720
  SHNDRT|    -.12180***     .00648   -18.80  .0000     -.13449   -.10910
MCVMXSEL|     .00269***     .00079     3.41  .0007      .00114    .00423
        |Diagonal elements of Cholesky matrix
   LNADT|     .05226***     .00552     9.48  .0000      .04147    .06309
  SHNDRT|     .04408***     .00470     9.37  .0000      .03487    .05330
MCVMXSEL|     .00055*       .00028     1.97  .0516      .00000    .00110
        |Below diagonal elements of Cholesky matrix
1SHN_LNA|    -.00426        .00729     -.58  .5596     -.01854    .01003
1MCV_LNA|    -.00535***     .00071    -7.54  .0000     -.00674   -.00396
1MCV_SHN|     .00572***     .00051    11.25  .0000      .00472    .00672
        |Dispersion parameter for NegBin distribution
ScalParm|     .81418***     .04185    19.45  .0000      .73215    .89620
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
             LNADT        SHNDRT     MCVMXSEL
--------+--------------------------------------------------------------------
LNADT      .2733E-02
SHNDRT    -.2224E-03   .1961E-02
MCVMXSEL  -.2796E-03   .2748E-03   .6166E-04

Implied standard deviations of random parameters

S.D_Beta|            1
--------+--------------
       1|      .0522910
       2|      .0442874
       3|     .00785124

Implied correlation matrix of random parameters

--------+---------------------------
Cor.Mat.|   LNADT   SHNDRT MCVMXSEL
--------+---------------------------
   LNADT| 1.00000  -.09606  -.68156
  SHNDRT| -.09606  1.00000   .79050
MCVMXSEL| -.68156   .79050  1.00000
```

Random Parameter Negative Binomial Model of Possible Injury Crashes on Six lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                 PINJ
Log likelihood function    -10882.94784
Restricted log likelihood  -15746.71303
Chi squared [   6 d.f.]      9727.53037
Significance level               .00000
McFadden Pseudo R-squared      .3088749
Estimation based on N =   5418, K =  18
Inf.Cr.AIC  =  21803.9 AIC/N =    [illegible]
Model estimated: Jun 06, 2016, 14:31:26
Sample is  2 pds and   2709 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
    PINJ|  Coefficient       Error       z    |z|>Z*          Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -8.69880***     .38941   -22.34  .0000    -9.46204  -7.93557
   LNLEN|     .75609***     .01846    41.07  .0000      .72191    .79426
 MCVLIMI|   -3.83132***     .14887   -16.77  .0000    -8.14231  -2.50034
    VCVL|    -.00047***   .8441D-04   -5.58  .0000     -.00064   -.00031
MCVMXSEL|     .00297***     .00049     6.09  .0000      .00202    .00393
  SHNDCR|    -.01685***     .00509    -3.26  .0012     -.02468   -.00657
        |Means for random parameters
   LNADT|    1.00617***     .03751    26.88  .0000      .93468   1.08160
VCVPTGRB|     .00262***     .00056     4.66  .0000      .00151    .00372
  SHNDLT|    -.10457***     .00523   -20.05  .0000     -.11513   -.09482
        |Diagonal elements of Cholesky matrix
   LNADT|     .03966***     .00359    11.05  .0000      .03263    .04670
VCVPTGRB|     .00154***     .00041     3.79  .0002      .00075    .00234
  SHNDLT|     .01000***     .00308     3.26  .0012      .00398    .01603
        |Below diagonal elements of Cholesky matrix
1VCV_LNA|    -.00089        .00055    -1.61  .1066     -.00197    .00019
1SHN_LNA|     .01117*       .00584     1.91  .0560     -.00029    .02262
1SHN_VCV|    -.01416***     .00425    -3.33  .0009     -.02249   -.00582
        |Dispersion parameter for NegBin distribution
ScalParm|     .30907***     .01087    28.45  .0000      .28777    .33036
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==> Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
             LNADT      VCVPTGRB       SHNDLT
--------+--------------------------------------------------------------------
LNADT      .1573E-02
VCVPTGRB  -.3522E-04   .3172E-05
SHNDLT     .4428E-03  -.3177E-04   .4251E-03

Implied standard deviations of random parameters

S.D_Beta|            1
--------+--------------
       1|      .0396603
       2|     .00178112
       3|      .0206183

Implied correlation matrix of random parameters

--------+---------------------------
Cor.Mat.|   LNADT VCVPTGRB   SHNDLT
--------+---------------------------
   LNADT| 1.00000  -.49861   .54151
VCVPTGRB| -.49861  1.00000  -.86518
  SHNDLT|  .54151  -.86518  1.00000
```

