Urban and Suburban Arterial Safety Performance Functions: Final Report

WA-RD 857.1

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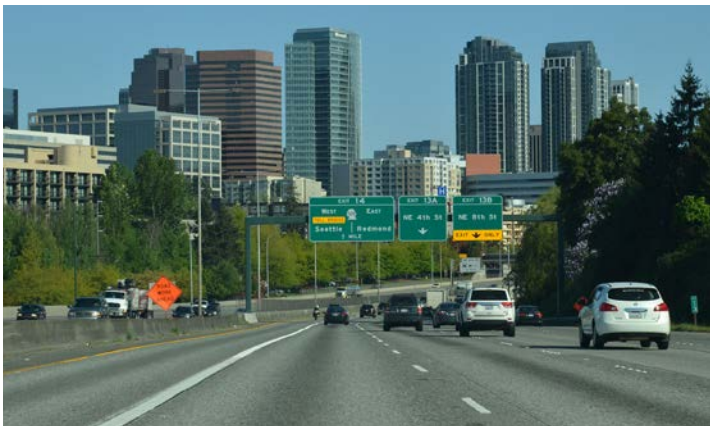
June 2016



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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.

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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.

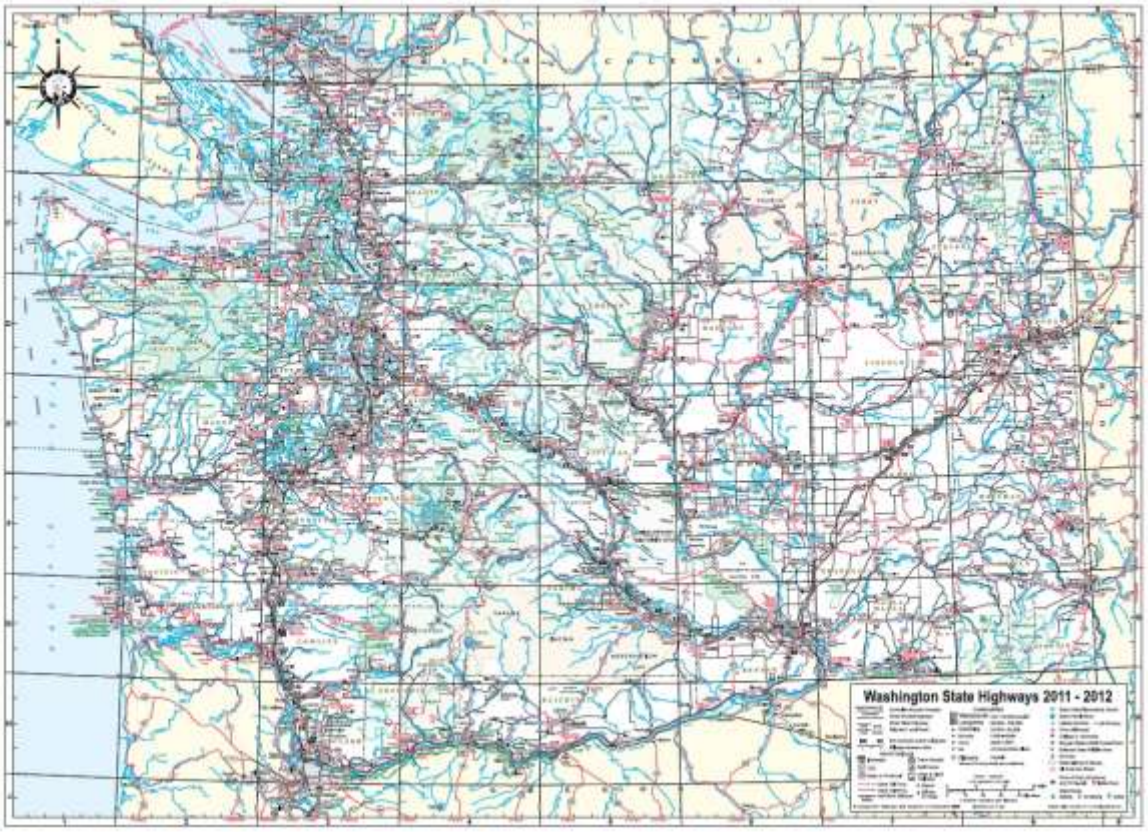

Figure 1.1: Washington State Highway Map 2011-2012.

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)
90(297.48 miles)	163(3.33 miles)	270(9.84 miles)	509(29.24 miles)	900(15.28 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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8(20.66 miles)	113(9.58 miles)	197(2.48 miles)	305(13.31 miles)	529(7.7 miles)
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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(186.39 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)
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24(78.71 miles)	141(25.99 miles)	231(72.07 miles)	501(13.82 miles)	599(1.73 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.

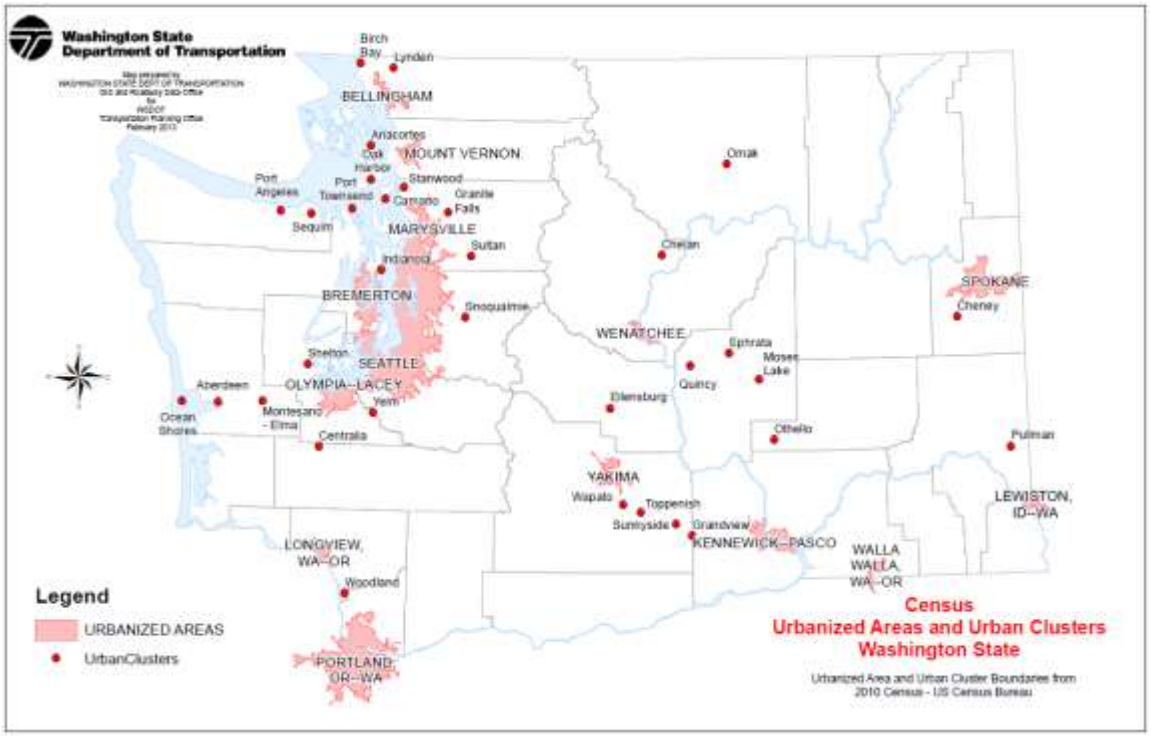


Figure 1.2: WSDOT Census Urbanized Areas and Urban Clusters Map.

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.

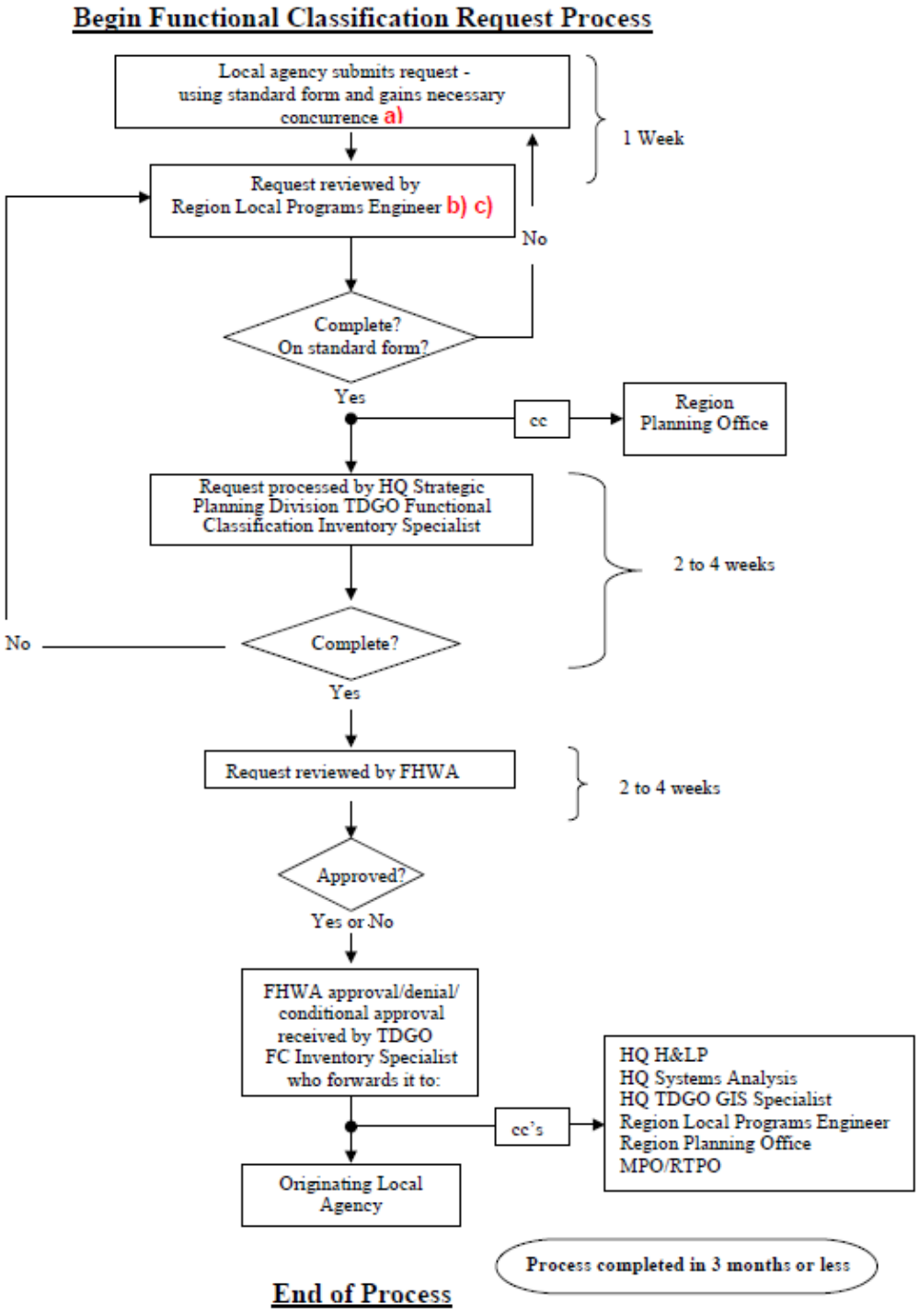


Figure 1.3: WSDOT Functional Classification Request Flow Chart.

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.

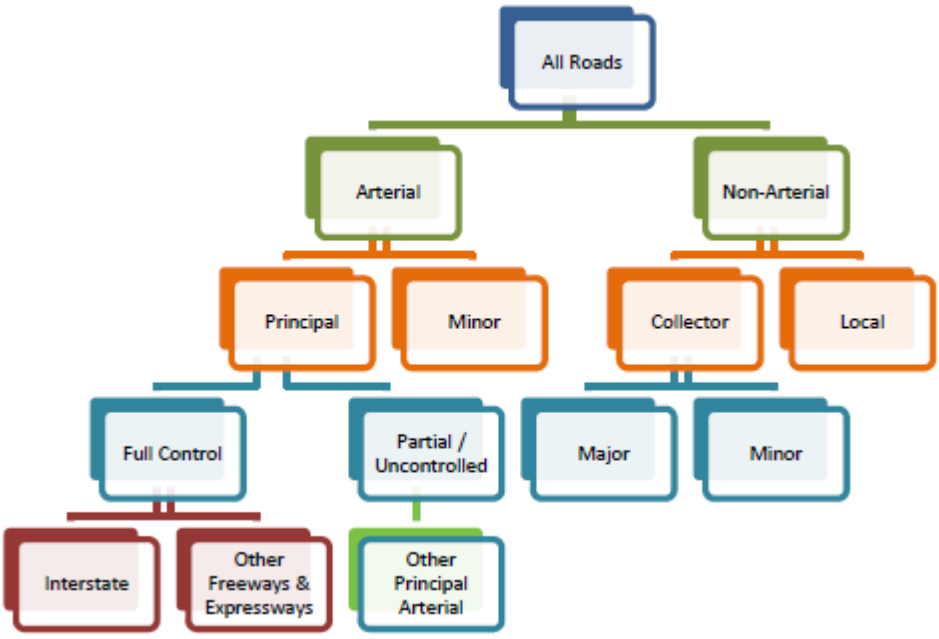


Figure 1.4: Federal Functional Classification Decision Tree (FHWA).

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.]      2152.02765
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 25, 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	-6.89829
DEG1	.00405*	.00241	1.88	.0630	-.00068	.00578
VCK2	-.92239**	.36093	-2.56	.0106	-1.62979	-.21498
MCVLIMZ	-1.13925***	.18518	-6.15	.0000	-1.50220	-.77630
MCVCRAN	.00010***	.8240D-05	11.35	.0000	.00009	.00012
SHWDCK	-.95206***	.35755	-2.66	.0078	-1.65258	-.25128
MARL	-.18783***	.05322	-3.53	.0004	-.29214	-.08352
NOFLINC	-.35857***	.12547	-2.87	.0042	-.60580	-.11368
	Means for random parameters					
LNADT	.99957***	.02589	38.61	.0000	.94883	1.05032
LNLEN	.98962***	.01877	52.72	.0000	.95273	1.02681
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	.06086	.11669
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	-.06351***	.00985	-6.45	.0000	-.08322	-.04460
lSHW_LNL	.02777***	.00708	3.94	.0001	.01395	.04159
	Dispersion parameter for NegBin distribution					
ScalParm	1.40992***	.14707	9.59	.0000	1.12167	1.69818

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	.44892	-.90338
LNLEN	.44892	1.00000	-.05588
SHWDLT	-.90338	-.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      -4204.88922
Restricted log likelihood    -4753.82279
Chi squared [  10 d.f.]      1097.86714
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	-8.00252***	.24082	-33.28	.0000	-8.47684	-7.53121
DEG1	.00996***	.00367	2.71	.0068	.00276	.01714
MCVCRAN	.88405D-04***	.14080D-04	6.28	.0000	.60811D-04	.11600D-03
MARL	-.22782***	.06916	-3.29	.0010	-.36342	-.09222
MCVMANEL	-.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	.94596	1.03028
SHWDLT	-.07650***	.01139	-6.72	.0000	-.09882	-.05418
TOTLANE	-.18889***	.06718	-2.81	.0049	-.32057	-.05722
	Diagonal elements of Cholesky matrix					
LNADT	.00598*	.00318	1.88	.0602	-.00026	.01224
LNLEN	.08457***	.01866	4.53	.0000	.04791	.12106
SHWDLT	.02333**	.01030	2.26	.0235	.00314	.04352
TOTLANE	.03613***	.01192	2.88	.0042	.01077	.05745
	Below diagonal elements of Cholesky matrix					
lLNL_LNA	-.08991***	.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	-.05782	.02441	-1.98	.0212	-.09888	.01001
	Dispersion parameter for NegBin distribution					
ScalParm	1.53033***	.24150	6.33	.0000	1.05621	2.00445

Implied covariance matrix of random parameters

Covariance matrix

	LNADT	LNLEN	SHWDLT	TOTLANE
LNADT	.7080E-03			
LNLEN	-.2990E-02	.1829E-01		
SHWDLT	.8796E-02	-.9840E-02	.2269E-01	
TOTLANE	-.8214E-02	.2503E-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     -1653.51884
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, 13:54:47
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|   -5.82278***     .36468  -11.00  .0000    -4.62188   -5.22370
  SHWDCR|   -.10902**       .05043   -2.16  .0306    -.20787    -.01018
 MCVLINE|    .70095*        .35740    1.95  .0704    -.05834    1.46024
SKYWDDEC|    .03680**       .01673    2.20  .0278     .00402     .06958
   MCOLR|   -.83165***      .14068   -5.90  .0000   -1.10796    -.55573
RCVDKSLI|   5.64183*       3.39961    1.96  .0670   -1.02128   12.30498
        |Means for random parameters
   LNLEN|    .94372***      .04222   22.35  .0000     .86087    1.02656
 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***      .03653    3.38  .0001     .06876     .20407
    MARL|    .28258**       .13264    2.13  .0332     .02265     .54250
        |Below diagonal elements of Cholesky matrix
lTOT_LNL|   -.20552***      .04565   -4.50  .0000    -.29760    -.11345
lMAR_LNL|   -.18824         .23084   -1.82  .0148    -.64068     .26420
lMAR_TOT|   -.21931         .16429   -1.09  .0140    -.58051     .14189
        |Dispersion parameter for NegBin distribution
ScalParm|    .70711***      .24215    2.92  .0035     .23243    1.18180
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------
                 LNLEN        TOTLANE          MARL
--------+--------------------------------------------------------
LNLEN       .2050E-01
TOTLANE    -.2984E-01    .6209E-01
MARL       -.2695E-01    .9335E-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  -.53688  -.46575
 TOTLANE| -.53688  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     .0913568
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
MCVMGKSEL|  -.00808***      .00193   -4.18  .0000    -.01186    -.00430
SNYWDINO|   -.05062*        .02591   -1.96  .0698    -.10726     .00604
MCVPTCVA|    .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    -.21340    -.01578
        |Diagonal elements of Cholesky matrix
   LNADT|    .89328**       .37203    2.41  .0158     .16503    1.41552
 TOTLANE|    .10271***      .02916    3.52  .0004     .04556     .15986
        |Below diagonal elements of Cholesky matrix
lTOT_LNA|    .17281         .13986    1.34  .0152    -.10080     .44611
        |Dispersion parameter for NegBin distribution
ScalParm|    .06649***      .00712    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|      .00708553
       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       -652.46554
Restricted log likelihood     -658.36872
Chi squared [   3 d.f.]         11.80076
Significance level                .00810
McFadden Pseudo R-squared       .0089621
Estimation based on N =  52080, 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|   -13.5528***     1.19897   -11.31  .0000    -15.9016  -11.2098
   MCOLR|     .86638**       .34272     2.53  .0115      .19466   1.53810
    MARL|     .66517**       .31700     2.10  .0359      .04386   1.28647
 VCVBVCA|     .00365***      .00119     3.10  .0019      .00138    .00603
 HCVCRAN|  .96029D-04**    .3914D-04    2.45  .0141  .18918D-04  .17274D-03
        |Means for random parameters
   LNADT|     .97201***      .14173     6.86  .0000      .69422   1.24979
  VCFARMA|   -.39224***      .09804    -4.00  .0001     -.58439   -.20010
        |Diagonal elements of Cholesky matrix
   LNADT|     .03563***      .01180     3.02  .0025      .01251    .05875
  VCFARMA|    .16447**       .06797     2.43  .0149      .03203    .29690
        |Below diagonal elements of Cholesky matrix
lVCF_LNA|    -.13017**       .06562    -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      VCFARMA
------------------------------------------------------------
LNADT        .1269E-02
VCFARMA    -.4638E-02    .4400E-01

Implied standard deviations of random parameters

S.D_Beta|             1
--------+-------------
       1|      .0356263
       2|      .209750

Implied correlation matrix of random parameters

--------+-------------------
Cor.Mat.|    LNADT  VCFARMA
--------+-------------------
   LNADT| 1.00000  -.62062
 VCFARMA| -.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|   -.65887***       .11597    -5.68  .0000     -.88617   -.43157
   MCOLR|   -.61745***       .11101    -5.56  .0000     -.83502   -.39988
 HCVCRAN| .80145D-04***   .17490D-04    4.58  .0000  .45833D-04  .11443D-03
        |Means for random parameters
   LNLEN|     .95870***      .02783    34.27  .0000      .89918   1.00825
  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         .04092    -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    -.7326E-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        -668.96638
Restricted log likelihood      -576.69335
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    -4.28  .0000    -1.35109   -.49853
   MCOLR|   -.78402***       .20488    -3.83  .0001    -1.18572   -.38231
ENTMDINC|    .04597*         .02519     1.93  .0480    -.00340     .09533
 TOTLANE|    .48226**        .22272     2.17  .0304     .04574     .91875
 MCVLIMI|  -1.19206*         .69158    -1.96  .0846   -2.54813     .18281
        |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***       .02948     3.13  .0018      .03447    .15005
 MCVCRAN| .52977D-04**    .2508D-04     2.11  .0346  .38243D-05 .10213D-03
        |Below diagonal elements of Cholesky matrix
lMCV_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|   .529766E-04