Random Parameter Negative Binomial Model of Evident Injury Crashes on Six lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients   NegBnReg Model
Dependent variable                 EVI
Log likelihood function    -1257.41432
Restricted log likelihood  -1390.43997
Chi squared [    6 d.f.]     266.05130
Significance level              .00000
McFadden Pseudo R-squared     .0956716
Estimation based on N =   5418, K =  18
Inf.Cr.AIC  =   2550.8 AIC/N =    .471
Model estimated: Jun 20, 2016, 20:52:41
Sample is  2 pds and   2709 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
     EVI|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -5.84288***      .74789    -7.81  .0000    -7.30871  -4.37705
 NCVLINI|   -3.70270***      .84138    -4.40  .0000    -5.35180  -2.05360
MCVMXSEL|     .00391**       .00163     2.39  .0168      .00071    .00711
BWYWDINC|    -.03929***      .00995    -3.95  .0001     -.05880   -.01978
  VCVL13|   -4.94121***     1.31474    -3.76  .0002    -7.51806  -2.36437
 NCVCRAD| .997210D-04*    .50770D-04    1.97  .0652 -.174130D-06 .216660D-03
 HSFLDEC|   -1.48823***      .39646    -3.76  .0002    -2.26523   -.71014
    DEG1|    -.02362**       .01012    -2.33  .0196     -.04346   -.00379
        |Means for random parameters
  LNADT |     .64064***      .09162     6.99  .0000      .46106    .82022
  SHWDRT|    -.15622***      .01321   -11.82  .0000     -.18212   -.13033
  LNLEN |     .86143***      .04519    19.06  .0000      .77286    .95001
        |Diagonal elements of Cholesky matrix
  LNADT |     .02963**       .01347     2.13  .0336      .00224    .05502
  SHWDRT|     .02312**       .01112     2.08  .0376      .00132    .04491
  LNLEN |     .05051***      .01535     2.76  .0057      .01475    .08654
        |Below diagonal elements of Cholesky matrix
1SHW_1NA|     .03151*        .01646     1.92  .0553     -.00071    .06373
1LNL_1NA|    -.09475*        .05415    -1.75  .0801     -.20086    .01136
1LNL_SHW|     .01280         .03151      .41  .6845     -.04898    .07456
        |Dispersion parameter for NegBin distribution
ScalParm|    1.35907***      .36488     3.73  .0002      .64398   2.07415
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------
              LNADT        SHWDRT        LNLEN
--------+--------------------------------------------------------------
LNADT      .8196E-03
SHWDRT     .9023E-03    .1527E-02
LNLEN     -.2713E-02   -.2690E-02    .1172E-01

Implied standard deviations of random parameters

S.D_Beta|               1
--------+-----------------
       1|        .0286321
       2|        .0390822
       3|         .108273

Implied correlation matrix of random parameters

--------+------------------------------
Cor.Mat.|    LNADT    SHWDRT     LNLEN
--------+------------------------------
   LNADT| 1.00000    .80631   -.87509
  SHWDRT|  .80631   1.00000   -.63546
   LNLEN| -.87509   -.63546   1.00000
```

Random Parameter Negative Binomial Model of Serious Injury Crashes on Six lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients   NegBnReg Model
Dependent variable                SINJ
Log likelihood function     -362.54124
Restricted log likelihood   -363.37498
Chi squared [    1 d.f.]       1.66748
Significance level              .19660
McFadden Pseudo R-squared     .0022944
Estimation based on N =   5418, K =   8
Inf.Cr.AIC  =    741.1 AIC/N =    .137
Model estimated: Jun 16, 2016, 19:49:44
Sample is  2 pds and   2709 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
    SINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -2.03328***      .01485    -2.64  .0083     -.06645   -.01010
  1NLEN |     .77646***      .10048     7.73  .0000      .57951    .97341
  SHWDRT|    -.14474***      .03392    -4.27  .0000     -.21122   -.07827
BWYWDINC|    -.10065***      .03278    -3.07  .0021     -.16481   -.03649
    DEG1|     .02746*        .01836     1.89  .0342     -.00248    .00762
        |Means for random parameters
  LNADT |     .47600**       .23563     2.02  .0433      .01437    .93762
        |Scale parameters for dists. of random parameters
  LNADT |     .02625**       .01047     2.51  .0122      .00572    .04678
        |Dispersion parameter for NegBin distribution
ScalParm|   -2.53531*       1.53101    -1.66  .0977    -5.53602    .46541
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

Random Parameter Negative Binomial Model of Unknown Injury Crashes on Six lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable               UNKNOWN
Log likelihood function      -288.12453
Restricted log likelihood    -261.69146
Chi squared [   2 d.f.]         5.13430
Significance level               .02346
McFadden Pseudo R-squared      .0098096
Estimation based on N =   5418, K =   7
Inf.Cr.AIC  =    592.2 AIC/N =     .098
Model estimated: Jun 17, 2016, 23:11:52
Sample is  2 pds and   2709 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                Standard            Prob.      95% Confidence
 UNKNOWN|  Coefficient     Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -4.21247      2.76711   -1.52  .0878   -9.63591   1.21097
   LNADT|     .51027**     .24035    2.12  .0337     .03923    .98131
   LNLEN|    1.01072***    .11503    8.79  .0000     .78525   1.23618
  SHWDRT|    -.11649***    .03181   -3.67  .0002    -.17724   -.05574
        |Means for random parameters
RWYMDINC|    -.06210**     .02531   -2.45  .0142    -.11171   -.01248
        |Scale parameters for dists. of random parameters
RWYMDINC|     .00663**     .00342    2.52  .0118     .00192    .01534
        |Dispersion parameter for NegBin distribution
ScalParm|    5.14064*     2.92895    1.76  .0792    -.40000  10.88129
--------+--------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

Random Parameter Negative Binomial Model of High Injury Crashes on Six lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                HIINJ
Log likelihood function     -1645.08154
Restricted log likelihood   -1915.80341
Chi squared [   6 d.f.]       545.44294
Significance level               .00000
McFadden Pseudo R-squared      .1420836
Estimation based on N =   5418, K =  17
Inf.Cr.AIC  =   3320.2 AIC/N =     .613
Model estimated: Jun 15, 2016, 21:01:06
Sample is  2 pds and   2709 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                Standard            Prob.      95% Confidence
   HIINJ|  Coefficient     Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -6.75413***     .77946   -8.70  .0000   -8.31180  -5.23643
 HCVLINI|   -1.03381***     .39031   -2.65  .0081   -1.79590   -.26881
  SHWDRT|    -.08727***     .01216   -7.18  .0000    -.11110   -.06344
   VCVL1|   -2.81755***     .77826   -3.62  .0003   -4.34517  -1.29052
  VCVL16|    3.05877***     .87061    3.51  .0004    1.35260   4.76499
RWYMDINC|    -.02899***     .00749   -3.87  .0001    -.04366   -.01430
  VCVL12|    3.83426***    1.42220    2.70  .0070    1.04679   6.62172
        |Means for random parameters
   LNLEN|     .81445***     .03582   22.67  .0000     .74404    .88482
SHWDRTCR|    -.04423***     .01525   -2.90  .0037    -.07412   -.01434
   LNADT|     .81773***     .07824   10.45  .0000     .66436    .97108
        |Diagonal elements of Cholesky matrix
   LNLEN|     .06355        .03272    1.94  .0678    -.01387    .14176
SHWDRTCR|     .04720***     .01485    2.89  .0039     .01514    .07923
   LNADT|     .00943**      .00425    2.22  .0266     .00110    .01776
        |Below diagonal elements of Cholesky matrix
lSHW_LNL|     .05298**      .02077    2.55  .0108     .01225    .09368
lLNA_LNL|    -.00608        .01340    -.45  .6499    -.03233    .02017
lLNA_SHW|    -.01128*       .00677   -1.67  .0957    -.02455    .00199
        |Dispersion parameter for NegBin distribution
ScalParm|    1.28613***     .14625    8.35  .0000     .73028   1.98198
--------+--------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
              LNLEN    SHWDRTCR      LNADT
--------+--------------------------------------------------------------------
LNLEN       .4061E-02
SHWDRTCR    .3383E-02   .5032E-02
LNADT      -.3554E-03  -.3544E-03   .2531E-03

Implied standard deviations of random parameters

S.D_Beta|           1
--------+-------------
       1|     .0635541
       2|     .0709349
       3|     .0159094


Implied correlation matrix of random parameters

--------+-------------------------
Cor.Mat.|   LNLEN SHWDRTCR    LNADT
--------+-------------------------
   LNLEN| 1.00000   .74653  -.35211
SHWDRTCR|  .74653  1.00000  -.75706
   LNADT| -.35211  -.75706  1.00000
```