Implied correlation matrix of random parameters

--------+-----------------
Cor.Mat.|   LNLEN  MCVCRAN
--------+-----------------
   LNLEN| 1.00000   .00136
 MCVCRAN|  .00136  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     -5286.83355
Chi squared [   3 d.f.]        1343.91034
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***      .20392   -38.38  .0000    -8.22807  -7.42873
 MCVCRAN| .98980D-04***   .1163D-04     5.68  .0000  .76577D-04 .12138D-03
    MCVL|   -.00023***    .4068D-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|   -.08657***       .01590    -5.45  .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|      .0868656

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  -41097.14718
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|     .99865***      .01380    72.35  .0000       .97163   1.02574
 TOTLANE|    -.03610***      .01676    -5.73  .0000      -.12594   -.06325
  SHNDRT|    -.03089***      .00283   -10.96  .0000      -.03663   -.02544
 VCVLIMI|    -.55120***      .11898    -4.63  .0000      -.78440   -.31799
 HCVCRAN| .50507D-04***   .50210-05    10.12  .0000   .40966D-04  .60648D-04
    HCVR|-.11997D-04***   .24200-05    -4.96  .0000 -.16741D-04 -.72527D-05
SHNDLTCR|    -.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|     .01188***      .00168     7.06  .0000       .00857    .01518
        |Diagonal elements of Cholesky matrix
    DEG1|     .00230***      .00081     2.84  .0045       .00071    .00389
   LNLEN|     .05877***      .00727     8.23  .0000       .04593    .07401
RWYWDINC|     .00095**       .00043     2.21  .0272       .00011    .00179
        |Below diagonal elements of Cholesky matrix
1LNL_DEG|     .06637***      .00870     7.63  .0000       .04932    .08342
1RWY_DEG|    -.00219         .00126    -1.96  .0497      -.00267    .00228
1RWY_LNL|    -.00488***      .00103    -4.75  .0000      -.00690   -.00287
        |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         .3841E-06
LNLEN        .3834E-04   .7977E-02
RWYWDINC   -.1114E-06  -.3047E-03   .2479E-04

Implied standard deviations of random parameters

S.D_Beta|             1
--------+--------------
       1|   .577975E-03
       2|      .0893190
       3|     .00497884


Implied correlation matrix of random parameters


--------+-----------------------------
Cor.Mat.|     DEG1    LNLEN RWYWDINC
--------+-----------------------------
    DEG1| 1.00000    .76310  -.03572
   LNLEN|  .74310  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.]     10038.90089
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     -8.60706  -8.11437
   LNADT|    1.00836***      .01560    64.63  .0000       .97778   1.03894
    DEG1|     .01448**       .00683     2.09  .0367       .00090    .02807
  SHNDRT|    -.03335***      .00339    -9.83  .0000      -.04000   -.02670
 VCVLIMI|    -.78326***      .13548    -5.78  .0000     -1.04881   -.51768
 HCVCRAN| .45408D-04***   .61580-05     7.37  .0000   .33337D-04  .57478D-04
    HCVR|-.97801D-05***   .27980-05    -3.50  .0005 -.15265D-04 -.42956D-05
SHNDLTCR|    -.07856***      .00756   -10.39  .0000      -.09335   -.06374
        |Means for random parameters
 TOTLANE|    -.07149***      .02122    -3.37  .0008      -.11306   -.02990
   LNLEN|     .90668***      .01046    86.73  .0000       .88618    .92718
RWYWDINC|     .00910***      .00242     3.77  .0002       .00438    .01389
        |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
1LNL_TOT|     .06185***      .01040     5.95  .0000       .04147    .08223
1RWY_TOT|    -.01279***      .00289    -4.43  .0000      -.01844   -.00713
1RWY_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   -.1164E-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    .71786  -.93496
   LNLEN|  .71786  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     -9351.90656
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, 15:57:50
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***      .00871    -5.56  .0000     -.05718   -.00066
    HCVR|-.294000D-04***  .73580D-05    -4.00  .0001 -.438240D-04 -.149760D-04
 SHWDLTCR|   -.11637***      .01392    -8.36  .0000     -.14365   -.08908
HCVMXSEL|     .00418***      .00081     5.13  .0000      .00317    .00519
RHYWDDEC|     .01640***      .00546     3.00  .0027      .00569    .02711
 VCPARMA|     .02366*        .01253     1.89  .0587     -.00097    .04823
   MCOLA|     .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|       .0593581
       2|       .0395231

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.| TOTLANE    LNADT
--------+------------------
 TOTLANE| 1.00000  -.96269
   LNADT| -.96269  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|     .73018***      .03420    21.35  .0000      .66315    .79720
  SHWDRT|    -.02097**       .00829    -2.55  .0109     -.03710   -.00483
    HCVR|-.186270D-04***  .64140D-05   -2.90  .0037 -.311970D-04 -.605650D-05
SHWDLTCR|    -.04783***      .01636    -2.92  .0035     -.07990   -.01577
HCVMXSEL|     .00188***      .00066     2.83  .0047      .00058    .00318
RHYWDDEC|     .01187**       .00594     2.00  .0457      .00023    .02350
   MCOLA|     .26178***      .08219     3.18  .0014      .10069    .42283
MCVCRAH|  .37482D-04***  .14070D-04     2.66  .0077  .99078D-05  .65057D-04
        |Means for random parameters
 TOTLANE|    -.10370**       .04805    -2.16  .0309     -.19789   -.00952
   LNLEN|     .88089***      .01892    46.55  .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  -.86775
   LNLEN| -.86775  1.00000
```

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

```
Random Coefficients : NegBinReg Model
Dependent variable                  SINJ
Log likelihood function       -2392.25153
Restricted log likelihood     -2407.83462
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
```

SINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-8.01078***	.46824	-19.33	.0000	-8.92462	-8.09697
HCVCRAN	.60122D-04**	.2977D-04	2.33	.0196	.96179D-05	.11083D-03
HCVPTCVA	.00221***	.00044	8.49	.0036	.00097	.00346
	Means for random parameters					
LNADT	.41027***	.05135	7.89	.0000	.30957	.51098
DEG1	-.02645***	.00555	-3.06	.0021	-.04331	-.00966
	Diagonal elements of Cholesky matrix					
LNADT	.02824***	.00505	5.58	.0000	.01834	.03813
DEG1	.01662***	.00501	3.32	.0009	.00679	.02646
	Below diagonal elements of Cholesky matrix					
1DEG_LNA	.01149**	.00521	2.24	.0249	.00147	.02151
	Dispersion parameter for NegBin distribution					
ScalParm	.17565**	.08585	2.13	.0330	.01641	.34245

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-------------------------------------------------------
              LNADT         DEG1
--------+-------------------------------------------------------
LNADT       .7979E-03
DEG1        .3302E-03   .4126E-03

Implied standard deviations of random parameters

S.D_Beta|            1
--------+-------------
       1|      .0282570
       2|      .0203178

Implied correlation matrix of random parameters


--------+-------------------
Cor.Mat.|   LNADT     DEG1
--------+-------------------
   LNADT| 1.00000   .87551
    DEG1|  .87551  1.00000
```

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

```
Random Coefficients  NegBinReg 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, 18:04:38
Sample is  2 pds and  47057 individuals
Negative binomial regression model
```

FATAL	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-10.0779***	.76548	-13.17	.0000	-11.5781	-8.5777
HCVPTCVA	.00426***	.00073	5.82	.0000	.00282	.00569
SMMDRI	.04803*	.02510	1.97	.0557	-.00117	.09723
	Means for random parameters					
LNADT	.41509***	.06456	6.61	.0000	.24592	.58436
DEG1	-.03552**	.01409	-2.52	.0117	-.06313	-.00791
	Diagonal elements of Cholesky matrix					
LNADT	.03736***	.00766	5.57	.0000	.02233	.05238
DEG1	.02224**	.00940	2.37	.0180	.00381	.04066
	Below diagonal elements of Cholesky matrix					
1DEG_LNA	-.01023	.00754	-1.91	.0418	-.02559	.00513
	Dispersion parameter for NegBin distribution					
ScalParm	.14341	.12040	1.98	.0329	-.09236	.37858

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-------------------------------------------------------
              LNADT         DEG1
--------+-------------------------------------------------------
LNADT       .1396E-02
DEG1       -.3621E-03   .9951E-03

Implied standard deviations of random parameters

S.D_Beta|            1
--------+-------------
       1|      .0373469
       2|      .0244775

Implied correlation matrix of random parameters


--------+-------------------
Cor.Mat.|   LNADT     DEG1
--------+-------------------
   LNADT| 1.00000  -.41796
    DEG1| -.41796  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   -1267.09246
Chi squared [   3 d.f.]       32.31224
Significance level             .00000
McFadden Pseudo R-squared      .0127811
Estimation based on N =  94114, K =  11
Inf.Cr.AIC  =   2523.8 AIC/N =     .027
Model estimated: Sep 09, 2015, 16:51:56
Sample is  2 pds and  47057 individuals
Negative binomial regression model
```

UNKNOWN	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-10.0530***	.78480	-12.81	.0000	-11.5912	-8.5148
HCVLIN1	-.93742**	.41058	-2.28	.0224	-1.74210	-.13275
HCVCRAH	.88401D-04**	.3824D-04	2.31	.0208	.13495D-04	.16338D-03
MCOLR	.42066***	.23772	2.61	.0090	.10474	1.08658
RHYNDISC	-.01599	.11059	-1.91	.0512	-.03674	.00477
	Means for random parameters					
LNLEN	.82935***	.08067	18.30	.0000	.62643	1.02447
LNADT	.74634***	.09748	7.55	.0000	.57518	.95750
	Diagonal elements of Cholesky matrix					
LNLEN	.10600***	.03549	2.99	.0028	.03644	.17556
LNADT	.01582**	.00778	2.05	.0409	.00047	.03117
	Below diagonal elements of Cholesky matrix					
LLNA_LNL	.03239***	.00961	3.45	.0006	.01415	.05183
	Dispersion parameter for NegBin distribution					
ScalParm	.24811**	.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:	.0347048

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     -9738.23386
Restricted log likelihood  -10040.17820
Chi squared [   3 d.f.]       603.87872
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
```

HIINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-8.35672***	.21519	-29.54	.0000	-8.77647	-7.93496
DEG1	-.00627*	.00321	-1.96	.0500	-.01255	.00005
MCOLR	.18282**	.06812	2.21	.0270	.01795	.28830
HCVLIN1	-.70419***	.12859	-5.48	.0000	-.95622	-.45215
HCVCRAH	.71336D-04***	.1251D-04	5.79	.0000	.47191D-04	.95481D-04
SMMINT	-.02022***	.00666	-3.04	.0024	-.03326	-.00717
HCVNRSEL	.00213***	.00066	3.67	.0002	.00099	.00326
	Means for random parameters					
LNLEN	.84075***	.01515	55.50	.0000	.81105	.87046
LNADT	.62101***	.02396	25.96	.0000	.57405	.66796
	Diagonal elements of Cholesky matrix					
LNLEN	.06815***	.01065	6.16	.0000	.04441	.08868
LNADT	.00885***	.00232	3.82	.0001	.00431	.01340
	Below diagonal elements of Cholesky matrix					
LLNA_LNL	.01138***	.00308	3.70	.0002	.00536	.01742
	Dispersion parameter for NegBin distribution					
ScalParm	1.0443***	.12426	8.41	.0000	.80096	1.28803

```
Note: nnnn.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	.4644E-03	
LNADT	.7415E-03	.2075E-03

Implied standard deviations of random parameters

S.D_Beta:	1
1:	.0681470
2:	.0144136

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, 16:05:13
Sample is 2 pds and 47057 individuals
Negative binomial regression model

JUSTINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-12.2603***	.39917	-30.71	.0000	-13.0427	-11.4780
MCVLIMI	-1.92441***	.33462	-5.75	.0000	-2.58026	-1.26857
MCVCRAN	.86400D-04***	.21690D-04	3.98	.0001	.43889D-04	.12891D-03
SNNDRT	-.04674***	.01041	-4.49	.0000	-.06715	-.02634
MCVMXSEL	.00361***	.00092	3.91	.0001	.00180	.00542
TOTLANE	-.30701***	.06156	-4.99	.0000	-.42761	-.18640
SNWDCR	-.05321***	.01178	-4.52	.0000	-.07630	-.03013
BNVNDDEC	.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***	.02395	3.95	.0001	.04756	.14146
LNADT	.02650***	.00443	5.98	.0000	.01782	.03518
DEG1	.01425***	.00464	3.07	.0022	.00514	.02335
	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	.8932E-02		
LNADT	-.1669E-02	.1014E-02	
DEG1	-.1037E-02	.5712E-03	.3235E-03

Implied standard deviations of random parameters

S.D_Beta	1
1	.0945089
2	.0318425
3	.0179873

Implied correlation matrix of random parameters

Cor.Mat.	LNLEN	LNADT	DEG1
LNLEN	1.00000	-.55456	-.61005
LNADT	-.55456	1.00000	.99735
DEG1	-.61005	.99735	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 -25494.30680
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

LOINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-8.21652***	.12428	-66.11	.0000	-8.46010	-7.97294
HCVLIMI	-.75758***	.08531	-9.23	.0000	-.89479	-.62038
HCVCRAN	.64488D-04***	.72670D-05	8.87	.0000	.50244D-04	.78732D-04
SNNDRT	-.03239***	.00329	-9.84	.0000	-.03884	-.02594
MCVMXSEL	.00209***	.00042	5.01	.0000	.00127	.00291
SNWDCR	-.04400***	.00373	-11.80	.0000	-.05131	-.03669
NWVNDDEC	.01676***	.00250	6.71	.0000	.01186	.02166
MCVPTTYA	-.00063***	.00024	-2.65	.0081	-.00109	-.00016
	Means for random parameters					
LNLEN	.90457***	.01006	90.05	.0000	.88485	.92429
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*	.01567	-1.94	.0527	-.05791	.00352
lTOT_LNA	-.02436*	.01309	-1.86	.0626	-.05001	.00129
	Dispersion parameter for NegBin distribution					
ScalParm	.56823***	.02741	20.73	.0000	.51450	.62196

Implied covariance matrix of random parameters

Covariance matrix

	LNLEN	LNADT	TOTLANE
LNLEN	.1564E-01		
LNADT	-.3523E-02	.1080E-02	
TOTLANE	-.3402E-02	.3538E-03	.1381E-02

Implied standard deviations of random parameters

S.D_Beta	1
1	.125062
2	.0328650
3	.0371646

Implied correlation matrix of random parameters

Cor.Mat.	LNLEN	LNADT	TOTLANE
LNLEN	1.00000	-.85717	-.73201
LNADT	-.85717	1.00000	.28984
TOTLANE	-.73201	.28984	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     -14551.52260
Restricted log likelihood   -38629.52022
Chi squared [   6 d.f.]      47355.19524
Significance level                .00000
McFadden Pseudo R-squared       .6165513
Estimation based on N =  17072, K =  17
Inf.Cr.AIC  =  28737.5 AIC/N =    1.742
Model estimated: Sep 09, 2015, 17:45:05
Sample is  2 pds and   8536 individuals
Negative binomial regression model
```

TOTALACC	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-4.70471***	.26456	-17.78	.0000	-5.22327	-4.18615
LNLEN	.82368***	.01559	52.85	.0000	.79259	.85398
VCK2	.55514***	.06617	8.36	.0000	.42344	.68283
HCVMXSL1	-4.95635***	1.23975	-2.84	.0001	-7.48621	-2.43049
TOTLANE	.09795***	.01549	6.32	.0000	.06759	.12831
SHNDCR	-.08617***	.00469	-9.55	.0000	-.05536	-.03699
VCVPTGRB	.00149***	.00032	4.59	.0000	.00086	.00212
	Means for random parameters					
LNADT	.70115***	.02981	23.54	.0000	.64351	.75878
VCK	-3.07667***	.27574	-11.17	.0000	-3.61911	-2.53523
HCVLIMI	-1.65436***	.13735	-12.04	.0000	-2.20276	-1.55596
	Diagonal elements of Cholesky matrix					
LNADT	.05216***	.00218	23.90	.0000	.04788	.05644
VCK	.61566***	.16381	3.76	.0002	.29458	.93673
HCVLIMI	.32283**	.14082	2.29	.0219	.04673	.59915
	Below diagonal elements of Cholesky matrix					
lVCK_LNA	1.60284***	.29966	5.35	.0000	1.01551	2.19017
lHCV_LNA	1.77309***	.21615	8.20	.0000	1.34938	2.19680
lHCV_VCK	-.69168***	.18770	-3.63	.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	HCVLIMI
LNADT	.2721E-02		
VCK	.8361E-01	2.948	
HCVLIMI	.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	HCVLIMI
LNADT	1.00000	.93351	.91850
VCK	.93351	1.00000	.72895
HCVLIMI	.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
```

PDO	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-5.98582***	.32986	-18.15	.0000	-6.63233	-5.33931
VCK	-.47101***	.09594	-4.91	.0000	-.65905	-.28298
HCVMXSL1	-6.20628***	1.55767	-3.98	.0001	-8.25925	-3.15331
TOTLANE	-.08122***	.02755	-2.95	.0032	-.13522	-.02722
SHNDCR	-.03998***	.00536	-7.46	.0000	-.05049	-.02948
VCVPTGRB	.00391***	.00064	6.09	.0000	.00265	.00517
DES1	-.00377**	.00148	-2.54	.0110	-.00667	-.00086
RWYMDIMC	.03166***	.00301	10.52	.0000	.02576	.03756
HCVPICVA	.00146***	.00031	4.65	.0000	.00084	.00207
HCVCRAN	.82274D-04***	.8830D-05	9.21	.0000	.64772D-04	.99775D-04
VCVVPIA	-.00281***	.00041	-6.84	.0000	-.00361	-.00200
	Means for random parameters					
LNADT	.79891***	.03737	21.38	.0000	.72566	.87215
LNLEN	.92218***	.01836	50.23	.0000	.88620	.95816
HCVLIMI	-3.15350***	.20148	-15.65	.0000	-3.54836	-2.75861
	Diagonal elements of Cholesky matrix					
LNADT	.01956***	.00653	3.00	.0027	.00676	.03235
LNLEN	.11585***	.00704	16.47	.0000	.10206	.12964
HCVLIMI	.44239***	.15611	2.83	.0046	.13642	.74836
	Below diagonal elements of Cholesky matrix					
lLNL_LNA	.12607***	.01796	7.02	.0000	.09087	.16127
lHCV_LNA	.76878***	.28161	2.73	.0063	.21653	1.32072
lHCV_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	HCVLIMI
LNADT	.3825E-03		
LNLEN	.2466E-02	.2932E-01	
HCVLIMI	.1504E-01	.2232	1.975

Implied standard deviations of random parameters

S.D_Beta	1
1	.0195572
2	.171218
3	1.40528

Implied correlation matrix of random parameters

Cor.Mat.	LNADT	LNLEN	HCVLIMI
LNADT	1.00000	.73632	.54706
LNLEN	.73632	1.00000	.92764
HCVLIMI	.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 -6521.71067
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 8586 individuals
Negative binomial regression model

PINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-5.55183***	.47325	-12.37	.0000	-6.77957	-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
VCVFDGRB	.00495***	.00106	4.70	.0000	.00290	.00705
MCVLIMI	-2.34819***	.27509	-8.54	.0000	-2.88736	-1.80902
RWYMDINC	.02746***	.00300	9.16	.0000	.02167	.03332
HCVCRAM	.75716D-04***	.14072D-04	5.38	.0000	.48137D-04	.10329D-03
VCVVFIA	-.00445***	.00076	-5.84	.0000	-.00591	-.00296
	Means for random parameters					
LNADT	.63677***	.04950	12.86	.0000	.53974	.73379
LNLEN	.87743***	.02764	31.75	.0000	.82328	.93161
DEG1	-.00716***	.00259	-2.77	.0057	-.01223	-.00209
	Diagonal elements of Cholesky matrix					
LNADT	.02582***	.00877	2.94	.0032	.00863	.04301
LNLEN	.10332***	.00994	10.38	.0000	.08384	.12290
DEG1	.42468**	.19680	2.16	.0309	.03896	.81040
	Below diagonal elements of Cholesky matrix					
1LNL_LNA	.13924***	.02567	5.43	.0000	.08894	.18955
1DEG_LNA	.05122***	.01136	4.51	.0000	.02896	.07348
1DEG_LNL	-.00373	.00274	-1.96	.0741	-.00911	.00165
	Dispersion parameter for NegBin distribution					
ScalParm	.30199***	.01721	18.40	.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	.179387
3	.0055187б

Implied correlation matrix of random parameters

Cor.Mat.	LNADT	LNLEN	DEG1
LNADT	1.00000	.80807	.61176
LNLEN	.80807	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

EVI	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-5.42644***	.59162	-9.18	.0000	-6.58500	-4.26887
MCVMXSEL	.05753***	.01754	3.28	.0010	.02322	.09136
MCVLIMI	-2.11164***	.40468	-5.22	.0000	-2.90483	-1.31879
RWYMDINC	.01307***	.00393	3.32	.0009	.00536	.02077
MCVCRAM	.39928D-04*	.2075D-04	1.95	.0543	-.73264D-06	.80555D-04
SHNDLT	-.06304***	.02897	-6.49	.0000	-.27762	-.04245
	Means for random parameters					
LNADT	.53548***	.06385	8.38	.0000	.41027	.66068
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					
1LNL_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	.0617753

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        .0529536
Estimation based on N =  17073, K =  13
Inf.Cr.AIC  =   1610.8 AIC/N =     .094
Model estimated: Sep 10, 2015, 19:54:30
Sample is  2 pds and   5596 individuals
Negative binomial regression model
```

SINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
Nonrandom parameters						
Constant	-5.93448***	1.21118	-4.90	.0000	-8.32837	-3.54060
HCVLINI	-1.60751**	.77155	-2.34	.0191	-3.31972	-.29531
VCPARMA	.09092***	.03927	2.66	.0079	.02179	.16006
Means for random parameters						
LNADT	.42565***	.12472	3.41	.0006	.18120	.67010
LNLEN	.87795***	.05614	15.10	.0000	.76400	.99190
SNWDRT	-.04908**	.02134	-2.01	.0440	-.09490	-.00116
Diagonal elements of Cholesky matrix						
LNADT	.04833***	.01707	2.71	.0066	.01257	.07979
LNLEN	.15987***	.04940	2.85	.0201	.01659	.13456
SNWDRT	.03257***	.01157	2.77	.0056	.00960	.05614
Below Diagonal elements of Cholesky matrix						
ILNL_LNA	.09713***	.03437	2.85	.0047	.02978	.16452
ISNW_LNA	-.02778**	.01230	-2.26	.0239	-.05189	-.00368
ISNW_LNL	.01944	.02041	1.95	.0607	-.00255	.05944
Dispersion parameter for NegBin distribution						
ScalParm	.08255**	.03397	3.43	.0101	.01597	.14914

```
Implied covariance matrix of random parameters

Covariance  matrix
```

	LNADT	LNLEN	SNWDRT
LNADT	.2147E-02		
LNLEN	.5946E-03	.1152E-01	
SNWDRT	-.3780E-03	.1885E-02	.1525E-02

```
Implied standard deviations of random parameters
```

S.D_Beta	1
1	.0463326
2	.107324
3	.0390554

```
Implied correlation matrix of random parameters
```

Cor.Mat.	LNADT	LNLEN	SNWDRT
LNADT	1.00000	.17991	-.20890
LNLEN	.17991	1.00000	.45215
SNWDRT	-.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       -218.73932
Restricted log likelihood     -219.48172
Chi squared [   1 d.f.]          1.48720
Significance level               .22718
McFadden Pseudo R-squared       .0033897
Estimation based on N =  17073, K =   5
Inf.Cr.AIC  =    447.5 AIC/N =     .026
Model estimated: Sep 10, 2015, 20:32:46
Sample is  2 pds and   5596 individuals
Negative binomial regression model
```

FATAL	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
Nonrandom parameters						
Constant	-9.81669***	2.24011	-4.38	.0000	-14.20723	-5.42615
LNLEN	.98632***	.09180	10.75	.0000	.80640	1.16623
Means for random parameters						
LNADT	.66762***	.23532	2.84	.0045	.20601	1.12923
Scale parameters for dists. of random parameters						
LNADT	.37819*	.19911	1.90	.0574	-.01198	.76856
Dispersion parameter for NegBin distribution						
ScalParm	.08365**	.03598	2.33	.0197	.01333	.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|   -9.93748***     2.87707    -3.45  .0006   -15.57655  -4.29843
 TOTLANE|     .22952***      .07562     3.04  .0024      .08132    .37773
        |Means for random parameters
  SHWDLT|    -.10138***      .02487    -4.08  .0000     -.15013   -.05263
        |Scale parameters for dists. of random parameters
  SHWDLT|     .05156***      .01706     3.02  .0025      .01813    .08499
        |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 [   3 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|     .00128**       .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|     .67434***      .05475    12.32  .0000      .56703    .78165
  SHWDRT|    -.07347***      .00868    -8.46  .0000     -.09051   -.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     -8136.25575
Restricted log likelihood   -8829.58691
Chi squared [   6 d.f.]      1386.20232
Significance level               .00000
McFadden Pseudo R-squared      .1569925
Estimation based on N =  17072, K =  20
Inf.Cr.AIC  =   8312.6 AIC/N =     .487
Model estimated: Sep 11, 2018, 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	-3.90689
VCBARNA	.05670***	.02120	2.68	.0074	.01514	.09826
HCVMKSEL	-7.29129**	3.07537	-2.37	.0177	-13.31891	-1.26367
SMRDCR	-.05035***	.01106	-4.56	.0000	-.07200	-.02871
VCVPTSRA	.00917**	.00393	2.44	.0147	.00062	.00972
HCVLIMI	-35514.0**	16235.48	-2.37	.0177	-70340.5	-6687.3
RWYWDINC	.08260***	.00992	8.32	.0000	.06292	.04028
HCVCRAN	.843800-04***	.18850-04	2.98	.0028	.194330-04	.933260-04
VCVVPIA	-.00384***	.00098	-4.03	.0001	-.00529	-.00189
HCVL	7.29381**	3.07847	2.37	.0177	1.24600	13.32162
Means for random parameters						
LNLEN	.86122***	.03159	27.26	.0000	.79931	.92314
LNADT	.45249***	.06051	7.97	.0000	.34569	.60109
DEG1	-.00620**	.00304	-2.04	.0418	-.01215	-.00025
Diagonal elements of Cholesky matrix						
LNLEN	.16228***	.02880	5.63	.0000	.10584	.21874
LNADT	.02558***	.00427	5.98	.0000	.01721	.03394
DEG1	.00617**	.00271	2.27	.0230	.00085	.01149
Below diagonal elements of Cholesky matrix						
LNA_LNL	-.03572***	.01029	-3.76	.0002	-.05585	-.01558
DEG_LNL	-.00467	.00339	-1.38	.0778	-.01123	.00208
DEG_LNA	.00017	.00291	2.08	.0423	-.00536	.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	.26948-01		
LNADT	-.62638-02	.21538-02	
DEG1	-.74248-03	.18148-03	.59058-04

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	-.83635	-.59524
LNADT:	-.83635	1.00000	.80871
DEG1:	-.59524	.80871	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                LOWINJ
Log likelihood function    -12565.05765
Restricted log likelihood  -29992.78271
Chi squared [   6 d.f.]     34854.45017
Significance level               .00000
McFadden Pseudo R-squared      .5709745
Estimation based on N =  17072, K =  21
Inf.Cr.AIC  =  25172.2 AIC/N =    1.510
Model estimated: Sep 11, 2018, 15:42:11
Sample is  2 pds and   8536 individuals
Negative binomial regression model
```

LOWINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
Nonrandom parameters						
Constant	-5.53639***	.30775	-17.99	.0000	-6.13856	-4.93421
VCN	-.43660***	.10581	-4.13	.0000	-.64389	-.22921
HCVMKSEL	-8.41774***	1.44549	-5.76	.0000	-8.28079	-2.55477
SMRDCR	-.02949**	.01211	-2.32	.0204	-.04327	-.00963
VCVPTSRA	.00310***	.00065	4.79	.0000	.00181	.00438
RWYWDINC	.01428***	.00193	7.40	.0000	.01050	.01805
HCVCRAN	.660365D-04***	.8198D-05	8.09	.0000	.500360D-04	.820434D-04
VCVVPIA	-.00249***	.00045	-5.57	.0000	-.00336	-.00161
HCVL	5.42099***	1.44844	3.75	.0002	2.58797	8.25388
DEG1	-.00628***	.00244	-4.22	.0000	-.00880	-.00326
SMRDLT	-.08790***	.00612	-8.19	.0000	-.04990	-.02580
SMRDRT	-.04570***	.00640	-8.53	.0000	-.05824	-.03115
MARL	-.29609***	.03697	-9.62	.0000	-.31774	-.09443
Means for random parameters						
LNLEN	.90987***	.01741	51.66	.0000	.87348	.94448
LNADT	.92911***	.03271	28.38	.0000	.76900	.89322
HCVLIMI	-26625.3***	7431.856	-3.75	.0002	-45054.1	-13667.6
Diagonal elements of Cholesky matrix						
LNLEN	.23711***	.01700	13.96	.0000	.20379	.27043
LNADT	.04023***	.00297	19.69	.0000	.03518	.04527
HCVLIMI	.31142**	.14692	2.12	.0340	.02545	.59938
Below diagonal elements of Cholesky matrix						
LNA_LNL	-.06252***	.00662	-9.45	.0000	-.07549	-.04955
LNCV_LNL	.30871	.25750	1.99	.0351	-.19998	.81039
LNCV_LNA	2.21816***	.22288	9.47	.0000	.78133	1.65499
Dispersion parameter for NegBin distribution						
ScalParm	.41141***	.01141	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	.3969E-01	1.474

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	.81071
HCVLIMI:	.23628	.81071	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       -8731.95525
Restricted log likelihood    -24417.20937
Chi squared [   6 d.f.]       31370.50822
Significance level                 .00000
McFadden Pseudo R-squared        .6423552
Estimation based on N =   8320, K =  21
Inf.Cr.AIC  =  17505.9 AIC/N =    2.104
Model estimated: Sep 11, 2015, 15:08:01
Sample is  2 pds and   4160 individuals
Negative binomial regression model
```

TOTALACC	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-5.00396***	.47424	-10.55	.0000	-5.93346	-4.07446
VCVL	-.00031***	.6661D-04	-4.67	.0000	-.00044	-.00018
MCVCRAS	.32207D-04***	.1182D-04	2.72	.0065	.90305D-05	.55383D-04
VCVPTGRA	.00363***	.00090	4.03	.0001	.00186	.00540
MCVA	.16955D-04**	.7066D-05	2.40	.0164	.31097D-05	.30801D-04
SHNDRT	-.09048***	.00503	-18.01	.0000	-.10033	-.08063
SHNDCR	.03535***	.00694	5.10	.0000	.02176	.04895
MCVLIMI	-2.38455***	.28936	-8.24	.0000	-2.95171	-1.81739
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	.75265***	.05349	14.82	.0000	.65781	.85749
TOTLANE	.12464***	.02917	4.27	.0000	.06747	.18181
	Diagonal elements of Cholesky matrix					
LNLEN	.23989***	.02458	9.76	.0000	.19171	.28807
LNADT	.06168***	.01353	4.56	.0000	.03513	.08823
TOTLANE	.01968***	.00486	4.05	.0001	.01015	.02920
	Below diagonal elements of Cholesky matrix					
lLNA_LNL	-.07701***	.01730	-4.45	.0000	-.11092	-.04310
lTOT_LNL	.03437	.03936	.87	.3826	-.04278	.11153
lTOT_LNA	-.05437	.03402	-1.60	.1100	-.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	.0672680

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.]       16990.35243
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, 13:04:56
Sample is  2 pds and   4160 individuals
Negative binomial regression model
```

PDO	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-5.85668***	.54900	-10.67	.0000	-6.93271	-4.78065
VCVL	-.00030***	.6751D-04	-4.45	.0000	-.00043	-.00017
MCVCRAS	.40624D-04***	.1323D-04	3.08	.0020	.14687D-04	.66761D-04
VCVPTGRA	.00237***	.00058	4.10	.0000	.00124	.00350
MCVA	.22560D-04***	.8023D-05	2.81	.0049	.68346D-05	.38285D-04
SHWDRT	-.08901***	.00584	-15.25	.0000	-.10045	-.07757
SHWDCR	.03268***	.00787	4.15	.0000	.01725	.04812
MCVLIMI	-2.42917***	.33788	-7.19	.0000	-3.08794	-1.76901
MCOLR	-1.36550***	.31372	-4.32	.0000	-1.98043	-.75056
VCR	-.27457*	.14368	-1.97	.0487	-.55068	.00675
	Means for random parameters					
LNLEN	.88125***	.02836	31.08	.0000	.82566	.93683
LNADT	.83017***	.06185	13.42	.0000	.70895	.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	.01995***	.00526	3.79	.0002	.00963	.03028
	Below diagonal elements of Cholesky matrix					
lLNA_LNL	-.06886***	.01941	-3.55	.0004	-.10690	-.03082
lTOT_LNL	.02417	.04361	.55	.5795	-.06131	.10964
lTOT_LNA	-.05462	.03676	-1.49	.1374	-.12668	.01744
	Dispersion parameter for NegBin distribution					
ScalParm	.36393***	.01349	26.98	.0000	.33750	.39036

Implied covariance matrix of random parameters

Covariance matrix

	LNLEN	LNADT	TOTLANE
LNLEN	.5181E-01		
LNADT	-.1367E-01	.6456E-02	
TOTLANE	.5501E-02	-.4993E-02	.3965E-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	-.74689	.38377
LNADT	-.74689	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       -4220.06312
Restricted log likelihood     -6470.32115
Chi squared [    8 d.f.]       4500.51605
Significance level                 .00000
McFadden Pseudo R-squared        .3475431
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
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
    PINJ|  Coefficient       Error       z    |z|>Z*         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
  SHNDCR|    .03378***       .01051     3.21  .0013      .01317    .05438
 HCVLIMI|  -2.76365***       .34955    -7.90  .0000    -3.44935  -2.07795
  MCOLR |  -1.77516***       .49884    -3.56  .0004    -2.75309   -.79728
ANVWDINC|    .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     1.88  .0195     -.02275    .17766
        |Diagonal elements of Cholesky matrix
   LNLEN|    .06038**        .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|   -.03268***       .01263    -2.59  .0097     -.05744   -.00792
        |Dispersion parameter for NegBin distribution
ScalParm|    .34664***       .01872    18.51  .0000      .30994    .38334
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------------
               LNLEN      VCVPTGRA      TOTLANE
--------+-----------------------------------------------------
LNLEN       .3646E-02
VCVPTGRA    .3131E-03   .4342E-04
TOTLANE   -.4640E-03  -.1728E-03   .1154E-02

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|      .0603831
       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
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
     EVI|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -4.32997***      .87129    -4.97  .0000    -6.03768  -2.62227
 TOTLANE|    .13120**        .05965     2.20  .0278      .01429    .24812
HCVMKSEL|    .00336***       .00105     3.20  .0014      .00130    .00542
   LNLEN|    .78095***       .04348    17.96  .0000      .69574    .86616
 HCVLIMI|  -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  .0296      .01311    .25987
        |Below diagonal elements of Cholesky matrix
lSHW_LNA|   -.01202          .00760    -1.98  .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|    -.04706*        .02651    -1.98  .0555    -.09903    .00490
MCVMXSEL|     .00681**       .00269     2.10  .0368     .00096    .01066
   LNLEN|     .74619***      .09351     7.98  .0000     .56292    .92947
 HCVLIMI|   -2.78513**      1.36611    -2.05  .0408   -5.47266   -.11760
        |Means for random parameters
   LNADT|     .25215*        .14610     1.81  .0723w   -.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|   -5.98367**      2.90005    -2.06  .0391   -11.66766   -.29969
   LNADT|     .08808***      .02701     3.26  .0011      .03514    .14102
 HCVLIMI|   -4.01482**      2.01912    -1.99  .0461    -7.98897   -.04866
  SHNDLT|    -.11973***      .03022    -3.98  .0029    -.18064   -.03883
  SHNDCR|     .09046***      .02715     3.33  .0009      .03724    .14368
        |Means for random parameters
   LNLEN|     .71888***      .11287     6.94  .0000      .49466    .93710
        |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  NegBinReg Model
Dependent variable                HIINJ
Log likelihood function     -2175.42530
Restricted log likelihood   -2498.04694
Chi squared [   6 d.f.]      327.24727
Significance level             .00000
McFadden Pseudo R-squared      .1050846
Estimation based on N =   8320, K =  16
Inf.Cr.AIC  =   4382.9 AIC/N =     .527
Model estimated: Sep 14, 2015, 15:59:48
Sample is  2 pds and   4160 individuals
Negative binomial regression model
```

HIINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-3.77801***	.77200	-4.89	.0000	-5.29190	-2.26573
HCYLIN1	-2.15975***	.52498	-4.16	.0000	-3.22262	-1.15688
TOTLANE	.16705***	.05446	3.07	.0022	.06031	.27378
VCYL	-.00031***	.9563D-04	-3.20	.0014	-.00049	-.00012
SHWDLT	-.06511***	.01119	-5.09	.0000	-.09003	-.04619
SHWDCR	.03257***	.01160	2.86	.0045	.01003	.05671
	Means for random parameters					
LNLEN	.38687***	.04002	22.16	.0000	.30814	.46560
LNADT	.40813***	.05567	6.61	.0000	.29472	.52153
HCYNKSEL	.00259**	.00108	2.46	.0138	.00053	.00466
	Diagonal elements of Cholesky matrix					
LNLEN	.14188***	.03717	3.82	.0001	.06897	.21469
LNADT	.01913***	.00496	2.75	.0060	.00538	.03277
HCYNKSEL	.15919*	.08172	1.96	.0514	-.00096	.31934
	Below diagonal elements of Cholesky matrix					
LNA_LNL	-.08196***	.01408	-3.49	.0003	-.07890	-.02901
LHCY_LNL	-.00446***	.00133	-3.35	.0008	-.00707	-.00185
LHCY_LNA	.00175	.00108	1.32	.2255	-.00037	.00387
	Dispersion parameter for NegBin distribution					
ScalParm	.69191***	.07699	7.49	.0000	.44091	.74271

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------------------
              LNLEN       LNADT     HCYNKSEL
--------+-----------------------------------------------------------
LNLEN      .2011E-01
LNADT     -.7283E-02   .3003E-02
HCYNKSEL  -.6527E-03   .2626E-03   .2574E-04

Implied standard deviations of random parameters

S.D_Beta|            1
--------+------------
       1|      .141825
       2|      .054800
       3|      .005072

Implied correlation matrix of random parameters


--------+-----------------------------------
Cor.Mat.|   LNLEN    LNADT HCYNKSEL
--------+-----------------------------------
   LNLEN| 1.00000  -.93707  -.91359
   LNADT| -.93707  1.00000   .98337
HCYNKSEL| -.91359   .98337  1.00000
```

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

```
Random Coefficients  NegBinReg Model
Dependent variable               JUSTINJ
Log likelihood function     -2783.20836
Restricted log likelihood   -3532.81192
Chi squared [   9 d.f.]      1479.21192
Significance level             .00000
McFadden Pseudo R-squared      .2093834
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
```

JUSTINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-5.30238***	.84341	-6.29	.0000	-7.35152	-3.25327
LNLEN	.75935***	.04051	18.75	.0000	.67987	.83874
SHWDLT	-.02655*	.01358	-1.90	.0655	-.05706	.00400
TOTLANE	.18422***	.05573	3.31	.0009	.07498	.29345
VCR	-.84429**	.39578	-2.29	.0170	-1.71987	-.16860
NCOLR	-1.70262***	.60819	-2.80	.0051	-2.89496	-.51027
NCYL	-.00364***	.8746D-04	-7.27	.0000	-.00581	-.00147
HCYNKSEL	.00494***	.00100	4.88	.0000	.00298	.00690
	Means for random parameters					
LNADT	.55548***	.10451	5.70	.0000	.39065	.80031
SHWDRT	-.07696***	.01539	-5.00	.0000	-.10712	-.04680
	Diagonal elements of Cholesky matrix					
LNADT	.08190***	.00997	7.88	.0000	.02991	.09908
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***	.02724	12.32	.0000	.28249	.38936

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------------------
              LNADT      SHWDRT
--------+-----------------------------------------------------------
LNADT      .9794E-03
SHWDRT    -.7548E-03   .3521E-03

Implied standard deviations of random parameters

S.D_Beta|            1
--------+------------
       1|      .0312961
       2|      .0241296

Implied correlation matrix of random parameters


--------+-----------------
Cor.Mat.|   LNADT    SHWDRT
--------+-----------------
   LNADT| 1.00000   .90948
  SHWDRT|  .90948  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      -7692.54334
Restricted log likelihood   -18815.05685
Chi squared [    3 d.f.]     22245.02680
Significance level                .00000
McFadden Pseudo R-squared       .5911496
Estimation based on N =   8320, K =  16
Inf.Cr.AIC  =  15417.1 AIC/N =    1.853
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
  SHNDLT|   -.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***   .5609D-04   -8.23  .0000     -.00057   -.00035
MCVMMXSEL|    .00342***      .00059    5.78  .0000      .00226    .00458
  SHWDRT|   -.07831***      .00788   -9.98  .0000     -.09369   -.06293
    VCVL|   -.00030***   .5814D-04   -5.14  .0000     -.00041   -.00018
  SHNDCR|    .04254***      .00642    6.63  .0000      .02996    .05512
        |Means for random parameters
   LNLEN|    .89860***      .02767   32.47  .0000      .84436    .95283
 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***      .01382    4.60  .0000      .03653    .09077
        |Dispersion parameter for NegBin distribution
ScalParm|    .38329***      .01393   25.74  .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   .99264
 TOTLANE|  .99264  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    -2693.22531
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, 13:60:23
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***      .10567   12.54  .0000     1.11778   1.53139
MCVMMXSEL|    .00263*       .00138    1.97  .0466     -.00007    .00533
  SHNDLT|   -.11048***      .01628   -6.48  .0000     -.15431   -.08266
    VCVL|   -.00050***      .00016   -2.90  .0051     -.00084   -.00015
        |Means for random parameters
   LNLEN|    .91320***      .06096   14.98  .0000      .79379   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***      .04082    3.16  .0016      .04679    .20763
    MCVR|    .00048***   .7882D-04    5.98  .0000      .00030    .00060
 TOTLANE|    .06046***      .01605    3.77  .0002      .02901    .09191
        |Below diagonal elements of Cholesky matrix
lMCV_LNL|    .00015      .9303D-04    1.90  .0456     -.00003    .00033
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***      .07688    8.64  .0000      .51356    .81480
--------+-----------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------------------
                 LNLEN        MCVR     TOTLANE
--------+-----------------------------------------------------------
LNLEN      .1644E-01
MCVR       .1914E-04   .2262E-06
TOTLANE    .1375E-01   .7944E-04   .3139E-01