Random Parameter Negative Binomial Model of Just Injury Crashes on Six lane SPF Class Roadway Segments

```
--------------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                JUSTINJ
Log likelihood function     -1708.81495
Restricted log likelihood   -2196.54106
Chi squared [   6 d.f.]       975.45386
Significance level               .00000
McFadden Pseudo R-squared      .2220431
Estimation based on N =   5418, K =  20
Inf.Cr.AIC  =   3457.6 AIC/N =     .638
Model estimated: Jun 20, 2016, 20:01:16
Sample is  2 pds and   2709 individuals
Negative binomial regression model
--------+-----------------------------------------------------------------------
        |                 Standard            Prob.       95% Confidence
 JUSTINJ|  Coefficient      Error        z   |z|>Z*          Interval
--------+-----------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -8.09561***     1.01753    -7.96  .0000  -10.09256   -6.10467
   LNLEN|     .84841***      .04101    20.69  .0000     .76502     .92879
 HCVLINE|   -3.95442***      .74975    -5.27  .0000   -5.42390   -2.48493
  SHWDRT|    -.21180***      .01768   -11.97  .0000    -.24648    -.17712
 RWYNDINC|   -.06852***      .00797    -7.84  .0000    -.07419    -.04289
    DESI|    -.02001**       .00959    -2.09  .0370    -.03881    -.00121
 VCVVPIA|    -.00145**       .00058    -2.51  .0121    -.00257    -.00032
  VCVL13|   -2.14690*       1.25212    -1.91  .0784   -4.60101     .30721
 HCVCRAN|     .00012**     .5112D-04    2.41  .0158     .00002     .00022
  SHWDLT|     .05671***      .01651     3.43  .0006     .02435     .08906
        |Means for random parameters
HCVMXSEL|     .00453***      .00149     3.05  .0023     .00162     .00744
  SMWDCR|    -.03755***      .00866    -4.34  .0000    -.05452    -.02058
   LNADT|    1.12930***      .10002    11.29  .0000     .93326    1.32535
        |Diagonal elements of Cholesky matrix
HCVMXSEL|     .00454***      .00106     4.29  .0000     .00247     .00662
  SHWDCR|     .05068***      .00881     5.75  .0000     .03342     .06794
   LNADT|     .00969**       .00401     2.41  .0158     .00182     .01756
        |Below diagonal elements of Cholesky matrix
1SMW_HCV|     .00378         .01117      .34  .7340    -.01809     .02566
1LNA_HCV|    -.03295***      .00951    -3.46  .0005    -.05160    -.01430
1LNA_SHW|     .02984***      .00624     4.78  .0000     .01760     .04208
        |Dispersion parameter for NegBin distribution
ScalParm|     .80798***      .10802     7.48  .0000     .59624    1.01968
--------+-----------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
--------------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------------
              HCVMXSEL       SMWDCR        LNADT
--------+-----------------------------------------------------
HCVMXSEL   .2064E-04
SMWDCR     .1724E-04    .2582E-02
LNADT     -.1497E-03    .1387E-02    .2070E-02

Implied standard deviations of random parameters

S.D_Beta|            1
--------+--------------
       1|     .00454282
       2|      .0508176
       3|      .0454996

Implied correlation matrix of random parameters

--------+--------------------------
Cor.Mat.|HCVMXSEL   SMWDCR    LNADT
--------+--------------------------
HCVMXSEL| 1.00000   .07468  -.72422
  SMWDCR|  .07468  1.00000   .59985
   LNADT| -.72422   .59985  1.00000
```

Random Parameter Negative Binomial Model of Low Injury Crashes on Six lane SPF Class Roadway Segments

```
--------------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                  LOINJ
Log likelihood function     -5314.22174
Restricted log likelihood  -15160.47570
Chi squared [   6 d.f.]     19692.51393
Significance level               .00000
McFadden Pseudo R-squared      .6494687
Estimation based on N =   5418, K =  20
Inf.Cr.AIC  =  10668.4 AIC/N =    1.969
Model estimated: Jun 20, 2016, 20:43:33
Sample is  2 pds and   2709 individuals
Negative binomial regression model
--------+-----------------------------------------------------------------------
        |                 Standard            Prob.       95% Confidence
   LOINJ|  Coefficient      Error        z   |z|>Z*          Interval
--------+-----------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -2.53824***      .84895    -2.99  .0028   -4.20412    -.87236
   LNADT|     .97576***      .04366    22.35  .0000     .89019    1.06134
 HCVLINE|   -2.46262***      .29289    -8.41  .0000   -3.03626   -1.88895
  SMWDCR|    -.00919**       .00392    -2.34  .0192    -.01688    -.00150
 RWYWDINC|   -.04431***      .00496    -8.93  .0000    -.05403    -.03459
  VCVL13|   -2.20341***      .62873    -3.52  .0004   -3.43177    -.97504
 HCVCRAN| .67097D-04***   .1819D-04     3.70  .0002  .31469D-04  .10263D-03
  VCVL18|   -1.00387***      .34575    -2.90  .0037   -1.68148    -.32626
 NOFLDEC|    -.79653***      .22646    -3.52  .0004   -1.24058    -.35249
 VCDANNA|     .04129***      .01502     2.75  .0060     .01185     .07073
        |Means for random parameters
HCVMXSEL|     .00214***      .00070     3.04  .0024     .00076     .00351
  SMWDRT|    -.15165***      .00697   -21.76  .0000    -.16531    -.13800
   LNLEN|     .98129***      .02246    43.69  .0000     .93727    1.02531
        |Diagonal elements of Cholesky matrix
HCVMXSEL|     .00206***      .00051     4.03  .0001     .00106     .00306
  SHWDRT|     .01825***      .00564     3.24  .0012     .00720     .02930
   LNLEN|     .01710***      .00648     2.64  .0083     .00440     .02980
        |Below diagonal elements of Cholesky matrix
1SMW_HCV|    -.01722***      .00666    -2.55  .0097    -.03028    -.00416
1LNL_HCV|     .06656***      .01721     3.87  .0001     .03284     .10029
1LNL_SMW|     .14275***      .01365    10.44  .0000     .11597     .16960
        |Dispersion parameter for NegBin distribution
ScalParm|     .77419***      .03562    21.73  .0000     .70438     .84401
--------+-----------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
--------------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------------
              HCVMXSEL       SMWDRT        LNLEN
--------+-----------------------------------------------------
HCVMXSEL   .4230E-05
SMWDRT    -.3542E-04    .6296E-03
LNLEN      .1368E-03    .1459E-02    .2511E-01

Implied standard deviations of random parameters

S.D_Beta|            1
--------+--------------
       1|     .00205676
       2|      .0250910
       3|       .158461

Implied correlation matrix of random parameters

--------+--------------------------
Cor.Mat.|HCVMXSEL   SMWDRT    LNLEN
--------+--------------------------
HCVMXSEL| 1.00000  -.68637   .42005
  SMWDRT| -.68637  1.00000   .36698
   LNLEN|  .42005   .36698  1.00000
```