Implied standard deviations of random parameters

S.D_Beta|            1
--------+--------------
       1|      .128208
       2|   .475608E-03
       3|      .177010


Implied correlation matrix of random parameters


--------+-------------------------
Cor.Mat.|    LNLEN     MCVR  TOTLANE
--------+-------------------------
   LNLEN| 1.00000   .31389   .60595
    MCVR|  .31389  1.00000   .87232
 TOTLANE|  .60595   .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 =  13
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|   -9.09455***      .97183    -9.36  .0000   -10.99568  -7.19050
   LNADT|    1.24294***      .12987     9.55  .0000      .98898   1.49690
  SHWDLT|    -.11072***      .02088    -5.30  .0000     -.15164   -.06979
        |Means for random parameters
   LNLEN|     .92366***      .07122    13.00  .0000      .78608   1.06526
    HCVR|    -.00028***   .9655D-04    -2.92  .0036     -.00047   -.00009
 TOTLANE|    -.00025**    .9744D-04    -2.35  .0187     -.00044   -.00006
        |Diagonal elements of Cholesky matrix
   LNLEN|     .17460***      .04919     3.55  .0004      .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
1HCV_LNL|     .10012         .04010     1.97  .1004     -.00008    .00032
1TOT_LNL|     .14291**       .06375     2.24  .0250      .01757    .26755
1TOT_HCV|     .11446***      .02682     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        .3048E-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|    .485350E-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       .2752615
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***     1.46833    -8.48  .0000    -15.3270   -9.5711
   LNLEN|     .87053***      .08270    10.53  .0000      .70844   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***      .17619     8.60  .0000     1.17107   1.85774
    HCVR|    -.00032**       .00016    -1.98  .0475     -.00064    .00000
 TOTLANE|    -.18365**       .09175    -2.00  .0454     -.36354   -.00376
        |Diagonal elements of Cholesky matrix
   LNADT|     .05006*        .02622     1.97  .0560     -.00523    .10539
    HCVR|     .00092***      .00011     2.99  .0028      .00011    .00084
 TOTLANE|     .05432***      .02068     2.63  .0086      .01378    .09485
        |Below diagonal elements of Cholesky matrix
1HCV_LNA|     .00020         .00013     1.92  .0475     -.00008    .00045
1TOT_LNA|     .12446         .08548     1.96  .0466     -.04317    .29209
1TOT_HCV|     .14221***      .03394     4.22  .0000      .07670    .20972
        |Dispersion parameter for NegBin distribution
ScalParm|    1.02038***      .26529     3.85  .0001      .50041   1.54035
--------+-----------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------------
                 LNADT         HCVR      TOTLANE
--------+-----------------------------------------------------
LNADT        .2506E-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      .0489343
Estimation based on N =   2202, K =   9
Inf.Cr.AIC  =    449.9 AIC/N =     .204
Model estimated: Sep 15, 2018, 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***     1.90849    -4.26  .0000   -11.85437  -4.38108
   LNLEN|    .75082***      .10944     6.86  .0000      .53633    .96531
  SHWDLT|   -.07895         .03059    -1.96  .0185     -.17814    .02018
        |Means for random parameters
   LNADT|    .96615***      .24107     4.01  .0001      .49569   1.43568
 TOTLANE|   -.58814***      .20743    -2.84  .0046     -.99474   -.18154
        |Diagonal elements of Cholesky matrix
   LNADT|    .07305*        .03795     1.93  .0541     -.00130    .14739
 TOTLANE|    .06851*        .03465     1.97  .0477     -.00644    .16347
        |Below diagonal elements of Cholesky matrix
 lTOT_LNA|   .30554**       .12412     2.46  .0138      .06228    .54881
        |Dispersion parameter for NegBin distribution
ScalParm|    .35449*        .19461     2.02  .0285     -.02694    .73592
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------
                 LNADT      TOTLANE
--------+--------------------------------------------
LNADT      .5336E-02
TOTLANE    .2232E-01        .1012

Implied standard deviations of random parameters

S.D_Beta|             1
--------+-------------
       1|      .0730489
       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      -81.33114
Restricted log likelihood    -83.28713
Chi squared [    1 d.f.]       3.91198
Significance level               .04794
McFadden Pseudo R-squared      .0234849
Estimation based on N =   2202, K =   6
Inf.Cr.AIC  =    174.7 AIC/N =     .079
Model estimated: Sep 16, 2018, 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***     4.11354    -2.62  .0088    -18.8554   -2.7143
   LNADT|   1.15459**       .49803     2.32  .0204      .17847   2.13071
   LNLEN|    .95624***      .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|    .17690*        .09500     1.98  .0486     -.00780    .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  =    593.7 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***    1.45305    -8.79  .0000    -15.4002    -9.7828
VCVPTURB|    -.00594**      .00257    -2.31  .0209     -.01099    -.00090
NCVMKSL1|   -12.1579*      7.04549    -1.93  .0844    -25.9671     1.6514
        |Means for random parameters
   LNADT|    1.09795***     .17466     6.29  .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
lTOT_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        -297.95833
Restricted log likelihood      -358.40693
Chi squared [    3 d.f.]        120.89720
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    -14.2856    -7.2302
RRYWDDEC|     .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|    1.03546***     .20862     4.97  .0000      .62677    1.44414
 TOTLANE|    -.00579**      .00262    -2.21  .0272     -.01098    -.00068
        |Diagonal elements of Cholesky matrix
   LNADT|     .13255***     .03150     4.22  .0000      .07119     .19487
 TOTLANE|     .05756*       .03244     1.97  .0760     -.00602     .12119
        |Below diagonal elements of Cholesky matrix
lTOT_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        .1747E-01
TOTLANE      .5206E-01       .1567

Implied standard deviations of random parameters

S.D_Beta|              1
--------+---------------
       1|        .132930
       2|        .395949

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

LOINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-9.94824***	.97016	-10.25	.0000	-11.84972	-8.04676
TOTLANE	-.15403**	.07671	-2.01	.0447	-.30438	-.00368
LNLEN	.93215***	.06899	13.48	.0000	.79610	1.06620
MCVMAXS1	-11.0167***	3.53546	-3.11	.0018	-17.9520	-4.0815
BCVR	.00017***	.4177D-04	3.98	.0001	.00008	.00025
VCM	-.59023**	.28384	-2.08	.0376	-1.14655	-.03392
	Means for random parameters					
LNADT	1.36693***	.12652	10.80	.0000	1.11896	1.61490
SHWDLT	-.10712***	.02108	-5.08	.0000	-.14843	-.06581
	Diagonal elements of Cholesky matrix					
LNADT	.05303***	.00739	7.18	.0000	.03855	.06751
SHWDLT	.05556***	.01589	3.50	.0005	.02442	.08670
	Below diagonal elements of Cholesky matrix					
1SHW_LNA	-.12282***	.01496	-8.21	.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 .2943913
Estimation based on N = 2020, K = 16
Inf.Cr.AIC = 2270.3 AIC/N = 1.124
Model estimated: Sep 14, 2016, 15:40:48
Sample is 2 pds and 1010 individuals
Negative binomial regression model

TOTALACC	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-7.84202***	.92621	-8.47	.0000	-9.65738	-6.02665
LNLEN	.84394***	.05099	16.55	.0000	.74401	.94387
BCVR	-.75276D-04***	.2730D-04	-2.76	.0058	-.12879D-03	-.21764D-04
DEGL	.03057***	.00763	4.04	.0001	.01591	.04584
SHWDCR	-.04138***	.01425	-2.89	.0038	-.06933	-.01338
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	-1.14342***	.42691	-2.68	.0073	-1.98234	-.30690
	Diagonal elements of Cholesky matrix					
LNADT	.07329***	.02121	3.46	.0005	.03173	.11486
TOTLANE	.06190*	.03576	1.95	.0624	-.00818	.13198
SHWDLT	.02372***	.00626	3.73	.0002	.01144	.03599
	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	.01745	.01608	1.59	.0957	-.01398	.04894
	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	.16619
SHWDLT	.93210	.16619	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 -843.30381
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

PDO	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-7.52550***	1.01491	-7.71	.0000	-9.51663	-5.53632
LNLEN	.83066***	.05100	16.29	.0000	.73071	.93061
TOTLANE	-.04306**	.01980	-2.17	.0297	-.08186	-.00425
	Means for random parameters					
LNADT	.90573***	.11140	8.13	.0000	.68739	1.12406
SHWDCR	-.04323***	.01569	-2.76	.0058	-.07399	-.01248
	Diagonal elements of Cholesky matrix					
LNADT	.02895***	.00595	4.87	.0000	.01729	.04061
SHWDCR	.04219***	.00958	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***	.22982	4.91	.0000	.67766	1.57852

Implied covariance matrix of random parameters

Covariance matrix

	LNADT	SHWDCR
LNADT	.8383E-03	
SHWDCR	.9456E-03	.2846E-02

Implied standard deviations of random parameters

S.D_Beta	1
1	.0289534
2	.0533823

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 PINJ
Log likelihood function -452.65759
Restricted log likelihood -500.67920
Chi squared [6 d.f.] 96.04321
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, 18:26:07
Sample is 2 pds and 1010 individuals
Negative binomial regression model

PINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-8.93822***	1.59539	-5.60	.0000	-12.06630	-5.81014
LNLEN	.76558***	.08130	9.42	.0000	.60622	.92493
TOTLANE	-.26909**	.11718	-2.30	.0217	-.49875	-.03942
HCVPTCVA	.00477*	.00249	1.92	.0552	-.00011	.00965
	Means for random parameters					
LNADT	1.04786***	.17652	5.94	.0000	.70188	1.39383
HCVLINI	-5.72795***	1.57034	-3.65	.0003	-8.80596	-2.64994
SHWDCR	-.15288***	.02974	-5.14	.0000	-.21127	-.09448
	Diagonal elements of Cholesky matrix					
LNADT	.09237***	.03359	2.75	.0060	.02655	.15820
HCVLINI	3.23370***	1.12976	2.88	.0040	1.03119	5.43621
SHWDCR	.06789***	.02008	3.38	.0007	.02853	.10725
	Below diagonal elements of Cholesky matrix					
lHCV_LNA	.00458*	.00250	1.82	.0687	-.00032	.00948
lSHW_LNA	.09266***	.03353	2.76	.0057	.02694	.15838
lSHW_HCV	-.05946**	.02552	-2.33	.0197	-.10948	-.00947
	Dispersion parameter for NegBin distribution					
ScalParm	1.52676**	.66122	2.31	.0209	.23079	2.82274

Implied covariance matrix of random parameters

Covariance matrix

	LNADT	HCVLINI	SHWDCR
LNADT	.1116E-01		
HCVLINI	.1160E-02	10.47	
SHWDCR	.9708E-03	-.1822	.1670E-01

Implied standard deviations of random parameters

S.D_Beta	1
1	.0923626
2	3.23556
3	.129237

Implied correlation matrix of random parameters

Cor.Mat.	LNADT	HCVLINI	SHWDCR
LNADT	1.00000	.03393	.71633
HCVLINI	.03393	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        -172.73281
Restricted log likelihood      -176.85745
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
 VCVVFIR|     .00717**       .00318     2.25  .0220      .00100     .01331
        |Means for random parameters
  SSNDCR|    -.08385*        .04521    -1.85  .0536     -.17245     .00476
   LNADT|     .60283**       .23552     2.56  .0105      .14122    1.06445
        |Diagonal elements of Cholesky matrix
  SSNDCR|     .07534***      .02678     2.81  .0049      .02284     .12784
   LNADT|     .03024*        .01590     1.93  .0571     -.00092     .06141
        |Below diagonal elements of Cholesky matrix
lLNA_SWN|    -.03980**       .01418    -2.98  .0171     -.06140    -.00601
        |Dispersion parameter for NegBin distribution
ScalParm|     .02818*        .01553     2.81  .0095     -.00225     .05861
--------+-----------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------------------------------
---
                SSNDCR        LNADT
--------+-----------------------------------------------------------------------
---
SSNDCR     .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.|  SSNDCR    LNADT
--------+------------------
  SSNDCR| 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      -101.03942
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, 19:25:34
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   -17.33618    -.86351
   LNADT|     .76897*        .44240     1.94  .0722     -.09011    1.60606
   DEG1|      .06823***      .02339     2.92  .0035      .02239     .11406
        |Means for random parameters
  SMNDCR|    -.46965**       .18363    -2.55  .0106     -.82994    -.10936
   LNLEN|    1.16871***      .18448     6.34  .0000      .80713    1.53029
        |Diagonal elements of Cholesky matrix
  SMNDCR|     .30160***      .11041     2.73  .0063      .08520     .51801
   LNLEN|     .17176         .10785     1.59  .0112     -.03957     .38312
        |Below diagonal elements of Cholesky matrix
lLNL_SMN|     .22706***      .06803     3.34  .0008      .09373     .36040
        |Dispersion parameter for NegBin distribution
ScalParm|     .96034*        .50613     1.97  .0573     -.02971    1.95038
--------+-----------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------------------
                SMNDCR        LNLEN
--------+-----------------------------------------------------------
SMNDCR     .9097E-01
LNLEN      .6848E-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.|  SMNDCR    LNLEN
--------+------------------
  SMNDCR| 1.00000   .79750
   LNLEN|  .79750  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      -365.45582
Chi squared [   8 d.f.]          40.03969
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***     1.51529    -4.90  .0000   -10.36562  -4.44538
   LNADT|     .79318***      .16608     4.78  .0000      .46768   1.11869
    MCVL|    -.00082***      .00026    -3.12  .0018     -.00133   -.00030
 HCVTRAN|     .00029***  .91750D-04     3.14  .0017      .00011    .00047
XXYNDDEC|    -.03429**       .01690    -2.03  .0425     -.06742   -.00116
        |Means for random parameters
   LNLEN|     .90133***      .09607     9.39  .0000      [illegible]   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  .0784     -.00915    .06705
        |Dispersion parameter for NegBin distribution
ScalParm|     .00343         .00229     1.80  .1355     -.00105    .00792
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------
               LNLEN      SHWDCR
--------+--------------------------------------------------------
LNLEN       .3234E-01
SHWDCR      .1457E-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 =      .22[illegible]
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     -.32578   -.13400
    MCVL|    -.00098**       .00044    -2.22  .0266     -.00185   -.00011
        |Means for random parameters
   LNLEN|    1.11266***      .13097     8.50  .0000      .85596   1.36937
MCVMXSEL|     .00740         .00903     1.97  .0610     -.00288    .01728
        |Diagonal elements of Cholesky matrix
   LNLEN|     .20205***      .06360     3.17  .0015      .07700    .32709
MCVMXSEL|     .00295**       .00135     2.19  .0285      .00031    .00558
        |Below diagonal elements of Cholesky matrix
 lMCV_LNL|     .00740        .00403     1.97  .0480     -.00245    .01725
        |Dispersion parameter for NegBin distribution
ScalParm|     .03784*        .02062     2.05  .0660     -.00220    .07787
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------
              LNLEN    MCVMXSEL
--------+--------------------------------------------------------
LNLEN      .4082E-01
MCVMXSEL   .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 MCVMXSEL
--------+--------------------
   LNLEN| 1.00000    .46937
MCVMXSEL|  .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    -1187.85378
Chi squared [   3 d.f.]       515.60648
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|   -7.19491***      .79144    -9.09  .0000    -8.74612  -5.64371
   LNADT|     .85113***      .08024    10.61  .0000      .69386   1.00839
 VCVLIMI|   -1.41442*        .76620    -1.95  .0669   -2.91814    .05729
        |Means for random parameters
   LNLEN|     .89677***      .05100    17.58  .0000      .79681    .99673
  SSNDCR|    -.04277***      .01430    -2.99  .0028    -.07081   -.01474
        |Diagonal elements of Cholesky matrix
   LNLEN|     .14896***      .01982     7.52  .0000      .11011    .18781
  SSNDCR|     .03685***      .00855     4.32  .0000      .02151    .05419
        |Below diagonal elements of Cholesky matrix
1SHW_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      SSNDCR
--------+-----------------------------------------
LNLEN      .2219E-01
SSNDCR     .3569E-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   SSNDCR
--------+-----------------
   LNLEN| 1.00000   .52685
  SSNDCR|  .52685  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    -3045.91846
Chi squared [   6 d.f.]      3534.68631
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
    DEGI|     .00557***      .00311     2.76  .0058      .00248    .01466
  SHWDRT|    -.10227***      .01453    -7.04  .0000    -.13074   -.07379
 HCVCRAN|-.92455D-04**    .40600D-04   -2.28  .0228 -.17203D-03 -.12884D-04
     VCR|    1.54300**       .65166     2.27  .0234      .20598   2.88103
   HCULR|   -1.16673**       .54213    -2.15  .0314   -2.22940   -.10406
        |Means for random parameters
   LNADT|     .76328***      .11143     6.85  .0000      .54487    .98168
   LNLEN|     .95979***      .05873    16.34  .0000      .84464   1.07494
RWYWDINC|     .03545***      .00665     5.31  .0000      .02236    .04853
        |Diagonal elements of Cholesky matrix
   LNADT|     .06872**       .02878     2.39  .0169      .01231    .12512
   LNLEN|     .04074**       .01641     2.48  .0131      .00857    .07290
RWYWDINC|     .03288*        .01700     1.96  .0531    -.00044    .06620
        |Below diagonal elements of Cholesky matrix
1LNL_LNA|     .13467*        .07869     1.98  .0870    -.01956    .28890
1RWY_LNA|    -.02383**       .01046    -2.27  .0228    -.04437   -.00330
1RWY_LNL|     .00352         .00640     1.85  .0522    -.00902    .01806
        |Dispersion parameter for NegBin distribution
ScalParm|     .64054***      .06566     9.76  .0000      .51184    .76923
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+---------------------------------------------------
               LNADT        LNLEN     RWYWDINC
--------+---------------------------------------------------
LNADT      .4722E-02
LNLEN      .9284E-02    .1897E-01
RWYWDINC  -.1638E-02   -.3108E-02    .5846E-03

Implied standard deviations of random parameters

S.D_Beta|             1
--------+--------------
       1|      .0687152
       2|       .137741
       3|      .0241786

Implied correlation matrix of random parameters

--------+--------------------------
Cor.Mat.|   LNADT    LNLEN RWYWDINC
--------+--------------------------
   LNADT| 1.00000   .97771  -.98568
   LNLEN|  .97771  1.00000  -.93314
RWYWDINC| -.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  -1792.77671
Chi squared [   3 d.f.]    1653.17888
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
```

PDO	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence 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**	.89042	2.05	.0399	.08457	3.17494
SHWDLT	-.05471***	.02074	-2.64	.0083	-.09536	-.01406
MCVCRAN	-.00016***	.5431D-04	-3.02	.0026	-.00027	-.00006
VCR	1.64425*	.85529	1.92	.0545	-.03206	3.32061
HCVMRBEL	.00348**	.00177	1.96	.0497	.00001	.00695
	Means for random parameters					
LNLEN	.93348***	.07240	12.89	.0000	.79158	1.07539
RWYWDINC	.05790***	.00807	7.17	.0000	.04208	.07372
	Diagonal elements of Cholesky matrix					
LNLEN	.18394***	.03818	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.]     493.86694
Significance level              .00000
McFadden Pseudo R-squared     .3035085
Estimation based on N =   1608, K =  11
Inf.Cr.AIC  =   1155.3 AIC/N =     .718
Model estimated: Sep 23, 2015, 17:12:48
Sample is  2 pds and    804 individuals
Negative binomial regression model
```

PINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-9.62051***	1.75979	-5.47	.0000	-13.06981	-6.17168
LNADT	1.03698***	.18505	5.60	.0000	.67429	1.39967
DESI	.01087*	.00606	1.98	.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	.00179	.03545
LNLEN	.07358***	.02548	2.88	.0038	.02363	.12353
	Below diagonal elements of Cholesky matrix					
lLNL_SSW	.06138***	.02253	2.73	.0064	.01724	.10556
	Dispersion parameter for NegBin distribution					
ScalParm	.67557***	.14479	4.67	.0000	.39179	.95935

Implied covariance matrix of random parameters

Covariance matrix

	SHWDLT	LNLEN
SHWDLT	.4174E-04	
LNLEN	.3946E-03	.9188E-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
RWYWDINC|     .03252**       .01456     2.23  .0255      .00389    .06108
        |Diagonal elements of Cholesky matrix
 VCPARMA|     .15725*        .08112     1.94  .0526     -.00175    .31625
RWYWDINC|     .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     RWYWDINC
--------+---------------------------------------------
VCPARMA     .2473E-01
RWYWDINC    .1055E-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 RWYWDINC
--------+-----------------
 VCPARMA| 1.00000   .54030
RWYWDINC|  .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      -78.50779
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    -9.85051  -5.48860
RWYWDINC|     .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 [   5 d.f.]          7.71955
Significance level                .05218
McFadden Pseudo R-squared       .0400105
Estimation based on N =   1608, K =   5
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  .0505    -.00162    .02528
        |Means for random parameters
   LNADT|     .01634*        .00879     1.86  .0632    -.00090    .03353
RNYNDINC|     .00313*        .00177     1.97  .0565    -.00033    .00660
        |Diagonal elements of Cholesky matrix
   LNADT|     .18878***      .07049     2.68  .0074     .05068    .32694
RNYNDINC|     .01680**       .00821     2.05  .0407     .00071    .03289
        |Below diagonal elements of Cholesky matrix
lRNY_LNA|    -.04536**       .01918    -2.36  .0181    -.08297   -.00775
        |Dispersion parameter for NegBin distribution
ScalParm|     .12468         .04922     1.98  .0281    -.06955    .31836
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------
              LNADT     RNYNDINC
--------+--------------------------------------------------
LNADT       .3569E-01
RNYNDINC  -.8564E-02   .2340E-02

Implied standard deviations of random parameters

S.D_Beta|              1
--------+----------------
       1|        .188784
       2|       .0483730

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|   LNADT RNYNDINC
--------+------------------
   LNADT| 1.00000  -.93776
RNYNDINC| -.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       .1385185
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
  SHMDCR|    -.08533*        .04529    -1.95  .0595    -.17409    .00343
        |Means for random parameters
 MCVCRAN|    -.00036***      .00011    -3.15  .0016    -.00058   -.00013
RNYNDINC|     .04057***      .01208     3.36  .0008     .01687    .06427
        |Diagonal elements of Cholesky matrix
 MCVCRAN|     .04424**       .02215     1.99  .0462     .00078    .08773
RNYNDINC|     .00741**       .00317     2.34  .0192     .00121    .01362
        |Below diagonal elements of Cholesky matrix
lRNY_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    RNYNDINC
--------+--------------------------------------------------
MCVCRAN    .2991E-07
RNYNDINC   .9955E-06   .8826E-04

Implied standard deviations of random parameters

S.D_Beta|              1
--------+----------------
       1|   .172955E-03
       2|      .00939484

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.| MCVCRAN RNYNDINC
--------+------------------
 MCVCRAN| 1.00000   .61452
RNYNDINC|  .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      -395.95063
Restricted log likelihood    -486.47671
Chi squared [   3 d.f.]       178.95218
Significance level               .00000
McFadden Pseudo R-squared      .1852146
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    -1.85  .0645    -8.24405     .24616
    VCVL|    -.00122**       .00054    -2.28  .0226    -.00227    -.00017
RNYRDINC|     .06557***      .01217     4.88  .0000     .03552     .08322
 HCVCRAM|    -.00018**    .8502D-04    -2.14  .0322    -.00035    -.00002
  SMWDCR|    -.18165***      .05246    -3.46  .0005    -.28429    -.07867
  LNADT |     .00018**    .8579D-04     2.08  .0390     .00001     .00035
        |Means for random parameters
  LNLEN |     .84699***      .09303     9.32  .0000     .66465    1.04852
MCVMXSEL|     .00937***      .00311     3.01  .0026     .00328     .01547
        |Diagonal elements of Cholesky matrix
  LNLEN |     .08263***      .00190     2.59  .0096     .02012     .14516
MCVMXSEL|     .00612***      .00236     2.58  .0099     .00147     .01078
        |Below diagonal elements of Cholesky matrix
1MCV_1NL|     .09302**       .04088     2.28  .0229     .01290     .17314
        |Dispersion parameter for NegBin distribution
ScalParm|     .71307***      .22134     3.22  .0013     .27825    1.14689
--------+--------------------------------------------------------------------
```

```
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   -2297.11631
Chi squared [   6 d.f.]      2385.98017
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***     1.08609    -2.61  .0090    -4.96380    -.70640
RNYRDINC|     .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 |     .32175***      .11558     2.78  .0054     .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
1MCV_LNL|    -.00486**       .00232    -2.10  .0361    -.00941    -.00032
1LNA_LNL|     .00279         .00177     1.98  .0446    -.00068     .00627
1LNA_MCV|    -.01920*        .01027    -1.87  .0615    -.03933     .00092
        |Dispersion parameter for NegBin distribution
ScalParm|     .59332***      .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      .5550E-02  -.2102E-03   .1112E-02

Implied standard deviations of random parameters

S.D_Beta|             1
--------+-------------
       1|       .154708
       2|     .00668163
       3|      .0333409

Implied correlation matrix of random parameters

--------+-------------------------
Cor.Mat.|   LNLEN MCVMXSEL    LNADT
--------+-------------------------
   LNLEN| 1.00000  -.72665   .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      .3552456
Estimation based on N =   1236, K =  14
Inf.Cr.AIC  =    894.9 AIC/N =     .724
Model estimated: Oct 06, 2015, 16:20:54
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|     .31938***     .10061     3.18  .0015      .12236    .51441
    DEXL|    -.02888**      .01209    -2.14  .0323    -.04967   -.00218
MCVOMXSEL|     .00298        .00155     1.93  .0471    -.00055    .00650
        |Means for random parameters
   LNLEN|     .77506***     .06783    11.48  .0000      .64211    .90801
     VCH|    3.00562***    1.06717     2.82  .0049      .91401   5.09724
 NOFLINC|     .39622**      .19784     2.02  .0436      .01144    .78501
        |Diagonal elements of Cholesky matrix
   LNLEN|     .13814***     .03981     3.34  .0008      .05512    .21116
     VCH|    5.89048***    1.09148     5.77  .0002     1.86881   9.91214
 NOFLINC|     .14200**      .07144     1.99  .0469      .00198    .28202
        |Below diagonal elements of Cholesky matrix
lVCH_LNL|   -6.15302***    1.91723    -3.29  .0012    -9.99084  -2.65520
lNOF_LNL|     .14353**      .07137     2.01  .0443      .00365    .28341
lNOF_VCH|     .07145        .06124     1.97  .0434     -.04858    .19148

        |Dispersion parameter for NegBin distribution
ScalParm|    1.92656**      .90968     2.12  .0339      .13321   3.71991
--------+--------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-------------------------------------------------------
              LNLEN          VCH     NOFLINC
--------+-------------------------------------------------------
LNLEN       .1773E-01
VCH          -.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|         .272468

Implied correlation matrix of random parameters

--------+--------------------------
Cor.Mat.|    LNLEN       VCH  NOFLINC
--------+--------------------------
   LNLEN| 1.00000  -.84678  -.81218
     VCH| -.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      -312.77889
Restricted log likelihood    -468.07641
Chi squared [   3 d.f.]       310.59604
Significance level               .00000
McFadden Pseudo R-squared      .3317731
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
     VCH|    1.28656**      .60621     2.12  .0338      .09661   2.47872
        |Means for random parameters
   LNLEN|     .94096***     .06868    13.70  .0000      .80633   1.07560
   LNADT|     .55133***     .08334     6.62  .0000      .38798    .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|    1.25810*       .67748     1.86  .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      -113.04630
Restricted log likelihood    -121.78074
Chi squared [   3 d.f.]        17.40687
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 08, 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***     1.75661    -4.33  .0000   -11.12235  -4.08057
   LNADT|     .65906***      .18579     3.55  .0004      .29093   1.01920
     VCR|    3.34078**      1.70306     1.96  .0498      .00280   6.67876
        |Means for random parameters
   LNLEN|     .70356***      .11289     6.23  .0000      .48228    .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   .9876E-07

Implied standard deviations of random parameters

S.D_Beta|              1
--------+----------------
      1|       .0417401
      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.]         9.19278
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, 18:30:52
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|     .69828***      .12460     5.60  .0000      .45407    .94248
    VCR2|    -.18783***      .05322    -3.53  .0004     -.29214   -.08352
        |Means for random parameters
   LNADT|     .42089**       .19391     2.18  .0317      .03691    .80488
        |Scale parameters for dists. of random parameters
   LNADT|     .05626**       .02298     2.45  .0144      .01119    .10132
        |Dispersion parameter for NegBin distribution
ScalParm|     .00720***      .00278     2.59  .0095      .00176    .01264
--------+-----------------------------------------------------------------------
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       .0480371
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|     .46525***      .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     1.98  .0381    -.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       .9482357
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|    1.31205***      .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|     .14534**       .07134     2.04  .0416      .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 [   2 d.f.]       342.71603
Significance level               .00000
McFadden Pseudo R-squared      .3470415
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
 VCPARMA|     .14770*       .09508     1.96  .0569     -.02848    .34404
    VCVL|    -.00063*       .00034    -1.87  .0614     -.00130    .00003
 MCVCRAN|     .00011**    .4576D-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|    2.08274**      .87233     2.39  .0170      .37301   3.79247
        |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        7.267

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|        .124539
       2|        2.69582


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    -8.35584  -5.74331
   LNADT|    1.02080***     .08772    11.64  .0000      .84858   1.19272
 HCVLIMI|   -1.73714***     .46441    -3.74  .0002    -2.64736   -.82692
  SHNDRT|    -.06702***     .01324    -5.06  .0000     -.09287   -.04117
 VCPARMA|     .05992**      .02633     2.28  .0228      .00832    .11153
 HCVCRAN| .87695D-04**    .44700D-04   1.96  .0498  .82997D-07 .17531D-03
        |Means for random parameters
   LNLEN|     .99443***     .05856    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    .04196
        |Diagonal elements of Cholesky matrix
   LNLEN|     .32577***     .05508     5.91  .0000      .21780    .43373
 TOTLANE|     .15076***     .05732     2.62  .0088      .03802    .26351
    DEG1|     .01123        .00586     1.96  .0418     -.00222    .02467
 RWYWDINC|    .00634***     .00149     3.99  .0001      .00014    .00954
        |Below diagonal elements of Cholesky matrix
 lTOT_LNL|    -.25405***     .06632    -3.93  .0001     -.38403   -.12407
 lDEG_LNL|    -.01025        .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     -.35269    .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|        .0254085
       4|        .0405675


Implied correlation matrix of random parameters

--------+-----------------------------------
Cor.Mat.|    LNLEN  TOTLANE     DEG1 RWYWDINC
--------+-----------------------------------
   LNLEN| 1.00000  -.85997  -.40323   .87816
 TOTLANE| -.85997  1.00000   .75575  -.94005
    DEG1| -.40323   .75575  1.00000  -.90604
RWYWDINC|  .87816  -.94005  -.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   -2399.41018
Chi squared [   6 d.f.]     2424.64487
Significance level               .00000
McFadden Pseudo R-squared      .5052555
Estimation based on N =   1452, K =  17
Inf.Cr.AIC  =   2408.2 AIC/N =    1.659
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
    BCVR|-.27490D-04*      .15111D-04   -1.97  .0589 -.57108D-04  .21266D-05
 TOTLANE|    -.25052***      .09512    -2.63  .0084    -.43696    -.06409
HCVMXSL1|   -24.8436***     5.41333    -4.58  .0000   -35.4779   -14.2494
 HCVCRAN|     .00013***   .4488D-04     2.91  .0037     .00004     .00022
RNYMDIRC|     .01583**       .00698     2.27  .0231     .00215     .02959
SHWDRTCR|    -.08311**       .03231    -2.57  .0101    -.14644    -.01977
        |Means for random parameters
   LNADT|    1.07468***      .09534    11.27  .0000     .88781    1.26158
   LNLEN|     .87136***      .06673    13.06  .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
1LNL_LNA|     .20060***      .07091     2.83  .0047     .06181     .33949
1HCV_LNA|    -.00101         .00177    -2.57  .0072    -.00448     .00247
1HCV_LNL|    -.00527***      .00147    -3.58  .0003    -.00816    -.00239
        |Dispersion parameter for NegBin distribution
ScalParm|     .65359***      .06223    10.50  .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  -.6196E-04  -.4778E-03   .3396E-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***      .14583     6.88  .0000     .72034    1.28338
HCVMXSL1|   -35.2226***     7.18629    -4.90  .0000   -49.3076   -21.1377
 HCVCRAN|     .00023***   .6291D-04     3.61  .0003     .00010     .00035
 VCEARMA|     .07880*        .04411     1.99  .0540    -.00785     .16524
        |Means for random parameters
  SHWDCR|    -.07655***      .02440    -3.14  .0017    -.12442    -.02877
   LNLEN|     .88324***      .08349    10.58  .0000     .71980    1.04668
        |Diagonal elements of Cholesky matrix
  SHWDCR|     .04429**       .01803     2.46  .0143     .00855     .07873
   LNLEN|     .09817***      .02342     4.19  .0000     .05226     .14408
        |Below diagonal elements of Cholesky matrix
1LNL_SHW|    -.05859***      .02116    -2.77  .0056    -.10007    -.01712
        |Dispersion parameter for NegBin distribution
ScalParm|     .48068***      .07959     6.04  .0000     .32305     .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|       .114527


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      -240.41858
Restricted log likelihood    -280.49544
Chi squared [   3 d.f.]        80.14376
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|    -5.14257***     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    -1.98  .0803    -49.1206    2.7944
   LNLEN|     .95315***       .16001     6.19  .0000      .66354   1.29475
        |Diagonal elements of Cholesky matrix
MCVMXSL1|     .27604**        .11848     2.34  .0191      .04343    .31066
   LNLEN|     .15081***       .05175     2.91  .0036      .04938    .25223
        |Below diagonal elements of Cholesky matrix
lLNL_MCV|    -.13653***       .04608    -2.96  .0031     -.23040   -.04465
        |Dispersion parameter for NegBin distribution
ScalParm|     .31349**        .13732     2.30  .0216      .04435    .58462
--------+--------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
            MCVMXSL1       LNLEN
--------+--------------------------------------------------------------------
MCVMXSL1       .0728
LNLEN         -.1294    .4189E-01

Implied standard deviations of random parameters

S.D_Beta|             1
--------+--------------
       1|       .933871
       2|       .204773

Implied correlation matrix of random parameters

--------+------------------
Cor.Mat.|MCVMXSL1    LNLEN
--------+------------------
MCVMXSL1| 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      -111.33073
Restricted log likelihood    -112.67961
Chi squared [   1 d.f.]         2.69776
Significance level               .10049
McFadden Pseudo R-squared      .0119709
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|     .66009***       .23121     2.77  .0056      .18693   1.09324
        |Scale parameters for dists. of random parameters
   LNLEN|     .63117***       .23916     2.64  .0083      .16242   1.09991
        |Dispersion parameter for NegBin distribution
ScalParm|     .09455*         .05066     1.86  .0629     -.00510    .19420
--------+--------------------------------------------------------------------
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       -382.98840
Restricted log likelihood     -453.05698
Chi squared [   3 d.f.]        140.13796
Significance level                .00000
McFadden Pseudo R-squared       .1546388
Estimation based on N =   1452, K =  10
Inf.Cr.AIC  =    786.0 AIC/N =      .541
Model estimated: Oct 02, 2015, 15:31:18
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|   -6.10082***     1.01809    -6.01  .0000    -7.09593  -5.10511
   LNLEN|     .81224***      .11049     7.35  .0000      .59568   1.02880
  SMNDLT|     .09281**       .04102     2.26  .0237      .01241    .17320
MCVMXSL1|  -13.4365*        6.99100    -1.97  .0488   -27.1386     .2656
        |Means for random parameters
   LNADT|     .53227***      .09872     5.39  .0000      .33878    .72576
  SHWDRT|    -.12215***      .03847    -3.18  .0015    -.19756   -.04675
        |Diagonal elements of Cholesky matrix
   LNADT|     .03309**       .01293     2.56  .0105      .00776    .05843
  SMWDRT|     .05492***      .01909     2.88  .0040      .01750    .09234
        |Below diagonal elements of Cholesky matrix
LSHW_LNA|    -.06090***      .02043    -2.98  .0029    -.10095   -.02086
        |Dispersion parameter for NegBin distribution
ScalParm|     .47989***      .12627     3.80  .0001      .23291    .72748
--------+-----------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
--------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------------------------
---
                  LNADT      SHWDRT
--------+-----------------------------------------------------------------
---
LNADT       .1095E-02
SMWDRT     -.2015E-02   .4725E-02

Implied standard deviations of random parameters

S.D_Beta|              1
--------+---------------
       1|       .0330922
       2|       .0620079

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|   -8.84653***     2.09579    -4.22  .0000   -12.95256  -4.73721
   LNADT|     .93569***      .22106     4.23  .0000      .50241   1.36896
MCVMXSL1|  -33.8450***     12.10433    -2.80  .0052   -57.5690  -10.1209
SMNDSTCR|    -.12042         .07522    -1.60  .1094    -.26785    .02702
 MCVCRAN|     .00017         .00011     1.59  .1118    -.00004    .00038
        |Means for random parameters
   LNLEN|     .89202***      .13291     6.71  .0000      .63153   1.15251
  SMNDRT|    -.04861         .02987    -1.63  .1037    -.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
LSHW_LNL|    -.05240***      .01826    -2.87  .0041    -.08818   -.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      SMNDRT
--------+-----------------------------------------------------------------
LNLEN       .5586E-02
SMNDRT     -.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   SMNDRT
--------+-----------------
   LNLEN| 1.00000  -.59596
  SMNDRT| -.59596  1.00000
```

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

```
Random Coefficients  NegBinReg Model
Dependent Variable                LOINJ
Log likelihood function     -1254.55731
Restricted log likelihood   -2882.87024
Chi squared [   6 d.f.]      3256.62559
Significance level            .00000
McFadden Pseudo R-squared     .5496266
Estimation based on N =   1452, K =  16
Inf.Cr.AIC  =   2601.7 AIC/N =   1.792
Model estimated: Oct 02, 2015, 16:19:56
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***	.09635	11.40	.0000	.89112	1.26109
HCVRKSL1	-21.2087***	4.68854	-4.52	.0000	-30.3880	-12.0293
VCBARNA	.08277***	.02915	2.84	.0045	.02564	.13989
HCVCRAN	.85773D-04**	.43582D-04	2.19	.0285	.98927D-05	.16165D-03
VCK	-3.81821**	1.70736	-2.06	.0386	-6.66871	-.27070
Means for random parameters						
LNLEN	.56303***	.06328	13.86	.0000	.74084	.98513
SNWDRT	-.04684***	.01409	-3.31	.0008	-.07425	-.01903
NOFLDEC	-.23572*	.12157	-1.94	.0529	-.47385	.00256
Diagonal elements of Cholesky matrix						
LNLEN	.23232***	.05247	4.44	.0000	.12999	.33565
SNWDRT	.12121***	.01574	7.70	.0000	.09036	.15205
NOFLDEC	.29079***	.08218	3.49	.0000	.12969	.45500
Below diagonal elements of Cholesky matrix						
LSNW_LNL	-.08627***	.01888	-4.57	.0000	-.11940	-.05618
LNDF_LNL	.48033***	.10041	4.78	.0000	.28354	.67713
LNDF_SNW	-.37127***	.04533	-8.19	.0000	-.46012	-.28243
Dispersion parameter for NegBin distribution						
ScalParm	.61117***	.05165	11.83	.0000	.50996	.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  |  SNWDRT |  NOFLDEC|
+---------+---------+---------+---------+
LNLEN      .5420E-01
SNWDRT    -.1965E-01   .2196E-01
NOFLDEC        .1118  -.8196E-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   SNWDRT  NOFLDEC
--------+---------------------------
   LNLEN| 1.00000  -.57537   .79100
  SNWDRT| -.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  NegBinReg Model
Dependent variable              TOTALACC
Log likelihood function     -702.25535
Restricted log likelihood   -974.54888
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	-4.16274***	1.19666	-3.15	.0000	-6.51114	-1.82034
LNADT	.80447***	.12503	6.70	.0000	.63961	1.16913
HCVCRAN	.94590D-04**	.26070-04	2.09	.0363	.36513D-05	.10669D-03
NOFLDEC	-.26446**	.12378	-2.14	.0327	-.50709	-.02183
SNWDRT	-.09002***	.01834	-4.66	.0000	-.12792	-.05212
Means for random parameters						
VCK	-3.00909*	1.69479	-1.97	.0014	-6.03668	.01841
DEG1	-.02544**	.01188	-2.14	.0322	-.04871	-.00216
LNLEN	.81341***	.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	.04268***	.01071	3.98	.0001	.02168	.06370
LNLEN	.07573***	.01620	4.68	.0000	.04398	.10747
Below diagonal elements of Cholesky matrix						
DEG_VCK	-.01947	.01346	-1.96	.0440	-.04608	.00672
LNL_VCK	-.18592***	.05295	-3.63	.0000	-.25372	-.12611
LDEG_DEG	.01703***	.00512	4.66	.0000	.06780	.16627
Dispersion parameter for NegBin distribution						
ScalParm	1.70435***	.39529	4.31	.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   .8660E-01

Implied standard deviations of random parameters

S.D_Beta|            1
--------+-------------
       1)       3.92043
       2)       .0470040
       3)       .294286