Random Parameter Negative Binomial Model of Total Crashes on Seven lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable               TOTALACC
Log likelihood function       -1338.66604
Restricted log likelihood     -5685.69899
Chi squared [   6 d.f.]        8694.02411
Significance level                 .00000
McFadden Pseudo R-squared        .7624630
Estimation based on N =   1160, K =  22
Inf.Cr.AIC  =   2721.4 AIC/N =    2.346
Model estimated: Jun 25, 2016, 11:46:08
Sample is  2 pds and    580 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                Standard            Prob.      95% Confidence
TOTALACC|  Coefficient     Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -6.13504***     .75470    -8.13  .0000    -7.61723  -4.65564
   LNLEN|     .91344***     .04152    22.00  .0000      .83205    .99482
 MCVLINE|   -1.01417**      .48391    -2.10  .0361    -1.96262   -.06572
   VCVL1|  -368.724**     143.1992    -2.57  .0100   -649.389   -88.058
 VCPARMA|     .12437***     .03692     3.37  .0008      .05200    .19674
SMNDLTCR|    -.08407***     .01528    -5.50  .0000     -.11401   -.05413
    DEG1|    -.02451**      .01042    -2.35  .0187     -.04494   -.00409
RMYMDDEC|     .00989        .00623     1.59  .0524     -.00232    .02210
  SHNDLT|     .04646***     .01655     2.81  .0050      .01403    .07890
    MCVB|    -.00015***   .3351D-04   -4.55  .0000     -.00022   -.00009
    VCVL|     .06920**      .02711     2.55  .0107      .01607    .12234
VCVPTGRA|    -.06923**      .02706    -2.56  .0105     -.12227   -.01619
        |Means for random parameters
  LNADT|     .86127***     .05014    17.18  .0000      .76299    .95955
  SHNDRT|    -.04567**      .01827    -2.50  .0124     -.08148   -.00986
MCVPTCVA|     .00442***     .00093     4.78  .0000      .00260    .00624
        |Diagonal elements of Cholesky matrix
   LNADT|     .01591*       .00882     1.98  .0644     -.00197    .03338
  SHNDRT|     .03274***     .00584     5.61  .0000      .02130    .04419
MCVPTCVA|     .00123**      .00051     2.42  .0156      .00023    .00222
        |Below diagonal elements of Cholesky matrix
lSHN_LNA|    -.02387**      .01184    -2.02  .0437     -.04706   -.00067
lMCV_LNA|    -.00021        .00071     -.29  .7710     -.00159    .00118
lMCV_SHN|    -.00085*       .00051    -1.97  .0754     -.00184    .00015
        |Dispersion parameter for NegBin distribution
ScalParm|    1.38851***     .17204     8.35  .0000     1.20212   1.57690
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
               LNADT      SHNDRT    MCVPTCVA
--------+--------------------------------------------------------------------
LNADT      .2530E-03
SHNDRT    -.3797E-03   .1642E-02
MCVPTCVA  -.3265E-05  -.2253E-04   .2265E-05

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|      .0159066
       2|      .0405205
       3|      .00150505