Implied correlation matrix of random parameters

Cor.Mat.|    VCK     DEG1    LNLEN
--------+---------------------------
    VCK| 1.00000  -.41637  -.80615
   DEG1| -.41637  1.00000   .76848
  LNLEN| -.80615   .76848  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       -849.40581
Restricted log likelihood     -671.04653
Chi squared [   3 d.f.]        356.72353
Significance level               .00000
McFadden Pseudo R-squared      .1908389
Estimation based on N =   1192, K =  11
Inf.Cr.AIC  =   1720.8 AIC/N =     .930
Model estimated: Oct 14, 2018, 16:37:19
Sample is  2 pds and    596 individuals
Negative binomial regression model
```

PDO:	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant:	-6.73073***	.98791	-6.89	.0000	-8.62750	-2.83367
LNADT:	.70187***	.09669	7.27	.0000	.51279	.89100
HCVLIN:	-4.19456***	.98306	-4.27	.0000	-6.12132	-2.26778
HCVNOPEL:	.00743***	.00220	3.47	.0006	.00332	.01155
HCVCRAN:	.00015***	.3666D-04	3.96	.0001	.00007	.00022
	Means for random parameters					
LNLEN:	1.02986***	.07093	14.69	.0000	.89216	1.16781
DEG1:	-.05393***	.01635	-3.26	.0011	-.08636	-.02149
	Diagonal elements of Cholesky matrix					
LNLEN:	.17604***	.01996	8.87	.0000	.13714	.21699
DEG1:	.04211***	.00953	4.28	.0000	.02256	.06137
	Below diagonal elements of Cholesky matrix					
LDEG_LNL:	-.02793***	.00737	-3.14	.0000	-.05228	-.02248
	Dispersion parameter for NegBin distribution					
ScalParm:	3.26936**	1.39501	2.32	.0002	.80739	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       -.6879E-02    .3212E-02

Implied standard deviations of random parameters

S.D_Beta|             1
--------+-------------
        1|       .176069
        2|       .056742

Implied correlation matrix of random parameters


--------+-------------------
Cor.Mat.|   LNLEN      DEG1
--------+-------------------
   LNLEN| 1.00000  -.68930
    DEG1| -.68930  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    -290.01267
Chi squared [   5 d.f.]        44.17819
Significance level               .00000
McFadden Pseudo R-squared      .0761872
Estimation based on N =   1192, K =  11
Inf.Cr.AIC  =    557.8 AIC/N =     .468
Model estimated: Oct 14, 2018, 16:23:18
Sample is  2 pds and    596 individuals
Negative binomial regression model
```

PINJ:	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant:	-4.40420***	1.59977	-2.75	.0028	-7.42210	-1.38630
LNADT:	.40060***	.15984	3.76	.0002	.28728	.91392
VCRANNA:	-.17778**	.08728	-2.04	.0416	-.34884	-.00673
HCVLIN:	-4.98150**	2.06223	-2.42	.0157	-9.02320	-.93981
HCVNTCVA:	.01095**	.00491	2.64	.0112	.00249	.01940
	Means for random parameters					
LNLEN:	.55657***	.11310	7.57	.0000	.43459	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:	-.15561**	.09919	-1.99	.0466	-.36018	-.00298
	Dispersion parameter for NegBin distribution					
ScalParm:	.80125**	.38360	2.08	.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    .1176E-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    -154.19576
Chi squared [   3 d.f.]        14.09971
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 16, 2015, 20:11:33
Sample is  2 pds and    586 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|    1.32065***      .15679     4.81  .0000      .71326   1.32786
    MCVR|    -.00033*        .00017    -2.04  .0121     -.00067    .00000
        |Diagonal elements of Cholesky matrix
   LNLEN|     .15108***      .04835     3.12  .0016      .05632    .24584
    MCVR|     .00617**       .00305     2.00  .0452      .00013    .01221
        |Below diagonal elements of Cholesky matrix
lMCV_LNL|    -.00019*        .00011    -1.96  .0404     -.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      -178.36362
Restricted log likelihood    -186.14321
Chi squared [   3 d.f.]        15.55911
Significance level               .00140
McFadden Pseudo R-squared      .0417954
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    586 individuals
Negative binomial regression model
--------+-----------------------------------------------------------------------
        |                  Standard            Prob.       95% Confidence
   HIINJ|  Coefficient       Error        z    |z|>Z*         Interval
--------+-----------------------------------------------------------------------
        |Nonrandom parameters
Constant|    -.55251*        .52126    -1.59  .0703    -1.90456    .13876
    MCVL|    -.00082***      .00031    -2.62  .0089     -.00148   -.00021
 TOTLANE|     .31006***      .11093     2.79  .0052      .09259    .52752
 MCVCRAH|     .00016**    .7656D-04     2.02  .0432      .00000    .00031
        |Means for random parameters
   LNADT|    1.13993***      .13742     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   .4462E-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     -172.38813
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|   -5.68885***     2.04197    -2.78  .0054    -9.68905  -1.68463
    HCVR|    -.00019*        .00011    -1.95  .0721     -.00042    .00003
   LNLEN|     .71886***      .16045     4.48  .0000      .40439   1.03332
        |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|     .60724**       .27512     2.21  .0273      .06801   1.14646
--------+--------------------------------------------------------------------
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       -604.28728
Restricted log likelihood     -753.16352
Chi squared [   6 d.f.]        297.75248
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  -4.19859
   LNADT|    1.00078***      .13465     7.43  .0000      .73691   1.26464
 MCVCRAH| .95937D-04**   .37780D-04     2.54  .0111  .21663D-04 .17001D-03
MCVOOKSEL|    .00960***      .00247     3.89  .0001      .00476    .01446
  SHNDRT|   -.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|   -5.67581**      2.25186    -2.52  .0117   -10.08733  -1.26028
        |Diagonal elements of Cholesky matrix
   LNLEN|     .07655***      .02525     3.03  .0024      .02710    .12601
    DEG1|     .02820***      .00821     3.43  .0006      .01210    .04429
     VCR|    3.88023***     1.33634     2.90  .0037     1.26105   6.49940
        |Below diagonal elements of Cholesky matrix
lDEG_LNL|     .03253**       .01342     2.42  .0153      .00624    .05883
lVCR_LNL|    -.02535**       .01251    -2.03  .0426     -.04986   -.00084
lVCR_DEG|     .02846**       .01313     2.17  .0302      .00273    .05420
        |Dispersion parameter for NegBin distribution
ScalParm|    2.48933***      .86343     2.88  .0040      .79312   4.18554
--------+--------------------------------------------------------------------
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    -5092.02706
Chi squared [   6 d.f.]      7897.30143
Significance level                .00000
McFadden Pseudo R-squared       .7754578
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
  SHWDCR|     .03749***      .01067     3.51  .0004      .01656    .05840
VCVPTGRA|    -.00659***      .00147    -4.49  .0000     -.00947   -.00371
  SHWDRT|    -.04810***      .01578    -3.05  .0023     -.07903   -.01717
 MCVLIMI|   -1.24064**       .60725    -2.04  .0410    -2.43063   -.05065
        |Means for random parameters
 VCPARMA|     .08202**       .04129     1.99  .0470      .00106    .16295
    DEG1|    -.04237***      .01203    -3.52  .0004     -.06596   -.01879
   LNLEN|     .86206***      .05501    16.03  .0000      .77425    .96990
        |Diagonal elements of Cholesky matrix
 VCPARMA|     .04912         .03173     1.94  .0618     -.01307    .11131
    DEG1|     .04910***      .00794     6.19  .0000      .03354    .06465
   LNLEN|     .03186**       .01545     2.06  .0391      .00158    .06214
        |Below diagonal elements of Cholesky matrix
lDEG_VCP|     .01746         .01362     1.99  .0964     -.00903    .04396
lLNL_VCP|     .02937         .02739     1.97  .0603     -.02432    .08306
lLNL_DEG|     .14706***      .02124     6.92  .0000      .10563    .18569
        |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        .8978E-03    .2716E-02
LNLEN       .1443E-02    .7700E-02    .2361E-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    .19157
    DEG1|  .33512   1.00000    .96796
   LNLEN|  .19157    .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       .7091965
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   -.25263
    DEG1|   -1.64702**       .65744    -2.51  .0122    -2.93658   -.35646
   LNADT|     .40717***      .11040     3.69  .0002      .19078    .62356
VCVPTGRA|    -.00662***      .00129    -5.12  .0000     -.00915   -.00409
 MCVLIMI|   -1.78383***      .65235    -2.73  .0063    -3.06358   -.50406
 TOTLANE|     .05161         .05749     1.97  .0507     -.03307    .13530
        |Means for random parameters
  SHWDCR|     .03652***      .01088     3.36  .0008      .01520    .05784
  SHWDLT|    -.04887***      .01864    -2.63  .0095     -.08578   -.01196
   LNLEN|     .87856***      .06171    14.24  .0000      .75762    .99952
        |Diagonal elements of Cholesky matrix
  SHWDCR|     .01914**       .00968     1.98  .0480      .00017    .03811
  SHWDLT|     .03221**       .01441     2.24  .0254      .00398    .06045
   LNLEN|     .04006**       .01830     2.19  .0286      .00419    .07593
        |Below diagonal elements of Cholesky matrix
lSHW_SHW|    -.00681         .01912    -2.28  .0213     -.04278    .03216
lLNL_SHW|    -.08958**       .03895    -2.30  .0215     -.16592   -.01323
lLNL_SHW|     .20982***      .02850     7.36  .0000      .15398    .26565
        |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
--------+--------------------------------------------------------------------
---
                SHWDCR       SHWDLT       LNLEN
--------+--------------------------------------------------------------------
---
SHWDCR      .3664E-03
SHWDLT     -.1016E-03    .1066E-02
LNLEN      -.1715E-02    .7234E-02    .5365E-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.|  SHWDCR    SHWDLT     LNLEN
--------+------------------------------
  SHWDCR| 1.00000   -.16260   -.38673
  SHWDLT| -.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                FINJ
Log likelihood function      -557.72244
Restricted log likelihood    -989.52630
Chi squared [   4 d.f.]      843.60772
Significance level              .00000
McFadden Pseudo R-squared     .4363743
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
```

FINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-4.74655***	.69537	-6.83	.0000	-6.10978	-3.38386
LNADT	.54070***	.06135	8.72	.0000	.41822	.66216
VCVPTGRA	-.00556***	.00206	-2.71	.0068	-.00962	-.00154
VCPARMA	.10245**	.05150	1.99	.0466	.00152	.20338
	Means for random parameters					
SHNDCR	.01536*	.00575	1.88	.0650	-.00118	.03311
DEG1	-.03017**	.01497	-2.01	.0440	-.05962	-.00082
LNLEN	.84849***	.05033	16.86	.0000	.75043	.94634
	Diagonal elements of Cholesky matrix					
SHNDCR	.02037**	.00886	2.30	.0215	.00301	.03773
DEG1	.03703**	.01760	2.10	.0354	.00256	.07152
LNLEN	.06943***	.02140	3.24	.0012	.02748	.11139
	Below diagonal elements of Cholesky matrix					
lDEG_SHN	-.00513**	.00240	-2.14	.0322	-.00983	-.00043
lLNL_SHN	-.00587	.06252	-2.13	.0365	-.08849	.07530
lLNL_DEG	.13840***	.03211	4.31	.0000	.07546	.20134
	Dispersion parameter for NegBin distribution					
ScalParm	3.31789***	1.06242	3.12	.0018	1.23568	5.40031

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

Implied covariance matrix of random parameters

Covariance matrix

	SHNDCR	DEG1	LNLEN
SHNDCR	.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	.0203656
2	.0381535
3	.154944

Implied correlation matrix of random parameters

Cor.Mat.	SHNDCR	DEG1	LNLEN
SHNDCR	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     .1754880
Estimation based on N =    878, K =  11
Inf.Cr.AIC  =    532.4 AIC/N =    .606
Model estimated: Dec 22, 2015, 15:50:08
Sample is  2 pds and    439 individuals
Negative binomial regression model
```

EVI	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-4.50041***	.92759	-4.85	.0000	-6.31904	-2.68178
LNADT	.52058***	.06291	8.28	.0000	.35833	.68334
SHNDLT	-.25241***	.08887	-4.29	.0000	-.41152	-.15330
SHNDRT	.20401***	.04606	3.12	.0018	.07654	.33148
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	.00238	.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	.2247E-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.]        1.45024
Significance level              .22849
McFadden Pseudo R-squared     .0076523
Estimation based on N =    878, K =   5
Inf.Cr.AIC  =    198.1 AIC/N =    .226
Model estimated: Dec 22, 2015, 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**      1.86582    -2.15  .0318    -7.66135   -.34526
   LNADT|     .23355         .16490     1.56  .1066    -.12856     .55592
        |Means for random parameters
   LNLEN|     .73353***      .13224     5.55  .0000     .47430     .99276
        |Scale parameters for dists. of random parameters
   LNLEN|     .11246         .07350     1.93  .0520    -.04140     .26633
        |Dispersion parameter for NegBin distribution
ScalParm|     .33540**       .15524     2.16  .0307     .03113     .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   -650.97054
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, 2015, 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***     1.84085    -3.79  .0002   -10.55603  -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|     .43228**       .21964     1.97  .0490     .00136     .86320
        |Scale parameters for dists. of random parameters
   LNADT|     .06013***      .01301     4.62  .0000     .03463     .08562
        |Dispersion parameter for NegBin distribution
ScalParm|     .17267***      .03209     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   -3865.48962
Chi squared [   8 d.f.]     5914.99126
Significance level               .00000
McFadden Pseudo R-squared      .7679363
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***   .1896D-04    -3.91  .0009 -.10209D-03 -.26199D-04
SMWDRTCR|     .09266***      .01685     5.12  .0018      .01957    .08878
        |Means for random parameters
   LNLEN|    1.04930***      .04581    22.90  .0000      .95951   1.13908
   LNADT|     .65545***      .06021    10.89  .0000      .55745    .77345
        |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
lLNA_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 [   9 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, 18:04:27
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|   -4.93366***      .79965    -6.17  .0000    -6.50094  -3.36637
  SHNDRT|     .18346***      .05360     3.42  .0006      .07841    .28852
  SMMDLT|    -.12923**       .05382    -2.40  .0164     -.23472   -.02373
MCVMESLL|   11.7475**       5.66695     2.07  .0382      .6405   22.5545
        |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
lLNA_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   .8461E-03

Implied standard deviations of random parameters

S.D_Beta|            1
--------+------------
       1|      .261205
       2|     .0290889

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    -9002.78452
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 26, 2015, 22:49:57
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|   -6.34022***     .94103    -6.74  .0000    -8.18459  -4.49582
 MCVCRAN| .90898D-04***  .1840D-04     4.94  .0000  .54825D-04  .12697D-03
   VCVL1|   1.37726***      .47268     2.91  .0036      .45085   2.30368
BNWNDINC|    .01422***      .00417     3.41  .0006      .00605    .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|    .91895***      .03366    27.30  .0000      .85300    .98495
        |Diagonal elements of Cholesky matrix
   LNADT|    .01818**       .00911     2.00  .0459      .00033    .03603
  SHWDCR|    .01668***      .00413     3.58  .0001      .00846    .02490
   LNLEN|    .04996***      .01071     4.66  .0000      .02896    .07096
        |Below diagonal elements of Cholesky matrix
lSHW_LNA|   -.00989**       .00479    -2.06  .0392     -.01929   -.00049
lLNL_LNA|   -.11962***      .02809    -4.26  .0000     -.17468   -.06457
lLNL_SHW|   -.21925***      .01273   -17.22  .0000     -.24420   -.19430
        |Dispersion parameter for NegBin distribution
ScalParm|   2.51430***      .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     -.2178E-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|   -7.21602***    1.05256    -6.86  .0000    -9.28158  -5.15445
 MCVCRAN| .84459D-04***  .19200D-04    4.40  .0000  .46834D-04  .12208D-03
  SHWDCR|   -.01777***      .00548    -3.24  .0012     -.02852   -.00703
   LNADT|    .84173***      .09028     9.32  .0000      .66477   1.01868
    VCVL|   -.00047**       .00020    -2.36  .0183     -.00084   -.00008
BNYWDINC|    .01622***      .00429     3.78  .0002      .00782    .02463
 VCPARMA|    .24325***      .04486     5.43  .0000      .15554    .33097
        |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|       .218475

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      -805.88829
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|   -6.86216***     1.27775    -5.35  .0000    -9.36653  -4.35778
   LNLEN|     .83760***      .03627    23.09  .0000      .76650    .90869
  SHMDRT|    -.03541***      .01267    -3.11  .0019     -.06624   -.01458
 NOFLINC|     .21609**       .09070     2.37  .0177      .03788    .39296
 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|     .73780***      .11868     6.22  .0000      .50529    .97030
        |Diagonal elements of Cholesky matrix
 MCVCRAN|     .00031***   .3110D-04    10.09  .0000      .00025    .00037
   LNADT|     .02489***      .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***     1.40754     3.45  .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 [   6 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***     2.21835    -3.73  .0002   -12.60501  -3.92100
 MCVCRAN| .82613D-04**    .3612D-04     2.29  .0222  .11816D-04 .15341D-03
   LNLEN|     .86923***      .04862    19.37  .0000      .77678    .96169
 MCVMXSEL|    .00011***   .4199D-04     2.62  .0087      .00003    .00019
        |Means for random parameters
   LNADT|     .79192***      .18487     4.28  .0000      .42969   1.15426
 SHWDLTCR|   -.04540**       .02148    -2.11  .0346     -.08753   -.00328
        |Diagonal elements of Cholesky matrix
   LNADT|     .05140***      .00834     6.16  .0000      .03504    .06775
 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|   2.19367*       1.13984     1.92  .0543     -.04041   4.42776
--------+--------------------------------------------------------------------
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       -73.44884
Restricted log likelihood     -76.34196
Chi squared [   1 d.f.]         5.78623
Significance level               .01615
McFadden Pseudo R-squared      .0378869
Estimation based on N =    556, K =   4
Inf.Cr.AIC  =    155.9 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
   VCVL1|    6.57957***     1.78886     3.68  .0002     3.07347  10.08567
   LNLEN|     .97985***      .17088     5.64  .0000      .63906   1.32064
        |Means for random parameters
  SHNDCR|    -.28694**       .13076    -2.21  .0271     -.54322   -.03266
        |Scale parameters for dists. of random parameters
  SHNDCR|     .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      -457.95618
Restricted log likelihood    -665.70863
Chi squared [   3 d.f.]       415.54490
Significance level               .00000
McFadden Pseudo R-squared      .3121072
Estimation based on N =    556, K =  10
Inf.Cr.AIC  =    935.9 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
  SHNDCR|    -.02398***      .00900    -2.67  .0077     -.04161   -.00636
 VCVL1MI|    1.24903*        .70331     1.95  .0697     -.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      .00008    .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        4.67151     1.97  .0731    -4.88431  21.86752
--------+--------------------------------------------------------------------
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     -.6199E-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   -.85824
   LNADT| -.85824   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        -501.58691
Restricted log likelihood      -755.71078
Chi squared [   3 d.f.]         508.24787
Significance level                 .00000
McFadden Pseudo R-squared        .3362714
Estimation based on N =     556, K =  10
Inf.Cr.AIC  =   1023.2 AIC/N =     1.185
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
 HCVCRAH| .85026D-04***  .21910D-04    3.88  .0001  .42076D-04  .12797D-03
 NOFLINC|     .26570**     .11762     2.26  .0239      .03517    .49622
   LNLEN|     .83500***    .04463    18.71  .0000      .74753    .92246
        |Means for random parameters
   LNADT|     .43632***    .13365     3.26  .0011      .17137    .69667
  SHNDCR|    -.02842***    .00908    -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    .05018
        |Below diagonal elements of Cholesky matrix
 lSHN_LNA|    .01042       .00621     1.67  .2043     -.00567    .02651
        |Dispersion parameter for NegBin distribution
ScalParm|     .28187***    .04429     6.36  .0000      .18506    .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       .7316E-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       -1372.85061
Restricted log likelihood     -6903.74432
Chi squared [   3 d.f.]       11061.78741
Significance level                 .00000
McFadden Pseudo R-squared        .6011491
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***    .00538    -2.73  .0063     -.02526   -.00418
   LNLEN|     .84152***    .03478    24.15  .0000      .77338    .90969
 HCVCRAH| .83097D-04***  .17510D-04    4.75  .0000  .48782D-04  .11741D-03
 VCRARMA|     .22245***    .05656     3.93  .0001      .11160    .33331
 HCVMXSL1|   -8.54589***   2.33452    -3.37  .0007   -13.51365  -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     5.58  .0000      .14639    .22952
 TOTLANE|     .04593***    .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|    2.09820***    .25380     8.25  .0000     1.60274   2.59366
--------+-----------------------------------------------------------------------
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|      .187960
       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       -652.63955
Restricted log likelihood    -2529.02388
Chi squared [   3 d.f.]       3753.76866
Significance level              .00000
McFadden Pseudo R-squared       .7930842
Estimation based on N =    550, K =  12
Inf.Cr.AIC  =   1329.7 AIC/N =   2.527
Model estimated: May 15, 2016, 23:41:27
Sample is  2 pds and    275 individuals
Negative binomial regression model
```

TOTALACC	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
Nonrandom parameters						
Constant	5.20411***	1.20775	4.31	.0000	2.91497	7.65126
LNLEN	.94249***	.07603	12.40	.0000	.79347	1.09150
SHWDCR	-.03617	.02539	-1.46	.1442	-.08002	.01168
VCVPTORA	-.00399**	.00198	-2.07	.0387	-.00778	-.00021
HCVRASEL	-.00401**	.00166	-2.42	.0157	-.00726	-.00076
SHWDLT	-.07126***	.02056	-3.85	.0006	-.11154	-.03073
Means for random parameters						
LNADT	-.34943***	.11809	-2.96	.0031	-.58089	-.11797
TOTLANE	.89309***	.08888	9.90	.0001	.16574	.62043
Diagonal elements of Cholesky matrix						
LNADT	.06233**	.02647	2.55	.0109	.01437	.11030
TOTLANE	.03453**	.01682	2.05	.0401	.00156	.06750
Below diagonal elements of Cholesky matrix						
ITOT_LNA	.07423	.05962	1.24	.2146	-.04301	.18147
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	.3956E-02	
TOTLANE	.9627E-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       -560.40592
Restricted log likelihood    -1480.22008
Chi squared [   3 d.f.]       1839.63836
Significance level              .00000
McFadden Pseudo R-squared       .6234187
Estimation based on N =    550, K =  12
Inf.Cr.AIC  =   1144.8 AIC/N =   2.083
Model estimated: Jun 23, 2016, 16:55:55
Sample is  2 pds and    275 individuals
Negative binomial regression model
```