Implied correlation matrix of random parameters


--------+----------------------------
Cor.Mat.|   LNADT   SHNDRT MCVPTCVA
--------+----------------------------
   LNADT| 1.00000  -.58904  -.13638
  SHNDRT| -.58904  1.00000  -.37432
MCVPTCVA| -.13638  -.37432  1.00000
```

Random Parameter Negative Binomial Model of Property Damage Only Crashes on Seven lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                    PDO
Log likelihood function       -1191.92557
Restricted log likelihood     -3625.11795
Chi squared [   3 d.f.]        4856.37576
Significance level                 .00000
McFadden Pseudo R-squared        .6877540
Estimation based on N =   1160, K =  15
Inf.Cr.AIC  =   2233.9 AIC/N =    1.377
Model estimated: Jun 25, 2016, 12:09:05
Sample is  2 pds and    580 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                Standard            Prob.      95% Confidence
     PDO|  Coefficient     Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -6.19057***     .52674   -11.75  .0000    -7.22237  -5.15517
 MCVLINE|   -3.28894***     .77234    -4.26  .0000    -4.80270  -1.77518
  SHWDRT|    -.01451        .01082    -1.95  .0476     -.03513    .00610
  SHNDCR|    -.04112***     .00744    -5.53  .0000     -.05549   -.02654
MCVPTCVA|     .00251***     .00079     3.18  .0015      .00096    .00405
    DEG1|    -.03967***     .01096    -3.60  .0003     -.06035   -.01795
MCVCRAN|     .00016***   .4249D-04     3.77  .0002      .00008    .00024
     VCR|   -1.47828***     .63100    -2.68  .0079    -2.91302   -.43553
    VCVL|    -.00024*       .00013    -1.94  .0519     -.00049    .00002
        |Means for random parameters
   LNLEN|     .87974***     .04300    20.46  .0000      .79546    .96403
   LNADT|     .86390***     .04496    19.22  .0000      .77561    .95200
        |Diagonal elements of Cholesky matrix
   LNLEN|     .09659***     .02969     3.25  .0011      .03839    .15478
   LNADT|     .01753***     .00406     4.32  .0000      .00957    .02548
        |Below diagonal elements of Cholesky matrix
lLNA_LNL|     .00805        .00881     1.94  .0347     -.00844    .02473
        |Dispersion parameter for NegBin distribution
ScalParm|    1.80874***     .24653     7.34  .0000     1.32556   2.29192
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
               LNLEN       LNADT
--------+--------------------------------------------------------------------
LNLEN      .9330E-02
LNADT      .7771E-03   .3720E-03

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|      .0965898
       2|      .0192872

Implied correlation matrix of random parameters


--------+------------------
Cor.Mat.|   LNLEN    LNADT
--------+------------------
   LNLEN| 1.00000   .41714
   LNADT|  .41714  1.00000
```

Random Parameter Negative Binomial Model of Possible Injury Crashes on Seven lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients   NegBnReg Model
Dependent variable                  PINJ
Log likelihood function       -624.14566
Restricted log likelihood    -1124.52833
Chi squared [   3 d.f.]      1000.76554
Significance level              .00000
McFadden Pseudo R-squared      .4449712
Estimation based on N =   1160, K =  15
Inf.Cr.AIC  =   1278.3 AIC/N =    1.102
Model estimated: Jun 26, 2016, 12:12:50
Sample is  2 pds and    580 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
    PINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -11.9159***     1.04688   -11.39  .0000   -13.9659   -9.8678
   LNADT|    1.28733***      .08781    14.66  .0000    1.11522   1.45943
 MCVLIMI|   -6.19625***     1.07722    -5.75  .0000   -8.30760  -4.08489
  SHNDCR|    -.04516***      .01068    -4.23  .0000    -.06605   -.02426
 VCFARMA|     .11301*        .05801     1.95  .0514    -.00068    .22671
 MCVCRAN|     .00026***    .5602D-04    4.97  .0000     .00017    .00035
    VCVL|    -.00046**       .00022    -2.05  .0403    -.00090   -.00002
VCVFTGRA|    -.08039**       .03718    -2.16  .0306    -.15326   -.00752
HCVMXSEL|     .00591***      .00182     3.25  .0012     .00234    .00948
        |Means for random parameters
   LNLEN|     .92807***      .06199    14.90  .0000     .80168   1.04446
VCVFTGRB|     .08136**       .03714     2.19  .0285     .00857    .15416
        |Diagonal elements of Cholesky matrix
   LNLEN|     .16351***      .02341     6.99  .0000     .11763    .20939
VCVFTGRB|     .00177*        .00091     1.94  .0526    -.00002    .00355
        |Below diagonal elements of Cholesky matrix
lVCV_LNL|     .00414***      .00088     4.71  .0000     .00242    .00587
        |Dispersion parameter for NegBin distribution
ScalParm|    2.76131***      .80389     3.43  .0006    1.18571   4.33681
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
              LNLEN     VCVFTGRB
--------+--------------------------------------------------------------------
LNLEN       .2674E-01
VCVFTGRB    .6776E-03    .2029E-04

Implied standard deviations of random parameters

S.D_Beta|             1
--------+--------------
       1|       .163513
       2|     .00450450

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|   LNLEN VCVFTGRB
--------+------------------
   LNLEN| 1.00000   .91928
VCVFTGRB|  .91988  1.00000
```

Random Parameter Negative Binomial Model of Evident Injury Crashes on Seven lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients   NegBnReg Model
Dependent variable                   EVI
Log likelihood function       -320.09718
Restricted log likelihood     -371.71957
Chi squared [   3 d.f.]       103.24481
Significance level              .00000
McFadden Pseudo R-squared      .1388744
Estimation based on N =   1160, K =  12
Inf.Cr.AIC  =    664.2 AIC/N =     .573
Model estimated: Jun 25, 2016, 13:12:44
Sample is  2 pds and    580 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
     EVI|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -6.49829***     1.67975    -3.87  .0001   -9.79063  -3.20600
   LNADT|     .56706***      .12755     4.45  .0000     .31706    .81707
 MCVLIMI|   -3.32003**      1.62620    -2.04  .0412   -6.50732   -.13274
 MCVCRAN|     .00021**     .9124D-04    2.26  .0237     .00003    .00038
RWYMDDEC|     .01808         .01139     1.92  .1653    -.00724    .03740
VCVFTGRB|    -.00275         .03236    -2.60  .0093    -.00841    .00088
        |Means for random parameters
   LNLEN|     .89730***      .09369     9.54  .0000     .71329   1.08132
  SMNDCR|    -.06440***      .02212    -2.91  .0036    -.10775   -.02105
        |Diagonal elements of Cholesky matrix
   LNLEN|     .08824***      .03112     2.84  .0046     .02725    .14924
  SMNDCR|     .03330**       .01533     2.18  .0304     .00318    .06344
        |Below diagonal elements of Cholesky matrix
lSMN_LNL|    -.05219***      .01321    -3.95  .0001    -.07808   -.02630
        |Dispersion parameter for NegBin distribution
ScalParm|    1.92295*       1.11618     2.72  .0049    -.26468   4.11068
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
              LNLEN       SMNDCR
--------+--------------------------------------------------------------------
LNLEN       .7787E-02
SMNDCR     -.4606E-02    .3833E-02

Implied standard deviations of random parameters

S.D_Beta|             1
--------+--------------
       1|      .0882442
       2|      .0619119

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|   LNLEN   SMNDCR
--------+------------------
   LNLEN| 1.00000  -.84298
  SMNDCR| -.84298  1.00000
```

Random Parameter Negative Binomial Model of High Injury Crashes on Seven lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                HIINJ
Log likelihood function      -424.75461
Restricted log likelihood    -507.38788
Chi squared [   1 d.f.]       165.26655
Significance level               .00000
McFadden Pseudo R-squared      .1628402
Estimation based on N =   1160, K =  11
Inf.Cr.AIC  =    871.5 AIC/N =     .751
Model estimated: Jun 25, 2016, 13:31:07
Sample is  2 pds and    580 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                Standard            Prob.      95% Confidence
   HIINJ|  Coefficient     Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -7.13240***   1.40963   -5.06  .0000    -9.89483  -4.36997
   LNADT|     .76089***    .10331    7.37  .0000      .55841    .96337
 HCVLIMI|   -5.93265***   1.36025   -4.36  .0000    -8.59855  -3.26665
  SHWDCR|    -.02271*      .01164   -1.95  .0511     -.04552    .00011
 HCVCRAN|     .00028***  .7254D-04   3.81  .0001      .00013    .00042
MCVSHSEL|     .00756**     .00341    2.22  .0266      .00088    .01424
    DEGL|    -.02327**     .01170   -1.99  .0466     -.04620   -.00035
RWYWDINC|     .05542**     .02297    2.41  .0158      .01041    .10043
        |Means for random parameters
   LNLEN|     .85390***    .07695   11.10  .0000      .70308   1.00472
        |Scale parameters for dists. of random parameters
   LNLEN|     .00689**     .00276    2.49  .0126      .00148    .01231
        |Dispersion parameter for NegBin distribution
ScalParm|    2.56395*     1.42878    1.98  .0427     -.23637   5.36434
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