PDO	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
Nonrandom parameters						
Constant	5.47397***	1.63889	3.51	.0001	2.65569	8.29364
LNLEN	.94539***	.08401	11.26	.0000	.78073	1.11005
TOTLANE	.27122***	.09515	2.91	.0036	.08570	.45675
HCVRASEL	-.00874**	.00180	-2.07	.0384	-.00728	-.00020
SHWDLT	-.08096***	.02247	-3.60	.0003	-.12502	-.03690
VCVEVCA	.01359*	.00752	1.94	.0523	-.00174	.02593
VCVPTORA	-.01962**	.00930	-2.11	.0348	-.03785	-.00140
Means for random parameters						
LNADT	-.38722***	.14539	-2.66	.0077	-.67217	-.10226
SHWDCR	-.06163**	.02944	-2.17	.0302	-.11737	-.00589
Diagonal elements of Cholesky matrix						
LNADT	.02561***	.00686	3.75	.0002	.01221	.03901
SHWDCR	.03024*	.01656	1.93	.0876	-.00219	.06267
Below diagonal elements of Cholesky matrix						
ISHW_LNA	-.05965**	.01559	-2.13	.0328	-.07611	-.00319
Dispersion parameter for NegBin distribution						
ScalParm	.68630***	.09822	6.99	.0000	.49379	.87882

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

Implied covariance matrix of random parameters

Covariance matrix

	LNADT	SHWDCR
LNADT	.6556E-03	
SHWDCR	-.1016E-02	.2498E-02

Implied standard deviations of random parameters

S.D_Beta	1
1	.0256079
2	.0496902

Implied correlation matrix of random parameters

Cor.Mat.	LNADT	SHWDCR
LNADT	1.00000	-.79555
SHWDCR	-.79555	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        .4943955
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
   LNAADT|   -.07480***     .02154    -3.47  .0005    -.11702   -.03258
  SHNDRT|   -.05005*        .03011    -1.96  .0470    -.10914    .00905
    VCVL|    .18915**       .07785     2.43  .0152     .03657    .34182
 VCVL1MI|  -994.881**     412.8658    -2.41  .0160  -1804.083  -185.679
 VCVBVCA|   -.03730*        .01942    -1.92  .0548    -.07536    .00076
 HCVNKSEL|   -.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    -.28363   -.01486
        |Diagonal elements of Cholesky matrix
   LNLEN|    .07451*        .04279     2.74  .0114    -.00920    .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***     .22446     5.25  .0000      .73949   1.61936
 TOTLANE|     .31222*       .17118     1.92  .0481    -.02319    .64763
  SHNDRT|   -.15060***      .05261    -2.95  .0044    -.25411   -.04708
VCVFTGRA|   -.03231***      .01118    -2.89  .0039    -.05422   -.01040
 VCVVPIA|    .02442***      .00929     2.63  .0085     .00622    .04262
        |Means for random parameters
  LNAADT|   -.17263***      .05302    -3.26  .0011    -.27654   -.06872
        |Scale parameters for dists. of random parameters
  LNAADT|    .03277**       .01585     2.07  .0386     .00172    .06383
        |Dispersion parameter for NegBin distribution
ScalParm|    1.38786**      .69678     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     -212.00789
Restricted log likelihood   -263.84910
Chi squared [   1 d.f.]      103.08302
Significance level              .00000
McFadden Pseudo R-squared     .1955670
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     -.94115    .01194
 TOTLANE|     .29891**       .11590     2.51  .0119      .06588    .53194
VCVPTGRA|    -.02060**       .00939    -2.19  .0282     -.03900   -.00220
 VCVVBIA|     .01549*        .00807     1.92  .0554     -.00058    .03128
NCVNKREL|    -.00393         .00269    -1.96  .0456     -.00921    .00134
  SHNDLT|    -.51402**       .26075    -1.97  .0487    -1.02508   -.00295

        |Means for random parameters
   LNLEN|   1.07018***       .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  .0479      .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|    -.45518**       .15276    -2.38  .0172     -.75942   -.07696
NOFLDEC|     .60522*        .32000     1.89  .0586     -.02198   1.23241
  SHNDLT|    -.07874**       .03438    -2.29  .0220     -.14614   -.01127
NCVNKREL|    -.07455**       .03792    -1.96  .0489     -.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***       .13166     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, 21:36:45
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|    5.66543***     1.32512     4.27  .0000     3.06836    5.27249
   LNADT|    -.36786***      .13427    -2.74  .0061    -.63102    -.10470
 NOFLDEC|     .38996***      .12952     3.01  .0026     .13609     .64382
  SHNDLT|    -.10904***      .01849    -5.59  .0000    -.14724    -.07083
VCVPTSHB|    -.00325*        .00182    -1.98  .0646    -.00682     .00032
    DEG1|     .23016***      .06509     3.54  .0004     .10259     .35773
        |Means for random parameters
   LNLEN|     .93736***      .07702    12.17  .0000     .78660    1.08833
MCVMXSEL|    -.00649***      .00233    -2.79  .0053    -.01106    -.00193
        |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
LNCV_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|      .0904440
       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, 21:36:08
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    17.59  .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
  SHNDRT|    -.07054***      .01644    -4.29  .0000    -.10275    -.03832
ANYWDDEC|    -.02339**       .00991    -2.36  .0183    -.04281    -.00397
    DEG1|     .25413***      .06028     4.22  .0000     .13598     .37227
        |Means for random parameters
   LNADT|     .78586***      .13326     5.90  .0000     .52475    1.04716
    HCVL|    -.00087***      .00019    -4.49  .0000    -.00124    -.00050
        |Diagonal elements of Cholesky matrix
   LNADT|     .04090***      .00520     7.89  .0000     .03066     .05114
    HCVL|     .00023**       .00010     2.27  .0229     .00003     .00042
        |Below diagonal elements of Cholesky matrix
LNCV_LNA|     .00022**      .9798D-04   2.27  .0233     .00003     .00041
        |Dispersion parameter for NegBin distribution
ScalParm|    1.17563***      .14099     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 -752.72996
Restricted log likelihood -3981.28159
Chi squared [3 d.f.] 6456.10305
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

PDO	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-3.56663***	1.13085	-3.31	.0009	-6.28068	-1.61241
LNLEN	.85564***	.05211	16.39	.0000	.75340	.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
VCVFTGRS	-.00334**	.00131	-2.55	.0107	-.00590	-.00077
HCVCRAD	-.00010***	.3950D-04	-2.59	.0095	-.00018	-.00002
	Means for random parameters					
LNADT	.67549***	.13327	5.07	.0000	.41429	.93669
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***	.19815	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 -1265.42085
Chi squared [3 d.f.] 1576.29433
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

PINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-7.13223***	1.63043	-4.37	.0000	-10.32781	-3.93664
LNLEN	.95800***	.07461	12.84	.0000	.81176	1.10424
HCVFTTYA	-.00089	.00209	-.42	.6722	-.00499	.00322
NOFLDEC	.42283***	.14849	2.85	.0044	.13180	.71386
RWYWDDEC	-.04114***	.01325	-3.10	.0019	-.06711	-.01517
VCVFTGRD	-.00583***	.00191	-3.06	.0022	-.00958	-.00210
DEG1	.01135	.01536	.74	.4598	-.01875	.04146
HCVDKSEL	.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
SHWDRT	-.09490***	.02482	-3.82	.0001	-.14355	-.04624
	Diagonal elements of Cholesky matrix					
LNADT	.05900***	.00869	6.79	.0000	.04196	.07604
SHWDRT	.01963	.01224	1.62	.1053	-.00414	.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	SHWDRT
LNADT	.3481E-02	
SHWDRT	-.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	SHWDRT
LNADT	1.00000	-.93444
SHWDRT	-.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   -10.78266    -.12820
   LMADT|     .62922**       .26527     2.18  .0291      .06422    1.19422
 VCPARNG|   -.30741***       .10671    -2.88  .0040     -.51656    -.09827
 TOTLANE|    .37438***       .13230     2.83  .0047      .11606     .63366
ANYMEDEC|   -.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      .73534    1.17904
  SHNDRT|   -.09259***       .03454    -2.68  .0073     -.16028    -.02490
        |Diagonal elements of Cholesky matrix
   LNLEN|    .11608***       .04475     2.59  .0095      .02831     .20386
  SHNDRT|     .03171**       .01483     2.14  .0325      .00265     .06076
        |Below diagonal elements of Cholesky matrix
lSHW_LNL|     .01133         .01023     1.11  .2682     -.00672     .03137
        |Dispersion parameter for NegBin distribution
ScalParm|   1.36966***       .12164     3.06  .0024      .13125     .60506
--------+--------------------------------------------------------------------
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     .1315E-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     .3272185
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
   LMADT|    .62729***       .20425     3.07  .0021      .22697    1.02761
 VCPARNG|    -.18820**       .07633    -2.47  .0137     -.33780    -.03860
 TOTLANE|     .26880**       .10743     2.50  .0123      .05824     .47936
ANYMEDEC|   -.05334***       .01715    -3.11  .0019     -.08695    -.01973
    HCVL|    -.00056**       .00024    -2.41  .0158     -.00105    -.00011
 HCVCRAN|     .00018         .00010     1.96  .0648     -.00005     .00036
        |Means for random parameters
   LNLEN|    .86633***       .07729    11.21  .0000      .71488    1.01783
  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  .0084      .00782     .05320
        |Below diagonal elements of Cholesky matrix
lSHW_LNL|    -.01435*        .00863    -1.66  .0962     -.03124     .00256
        |Dispersion parameter for NegBin distribution
ScalParm|   1 .57551***      .19692     2.84  .0033      .18258     .96476
--------+--------------------------------------------------------------------
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      -301.74188
Restricted log likelihood    -505.91973
Chi squared [   3 d.f.]       408.35570
Significance level               .00000
McFadden Pseudo R-squared      .4035776
Estimation based on N =    476, K =  13
Inf.Cr.AIC  =    629.5 AIC/N =    1.322
Model estimated: Jun 26, 2016, 14:06:06
Sample is  2 pds and    238 individuals
Negative binomial regression model
--------+--------------------------------------------------------------------
        |                Standard            Prob.      95% Confidence
 JUSTINJ|  Coefficient     Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -5.02226**    2.16859    -2.32  .0204    -9.28870   -.77582
   LNADT|    .62664***     .23199     2.70  .0069     .17195   1.08134
 TOTLANE|    .22296**      .11314     1.97  .0488     .00119    .44470
  SHWDLT|   -.06577*       .03618    -1.97  .0616    -.13472    .00319
RNYNDDEC|   -.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***     .03668     4.34  .0000     .08738    .23103
  VCPARMA|   .14695**      .07228     2.03  .0421     .00527    .28862
        |Below diagonal elements of Cholesky matrix
IVCP_LNL|   -.05830        .05254    -1.11  .2671    -.16127    .04467
        |Dispersion parameter for NegBin distribution
ScalParm|   1.53060***     .45901     3.33  .0009     .63086   2.43026
--------+--------------------------------------------------------------------
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
-----------------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+--------------------------------------------------------------------
               LNLEN     VCPARMA
--------+--------------------------------------------------------------------
LNLEN      .2534E-01
VCPARMA  -.9291E-02   .2499E-01

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|        .159199
       2|        .158088

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      .8375850
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
--------+--------------------------------------------------------------------
        |                Standard            Prob.      95% Confidence
   LOINJ|  Coefficient     Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -4.59122***   1.30015    -3.53  .0004    -7.13947  -2.04297
   LNADT|    .77706***     .14597     5.36  .0000     .49271   1.06138
    VCK2|   -.02687**      .01074    -2.50  .0124    -.04793   -.00581
 TOTLANE|    .23259***     .07272     3.20  .0014     .09005    .37513
  SHWDLT|   -.06356***     .02009    -3.16  .0016    -.10292   -.02416
RWYWIDEC|   -.02958***     .01066    -2.85  .0050    -.05027   -.00891
    HCVL|    .00594***     .00185     3.21  .0013     .00231    .00937
VCVFTGRB|   -.00356**      .00147    -2.42  .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*      .7162D-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 -.36111D-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     .84842   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    .4237E-05   .9375E-08

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|        .112643
       2|   .968233E-04

Implied correlation matrix of random parameters


--------+------------------
Cor.Mat.|   LNLEN  HCVCRAN
--------+------------------
   LNLEN| 1.00000   .37183
 HCVCRAN|  .37183  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 =    822, 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   1.13904
 VCFARMA|    -.13204**      .06641    -1.99  .0468     -.26221   -.00187
VCVPTGRA|    -.12867**      .05220    -2.46  .0137     -.23098   -.02636
  VCVLLZ|    5.67836*      3.10674     1.83  .0676     -.41074  11.76747
  SHWDET|    -.05535***     .01787    -3.10  .0019     -.09041   -.02035
RWYWDIMC|    -.01537        .00970    -1.58  .1133     -.03438    .00365
VCVPTGRB|     .12535**      .05256     2.39  .0167      .02272    .22797
        |Means for random parameters
   LNLEN|     .93467***     .07082    13.26  .0000      .79506   1.07458
    HCVL|    -.00058***     .00010    -5.37  .0000     -.00074   -.00035
        |Diagonal elements of Cholesky matrix
   LNLEN|     .16762***     .01908     8.79  .0000      .13029    .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    -1076.60436
Chi squared [   3 d.f.]       862.25780
Significance level                .00000
McFadden Pseudo R-squared       .3930914
Estimation based on N =    822, K =  14
Inf.Cr.AIC  =   1339.4 AIC/N =    1.629
Model estimated: Jun 28, 2016, 15:11:39
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   -.02560
  SHWDHT|    -.04607***     .01727    -2.67  .0077     -.07992   -.01221
VCVPTGRA|    -.13302**      .05377    -2.47  .0136     -.23842   -.02763
VCVPTGRB|     .13026**      .05359     2.43  .0143      .02423    .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    .19681
    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|        .155348
       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     -498.02851
Chi squared [   3 d.f.]        251.25160
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 28, 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|   -6.08759***     2.28298    -2.67  .0077   -10.56212  -1.61307
   LNADT|     .77356***      .21665     3.57  .0004      .34955   1.19760
 VCPARMA|    -.83455***      .30481    -2.74  .0062    -1.43197   -.23713
  VCVL12|    9.36559**      4.23210     2.21  .0269     1.07086  17.66035
    MCVL|    -.00078***      .00015    -5.06  .0000     -.00108   -.00048
  SEMDRI|    -.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|    -.70659***      .27314    -2.59  .0097    -1.24193   -.17124
        |Diagonal elements of Cholesky matrix
   LNLEN|     .10042***      .03350     3.02  .0026      .03518    .16569
VCVPTGRA|     .00296*        .00156     1.90  .0550     -.00010    .00602
        |Below diagonal elements of Cholesky matrix
lVCV_LNL|     .00241*        .00139     1.73  .0835     -.00032    .00514
        |Dispersion parameter for NegBin distribution
ScalParm|     .98920***      .27981     3.54  .0004      .44079   1.53762
--------+-----------------------------------------------------------------
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   .63134
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, 18:48:42
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
  SRNDRY|    -.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|    5.58227**      2.20076     2.54  .0112    -9.89568  -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      -215.49549
Restricted log likelihood    -249.11622
Chi squared [   3 d.f.]        50.23346
Significance level               .00000
McFadden Pseudo R-squared      .1133989
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   -.82890
   LNADT|     .78076***      .25515     2.95  .0032     .28478   1.26675
 VCPARMA|    -.25858         .16424    -1.56  .0646    -.58059    .06252
  SHNDRT|    -.04646         .03671    -1.87  .0586    -.11841    .02549
    HCVL|    -.00097***      .00024    -4.08  .0000    -.00143   -.00050
 VCVPTGRB|     .23571*       .12607     1.86  .0626    -.01237    .48379
 MCVMXSEL|     .01164***     .00349     3.33  .0009     .00479    .01849
        |Means for random parameters
   LNLEN|     .84772***      .14061     6.70  .0000     .47268   1.22292
 VCVPTGRA|    -.23068*       .12629    -1.93  .0678    -.47818    .01684
        |Diagonal elements of Cholesky matrix
   LNLEN|     .10036**       .04505     2.23  .0260     .01198    .18872
 VCVPTGRA|     .00434*       .00231     1.96  .0601    -.00018    .00887
        |Below diagonal elements of Cholesky matrix
 lVCV_LNL|     .00944***     .00188     5.02  .0000     .00578    .01312
        |Dispersion parameter for NegBin distribution
 ScalParm|    1.75705        1.37482     1.28  .2012    -.93752   4.45169
--------+--------------------------------------------------------------------
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|       .100336
       2|       .0103875

Implied correlation matrix of random parameters

--------+----------------
Cor.Mat.|   LNLEN VCVPTGRA
--------+----------------
   LNLEN| 1.00000   .90835
VCVPTGRA|  .90835  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      -216.35838
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***      .11597     7.10  .0000     .59576   1.05035
 NOFLDEC|     .61243**       .29016     2.11  .0348     .04377   1.18110
  SHWDRT|    -.06107**       .03006    -2.03  .0421    -.11898   -.00216
  VCVL12|    5.92127        4.30446     1.88  .0689   -2.81592  14.39786
        |Means for random parameters
   LNADT|     .59426**       .27637     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  .2823    -.00863    .00252
        |Dispersion parameter for NegBin distribution
 ScalParm|    2.77785        3.28927     2.83  .0041   -3.81018   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  NegBinReg Model
Dependent variable                LOINJ
Log likelihood function      -716.31648
Restricted log likelihood   -1816.88697
Chi squared [   3 d.f.]      2196.84178
Significance level             .00000
McFadden Pseudo R-squared      .6555166
Estimation based on N =    822, K =  10
Inf.Cr.AIC  =   1452.6 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	.69962	.97542
SNWDRT	-.05199***	.01750	-2.97	.0030	-.08629	-.01769
INUL	-.05870***	.01856	-3.17	.0015	-.09503	-.02236
VCVPTSRA	-.14164**	.05829	-2.38	.0169	-.25784	-.02544
VCVPTSRB	.13973**	.05817	2.36	.0182	.02376	.25569
SCVL	-.00035***	.00011	-3.02	.0000	-.00056	-.00013
	Means for random parameters					
LNADT	.79414***	.14095	5.88	.0000	.49107	1.09121
VCPARMA	-.16687***	.07446	-2.11	.0352	-.32264	-.01090
	Diagonal elements of Cholesky matrix					
LNADT	.03958***	.00646	6.12	.0000	.02691	.05225
VCPARMA	.10553***	.04159	2.63	.0085	.02800	.18305
	Below diagonal elements of Cholesky matrix					
IVCP_LNA	.05342	.04206	1.27	.2040	-.02800	.13583
	Dispersion parameter for NegBin distribution					
ScalParm	.62503***	.05182	8.88	.0000	.66565	.60741

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

Implied covariance matrix of random parameters

Covariance matrix

	LNADT	VCPARMA
LNADT	.1567E-02	
VCPARMA	-.2115E-02	.1455E-01

Implied standard deviations of random parameters

S.D_Beta|	1
1|	.0395822
2|	.1210861

Implied correlation matrix of random parameters

Cor.Mat.|	LNADT	VCPARMA
LNADT|	1.00000	.43640
VCPARMA|	.43640	1.00000

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

```
Random Coefficients  NegBinReg Model
Dependent variable              TOTALACC
Log likelihood function      -798.49370
Restricted log likelihood  -10724.54732
Chi squared [   3 d.f.]     19972.10725
Significance level              .00000
McFadden Pseudo R-squared      .9811399
Estimation based on N =    626, K =  12
Inf.Cr.AIC  =   1601.0 AIC/N =   2.523
Model estimated: Jun 27, 2016, 00:07:48
Sample is  2 pds and   313 individuals
Negative binomial regression model
```