Random Parameter Negative Binomial Model of Just Injury Crashes on Seven lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable               JUSTINJ
Log likelihood function      -357.44934
Restricted log likelihood    -453.25850
Chi squared [   5 d.f.]       191.61832
Significance level               .00000
McFadden Pseudo R-squared      .2113781
Estimation based on N =   1160, K =  15
Inf.Cr.AIC  =    744.9 AIC/N =     .642
Model estimated: Jun 25, 2016, 14:02:04
Sample is  2 pds and    580 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                Standard            Prob.      95% Confidence
 JUSTINJ|  Coefficient     Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|  -11.2759***    1.46046   -7.72  .0000   -14.1412   -8.4166
   LNLEN|     .79254***    .06719   11.80  .0000      .66086    .92422
  SHWDCR|    -.06118***    .01486   -4.12  .0000     -.09031   -.03205
 HCVCRAN|     .00023***  .6797D-04   3.39  .0007      .00010    .00036
    VCVL|    -.00056**     .00024   -2.28  .0225     -.00103   -.00008
RWYWDINC|    -.03139***    .01000   -3.14  .0017     -.05095   -.01180
 VCPARMA|     .32971***    .06634    4.88  .0000      .19969    .45973
 VCVL13|   -10.4034**     4.13332   -2.52  .0118   -18.5070   -2.3036
  SHWDRT|    -.04103**     .01607   -2.55  .0107     -.07252   -.00954
        |Means for random parameters
   LNADT|    1.21004***    .12614    9.59  .0000      .96282   1.45727
 HCVLIMI|   -3.50488***   1.32476   -2.65  .0082    -6.10138   -.90838
        |Diagonal elements of Cholesky matrix
   LNADT|     .03610***    .00631    5.72  .0000      .02373    .04847
 HCVLIMI|     .98240**     .44103    2.23  .0259      .11800   1.84680
        |Below diagonal elements of Cholesky matrix
lHCV_LNA|    -.07786**     .03168   -2.46  .0140      .01577    .13994
        |Dispersion parameter for NegBin distribution
ScalParm|    4.39974***   1.32823    3.31  .0009    -7.00303   1.79646
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
             LNADT     HCVLIMI
--------+--------------------------------------------------------------------
LNADT      .1303E-02
HCVLIMI   -.1388E-01        1.112

Implied standard deviations of random parameters

S.D_Beta|              1
--------+----------------
       1|       .0360895
       2|        1.05467

Implied correlation matrix of random parameters

--------+-----------------
Cor.Mat.|   LNADT  HCVLIMI
--------+-----------------
   LNADT| 1.00000  -.36381
 HCVLIMI| -.36381  1.00000
```

Random Parameter Negative Binomial Model of Low Injury Crashes on Seven lane SPF Class Roadway Segments

```
-----------------------------------------------------------------------------
Random Coefficients  NegBnReg Model
Dependent variable                LOINJ
Log likelihood function     -1211.64559
Restricted log likelihood   -4457.76765
Chi squared [   5 d.f.]      6492.24412
Significance level               .00000
McFadden Pseudo R-squared      .7281958
Estimation based on N =   1160, K =  16
Inf.Cr.AIC  =   2455.3 AIC/N =    2.117
Model estimated: Jun 26, 2016, 14:15:50
Sample is  2 pds and    580 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
   LOINJ|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -5.68455***      .54719   -10.39  .0000     -6.75702  -4.61207
   LNADT|     .87553***      .04737    18.48  .0000      .78268    .96838
 HCVLIMI|   -3.55105***      .75399    -4.71  .0000    -5.02855  -2.07326
  SHWDOR|    -.04917***      .00721    -6.82  .0000     -.06330   -.03504
 HCVCRAN|     .00013***   .4381D-04     3.05  .0023      .00005    .00022
    VCVL|    -.00074***      .00015    -5.02  .0000     -.00103   -.00045
 VCPARMA|     .10395**       .04116     2.52  .0118      .02328    .18461
  VCVL11|  -12.8547**       5.98027    -2.15  .0316    -24.5758   -1.1336
    DEG1|    -.04325***      .01073    -4.03  .0001     -.06428   -.02221
 VCVVFIA|     .00138**       .00064     2.16  .0310      .00013    .00263
        |Means for random parameters
   LNLEN|     .91465***      .04205    21.76  .0000      .83225    .99706
HCVMXSEL|     .00757***      .00156     4.84  .0000      .00450    .01063
        |Diagonal elements of Cholesky matrix
   LNLEN|     .05390***      .01654     3.26  .0011      .02148    .08632
HCVMXSEL|     .00207***      .00057     3.64  .0003      .00095    .00318
        |Below diagonal elements of Cholesky matrix
lHCV_LNL|    -.00126*        .00070    -1.80  .0717     -.00264    .00011
        |Dispersion parameter for NegBin distribution
ScalParm|    1.54385***      .19871     7.77  .0000     1.15439   1.93331
--------+--------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
             LNLEN    HCVMXSEL
--------+--------------------------------------------------------------------
LNLEN      .2905E-02
HCVMXSEL  -.6805E-04   .5842E-05

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|       .0538992
       2|      .00242115

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|    LNLEN HCVMXSEL
--------+------------------
   LNLEN| 1.00000  -.52145
HCVMXSEL| -.52145  1.00000
```

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