TOTALACC	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-7.68096***	.79849	-9.63	.0000	-9.25595	-6.12592
HCVR	.69472D-04**	.32480D-04	2.06	.0375	.40157D-05	.13493D-03
HCVTTYA	-.00239***	.00108	-2.87	.0077	-.00502	-.00077
HWYNDEC	-.00948	.00677	-1.84	.0617	-.02077	.00187
SNNDLTCR	.18784**	.12004	1.95	.0478	.00178	.38393
SNNDRTCR	-.08310*	.05021	-1.59	.0637	-.19152	.00531
	Means for random parameters					
LNADT	1.02364***	.07429	13.83	.0000	.88434	1.18334
LNLEN	.92833***	.04386	21.12	.0000	.84218	1.01449
	Diagonal elements of Cholesky matrix					
LNADT	.01148	.00706	1.62	.0751	-.00240	.02556
LNLEN	.05068***	.01715	2.95	.0032	.01702	.08426
	Below diagonal elements of Cholesky matrix					
INL_LNA	.12061***	.02481	4.86	.0000	.07199	.18924
	Dispersion parameter for NegBin distribution					
ScalParm	2.98024***	.42436	7.09	.0000	2.14910	3.82139

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	.1319E-03	
LNLEN	.1365E-02	.2711E-01

Implied standard deviations of random parameters

S.D_Beta|	1
1|	.0114800
2|	.1164015

Implied correlation matrix of random parameters

Cor.Mat.|	LNADT	LNLEN
LNADT|	1.00000	.91202
LNLEN|	.91202	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     -622.74236
Restricted log likelihood  -6618.81281
Chi squared [   3 d.f.]    11991.53891
Significance level              .00000
McFadden Pseudo R-squared     .9059059
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***    1.17368    -6.12  .0000    -9.48571  -4.88488
RWYWDDEC|    -.00678        .00706    -1.94  .0645    -.02287    .00937
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***     .10964     9.09  .0000     .77936   1.20685
   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
lLNL_LNA|     .07758***     .02604     2.99  .0029     .02679    .12842
        |Dispersion parameter for NegBin distribution
ScalParm|    3.58190***     .57967     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       .6683E-04
LNLEN       .6342E-03    .7727E-02

Implied standard deviations of random parameters

S.D_Beta|               1
--------+----------------
       1|      .00817654
       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                RINJ
Log likelihood function     -410.74201
Restricted log likelihood  -2069.56644
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
    RINJ|  Coefficient       Error       z    |z|>Z*        Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -8.23416***    1.21421    -6.78  .0000   -10.61397  -5.85435
SHNULTCR|     .08386*       .04346     1.94  .0651    -.00324    .17296
 VCVEVCA|     .00138*       .00070     1.92  .0548    -.00003    .00273
    MCVR|     .00217**      .00103     2.11  .0350     .00015    .00419
MCVORSEL|    -.08898**      .04261    -2.09  .0369    -.17247   -.00548
        |Means for random parameters
   LNADT|     .94022***     .10594     8.88  .0000     .73259   1.14786
   LNLEN|    1.02771***     .05432    18.92  .0000     .92123   1.13416
        |Diagonal elements of Cholesky matrix
   LNADT|     .01018        .00644     1.58  .0738    -.00244    .02280
   LNLEN|     .00198**      .00078     2.56  .0104     .00047    .00382
        |Below diagonal elements of Cholesky matrix
lLNL_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 NegBinReg Model
Dependent variable                TOTALACC
Log likelihood function    -35052.17489
Restricted log likelihood  -49826.49221
Chi squared [   5 d.f.]     29548.63065
Significance level              .00000
McFadden Pseudo R-squared       .1965153
Estimation based on N = 144138, K =  19
Inf.Cr.AIC  =  70142.4 AIC/N =    .487
Model estimated: May 26, 2016, 17:09:01
Sample is  2 pds and  72069 individuals
Negative binomial regression model
```

TOTALACC	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-8.58940***	.09029	-95.16	.0000	-8.76636	-8.41245
DEG1	.00289***	.00086	3.40	.0007	.00122	.00455
VCVL1NI	-1.17874***	.17724	-6.65	.0000	-1.52615	-.83132
SNWDCR	-.13020***	.02160	-6.03	.0000	-.17253	-.08787
VCRARNA	.03220***	.00724	4.45	.0000	.01801	.04640
SCVL1NI	-1.58953***	.09004	-15.21	.0000	-1.84590	-1.19303
SNWDRI	-.02668***	.00947	-7.40	.0000	-.05248	-.01987
SCVCRAN	.58932D-04***	.4764D-05	18.36	.0000	.77644D-04	.84220D-04
VCVPTGRA	.00054**	.00026	2.21	.0265	.00006	.00103
	Means for random parameters					
LNADT	1.05859***	.01104	86.83	.0000	1.03674	1.08004
RWYMDINC	.03970***	.00267	13.13	.0000	.02567	.03573
LNLEN	.94097***	.00856	109.68	.0000	.92416	.95778
	Diagonal elements of Cholesky matrix					
LNADT	.01487***	.00475	3.17	.0015	.00570	.02424
RWYMDINC	.00324**	.00148	1.97	.0464	.00002	.00649
LNLEN	.01400***	.00305	5.24	.0000	.01001	.02198
	Below diagonal elements of Cholesky matrix					
1RWY_LNA	.00067	.00292	.23	.8199	-.00506	.00639
1LNL_LNA	.10100***	.00992	10.61	.0000	.08294	.11966
1LNL_RWY	.06675***	.00712	8.59	.0000	.05283	.08075
	Dispersion parameter for NegBin distribution					
ScalParm	.76032***	.01967	38.27	.0000	.72138	.79826

```
Implied covariance matrix of random parameters

Covariance  matrix
```

	LNADT	RWYMDINC	LNLEN
LNADT	.2242E-03		
RWYMDINC	.9959E-05	.1104E-04	
LNLEN	.1512E-02	.2944E-05	.1492E-01

```
Implied standard deviations of random parameters
```

S.D_Beta	1
1	.0148722
2	.00332285
3	.122137

```
Implied correlation matrix of random parameters
```

Cor.Mat.	LNADT	RWYMDINC	LNLEN
LNADT	1.00000	.20018	.82492
RWYMDINC	.20018	1.00000	.70132
LNLEN	.82492	.70132	1.00000

Random Parameter Negative Binomial Model of Property Damage Only Crashes on Two lane SPF Class Roadway Segments

```
Random Coefficients NegBinReg Model
Dependent variable                PDO
Log likelihood function    -28667.53831
Restricted log likelihood  -49280.61876
Chi squared [   3 d.f.]     41226.16090
Significance level              .00000
McFadden Pseudo R-squared       .2337844
Estimation based on N = 144138, K =  16
Inf.Cr.AIC  =  57367.1 AIC/N =    .398
Model estimated: May 26, 2016, 12:17:16
Sample is  2 pds and  72069 individuals
Negative binomial regression model
```

PDO	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-9.21762***	.11126	-82.85	.0000	-9.43565	-8.99957
LNLEN	.90134***	.00869	103.68	.0000	.88432	.91840
DEG1	.00257***	.00095	3.07	.0022	.00103	.00470
VCVL1	-.77540***	.18706	-3.99	.0001	-1.16666	-.39214
SNWDCR	-.13053***	.02387	-5.46	.0000	-.17711	-.08394
SCVL1NI	-1.29280***	.11065	-10.90	.0000	-1.52338	-1.06015
SNWDRI	-.02054***	.00410	-5.06	.0000	-.02858	-.01251
RWYMDINC	.04197***	.00255	16.44	.0000	.03697	.04698
VCVPTGRA	.00118***	.00028	4.18	.0000	.00062	.00173
SCVCRAN	.77526D-04***	.9730D-05	13.53	.0000	.68295D-04	.88756D-04
	Means for random parameters					
LNADT	1.06373***	.01352	78.68	.0000	1.03722	1.09023
VCH	-.74992***	.21239	-3.53	.0004	-1.16620	-.33365
	Diagonal elements of Cholesky matrix					
LNADT	.02413***	.00111	21.83	.0000	.02196	.02632
VCH	.36473**	.15070	2.02	.0435	.01087	.71859
	Below diagonal elements of Cholesky matrix					
1VCH_LNA	-.05305***	.12995	-2.85	.0044	-.69679	-.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	-.8828E-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	-.68880
VCH	-.68880	1.00000

Random Parameter Negative Binomial Model of Possible Injury Crashes on Two lane SPF Class Roadway Segments

```
Random Coefficients  NegBinReg Model
Dependent variable                  PINJ
Log likelihood function    -10577.66039
Restricted log likelihood  -11978.94249
Chi squared [   5 d.f.]      2802.00407
Significance level              .00000
McFadden Pseudo R-squared       .1169371
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
```

PINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-12.4684***	.20940	-59.54	.0000	-12.8789	-12.0580
LNADT	1.50924***	.02464	55.14	.0000	1.26095	1.35753
VCVL1NI	-.04189***	.01455	-2.82	.0045	-.07099	-.01278
VCRANN	.04060***	.01421	2.86	.0043	.01276	.06844
HCVL1NI	-12.3229***	2.87706	-4.14	.0000	-18.1878	-6.4580
SHNDCR	-.08039***	.00719	-4.22	.0000	-.09441	-.01424
RHVNEINC	.00938***	.00482	9.17	.0000	.01894	.04882
HCVCRAN	.9656E-04***	.1207E-04	4.82	.0000	.3093E-04	.7823E-04
HCVL	.00203***	.00056	8.69	.0008	.00094	.00313
HCVR	-.2131E-04**	.1065E-04	-1.96	.0495	-.4256E-04	-.4352D-07
	Means for random parameters					
LNLEN	.90304***	.01829	59.06	.0000	.87307	.93300
SHNDCR	-.24778***	.04985	-4.98	.0000	-.48465	-.21065
	Diagonal elements of Cholesky matrix					
LNLEN	.10289***	.00870	16.07	.0000	.09102	.11417
SHNDCR	.14017**	.04676	2.04	.0415	.00541	.27494
	Below diagonal elements of Cholesky matrix					
SHW_LNL	-.41805*	.32111	-1.92	.0549	-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   .2076E-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  NegBinReg Model
Dependent variable                  EVI
Log likelihood function     -5615.40156
Restricted log likelihood   -5879.07270
Chi squared [   3 d.f.]       808.34028
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
```

EVI	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-6.01749***	.19401	-41.35	.0000	-6.39774	-7.63724
LNLEN	.90518***	.01618	56.09	.0000	.87641	.93985
DEG	.00644***	.00188	2.89	.0038	.00174	.00912
SHNDCR	-.09878**	.04176	-2.37	.0180	-.18062	-.01693
HCVL1NI	-1.36650***	.16511	-8.28	.0000	-1.69010	-1.04289
SHNDEF	-.03827***	.00000	-4.75	.0000	-.05388	-.02339
HCVCRAN	.89763D-04***	.1123D-04	7.95	.0000	.67836D-04	.1115BD-03
	Means for random parameters					
LNADT	.20442***	.02362	34.03	.0000	.75812	.85072
VCK	-.69066**	.33204	-2.05	.0375	-1.34145	-.03987
	Diagonal elements of Cholesky matrix					
LNADT	.01228***	.00211	5.79	.0000	.00809	.01637
VCK	.67259***	.29527	2.93	.0094	.25529	1.48790
	Below diagonal elements of Cholesky matrix					
LVCK_LNA	-.09831**	.04185	-2.35	.0188	-.18033	-.01628
	Dispersion parameter for NegBin distribution					
ScalParm	.85002***	.10319	8.05	.0000	.62788	1.05216

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------------------
              LNADT       VCK
--------+-----------------------------------------------------------
LNADT       .1498E-03
VCK        -.9588E-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  NegBinReg Model
Dependent variable                  SINJ
Log likelihood function     -9733.38471
Restricted log likelihood   -9801.43566
Chi squared [   2 d.f.]       136.10759
Significance level              .00000
McFadden Pseudo R-squared       .0243032
Estimation based on N = 164135, K =   8
Inf.Cr.AIC  =   9484.7 AIC/N =    .058
Model estimated: May 26, 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|   -5.69507***       .59673   -21.41  .0000    -9.27066  -7.71549
   LNADT|     .66569***       .04709    14.14  .0000      .57365    .75800
   LNLEN|     .91436***       .02691    33.96  .0000      .76364    .86813
    DEG1|     .00697         .00423     1.91  .0881     -.00252    .01625
 RCVLIMI|   -2.04531***       .52895    -3.87  .0001    -3.08200  -1.00863
 RCVCRAN|    .00016***   .2025D-04      8.70  .0000      .00013    .00018
        |Means for random parameters
  SHRLT|    -.05112***       .01747    -2.93  .0034     -.08535   -.01689
        |Scale parameters for dists. of random parameters
  SHRLT|     .01966**        .00895     2.19  .0283      .00209    .03719
        |Dispersion parameter for NegBin distribution
ScalParm|    .34322***       .11476     3.01  .0026      .12028    .57014
--------+-----------------------------------------------------------------------
Note: nnnn.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  NegBinReg Model
Dependent variable                 FATAL
Log likelihood function     -1018.96171
Restricted log likelihood   -1032.98594
Chi squared [   2 d.f.]       12.96746
Significance level              .00052
McFadden Pseudo R-squared       .0063414
Estimation based on N = 164135, 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|   -8.99934***       .88837    -9.45  .0000   -10.14053  -8.65816
   LNLEN|     .91984***       .05130    17.93  .0000      .81915   1.02018
SHRLTFCR|     .15752          .11274     1.90  .0323     -.06344    .37848
RWYWDTH |    -.11504**        .05171    -2.22  .0261     -.21495   -.01370
 RCVCRAN| .870140-04***   .3385D-04      2.59  .0095  .212485D-04  .152780D-03
        |Means for random parameters
   LNADT|     .64796***       .08898     7.31  .0000      .49344    .84228
        |Scale parameters for dists. of random parameters
   LNADT|     .05004***       .00985     5.19  .0000      .03113    .06895
        |Dispersion parameter for NegBin distribution
ScalParm|    .05690**        .02460     2.31  .0207      .00868    .10512
--------+-----------------------------------------------------------------------
Note: nnnn.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   -1569.42956
Chi squared [   3 d.f.]        60.39825
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, 18:11:56
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|   -1.67554**       .73482    -2.28  .0226   -3.11615    -.23573
 HCVCRAH|     .00011***   .2920D-04     3.78  .0002     .00005     .00017
        |Means for random parameters
   LNADT|     .79652***      .06579    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     1.63  .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      .8398E-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     .85826     .90795
    DEG1|     .00375*        .00213     1.96  .0590    -.00043     .00795
HCVHOURSEL|   .00315***      .00056     5.63  .0000     .00204     .00425
  BRNDCR|    -.09514**       .03920    -2.43  .0152    -.17196    -.01832
  BRNDRT|    -.03604***      .00757    -4.76  .0000    -.05088    -.02120
RWYWDINC|    -.01643***      .00633    -2.88  .0098    -.02901    -.00385
    HCVR|-.28233D-04***   .7883D-05    -3.58  .0003 -.43685D-04  -.12790D-04
        |Means for random parameters
   LNADT|     .72087***      .02172    33.55  .0000     .68401     .77112
 HCVLIMI|    -.63655***      .18093    -3.52  .0008   -1.01305    -.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    -.79088    -.33209
        |Dispersion parameter for NegBin distribution
ScalParm|    1.00572***      .11409     8.82  .0000     .78218    1.22924
--------+--------------------------------------------------------------------
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 -5905.31385
Restricted log likelihood -6322.38254
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

JUSTINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence 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	-5.52	.0000	-.06785	-.03227
HCVLIMI	-2.19902***	.30470	-7.21	.0000	-2.79827	-1.60069
SHNDRTCR	-.31848***	.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	1.27579	1.41069
HCVCRAN	.00011***	.1269D-04	8.69	.0000	.00009	.00014
	Diagonal elements of Cholesky matrix					
LNADT	.02354***	.00273	8.64	.0000	.01807	.02901
HCVCRAN	.19954D-04*	.1006D-04	1.97	.0449	-.359140-06	.390470-04
	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	.0235359
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 -28190.30635
Restricted log likelihood -38367.83542
Chi squared [6 d.f.] 20355.05838
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

LOINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-11.1068***	.15999	-69.42	.0000	-11.4204	-10.7932
SHWDLT	-.02662***	.00378	-7.03	.0000	-.03409	-.01920
HCVLIMI	-1.31125***	.11261	-11.64	.0000	-1.53200	-1.09056
HCVCRAN	.77054D-04***	.5575D-05	13.83	.0000	.66155D-04	.88011D-04
SHWDCR	-.13014***	.02363	-5.51	.0000	-.17645	-.08383
RWYMDDEC	.04502***	.00307	14.66	.0000	.03899	.05102
VCVPIGRA	.00069**	.00028	2.43	.0149	.00013	.00124
VCVLIMI	-1.37756***	.20471	-6.73	.0000	-1.77878	-.97636
VCRARMA	.02677***	.00647	4.34	.0000	.02016	.05338
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	.93115	.98905
	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	.00909038
2	.00216180
3	.117080

Implied correlation matrix of random parameters

Cor.Mat.	LNADT	DEG1	LNLEN
LNADT	1.00000	-.41625	.74144
DEG1	-.41625	1.00000	.28988
LNLEN	.74144	.28988	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      -2493.37061
Restricted log likelihood    -4831.62268
Chi squared [   6 d.f.]       4676.50448
Significance level                .00000
McFadden Pseudo R-squared       .4839478
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
```

TOTALACC	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-10.9822***	.63805	-17.19	.0000	-12.2347	-9.7297
LNLEN	.84062***	.04936	17.03	.0000	.74387	.93736
DES1	-.01611	.00620	-1.95	.1099	-.01631	.00406
NCVLINI	-2.03014***	.59186	-3.43	.0006	-3.19017	-.87010
RNYNDINC	.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
RNYNDDEC	.01491**	.00603	2.47	.0134	.00308	.02674
VCVL1	18.8005***	6.30799	2.97	.0030	6.3796	31.2214
NCVRNSL1	-16.7642***	5.83019	-2.88	.0040	-28.1911	-5.3372
	Means for random parameters					
LNADT	1.29795***	.07201	18.03	.0000	1.15682	1.43909
VCPARMA	.09562***	.03590	2.66	.0077	.02526	.16599
SHNDLT	-.04318***	.01148	-3.76	.0002	-.06568	-.02067
	Diagonal elements of Cholesky matrix					
LNADT	.03142***	.00816	3.85	.0001	.01544	.04741
VCPARMA	.06563***	.02347	2.80	.0052	.01964	.11163
SHNDLT	.01386***	.00507	2.48	.0098	.00341	.02390
	Below diagonal elements of Cholesky matrix					
lVCP_LNA	-.02596	.03556	-.73	.4651	-.09623	.04432
lSHN_LNA	-.00422	.01036	-.41	.6835	-.02452	.01608
lSHN_VCP	-.01165	.00737	-1.58	.1139	-.02609	.00279
	Dispersion parameter for NegBin distribution					
ScalParm	.31131***	.01937	16.07	.0000	.27335	.34927

Implied covariance matrix of random parameters

Covariance matrix

	LNADT	VCPARMA	SHNDLT
LNADT	.9875E-03		
VCPARMA	-.8156E-03	.4991E-02	
SHNDLT	-.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	SHNDLT
LNADT	1.00000	-.36775	-.23182
VCPARMA	-.36775	1.00000	-.50943
SHNDLT	-.23182	-.50943	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
```

PDO	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-10.9368***	.72677	-15.05	.0000	-12.3612	-9.5121
LNLEN	.82125***	.05693	14.43	.0000	.70967	.93284
MCVLINI	-2.72480***	.69614	-3.91	.0001	-4.08920	-1.36039
RNYNDINC	.01666***	.00561	3.05	.0021	.00605	.02727
VCVL	-.00071***	.00020	-3.62	.0003	-.00109	-.00032
VCVL13	2.95264*	1.67014	1.97	.0571	-.32077	6.22605
NCVRNSL1	-14.9738**	6.71486	-2.17	.0300	-27.7948	-1.4128
SHNDCB	.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
SHNDLT	-.04423***	.01264	-3.50	.0005	-.06901	-.01945
	Diagonal elements of Cholesky matrix					
LNADT	.03740***	.00880	4.25	.0000	.02016	.05464
MCVCRAN	.55356D-04**	.2264D-04	2.45	.0144	.11006D-04	.99760D-04
SHNDLT	.02042***	.00721	2.83	.0046	.00629	.03455
	Below diagonal elements of Cholesky matrix					
lMCV_LNA	.98068D-04***	.3155D-04	3.11	.0019	.36232D-04	.15990D-03
lSHN_LNA	-.01622	.01192	-1.36	.1736	-.03959	.00714
lSHN_MCV	-.00910	.00842	-1.08	.2796	-.02359	.00739
	Dispersion parameter for NegBin distribution					
ScalParm	.27817***	.02065	13.45	.0000	.23773	.31860

Implied covariance matrix of random parameters

Covariance matrix

	LNADT	MCVCRAN	SHNDLT
LNADT	.1399E-02		
MCVCRAN	.3666E-05	.1268E-07	
SHNDLT	-.6066E-03	-.2059E-05	.7630E-03

Implied standard deviations of random parameters

S.D_Beta	1
1	.0374010
2	.112626E-03
3	.0276218

Implied correlation matrix of random parameters

Cor.Mat.	LNADT	MCVCRAN	SHNDLT
LNADT	1.00000	.87074	-.58737
MCVCRAN	.87074	1.00000	-.67344
SHNDLT	-.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*       .00750     1.96  .0507     -.00060    .02997
 VCVVPIA|    -.00389***      .00102    -3.82  .0001     -.00589   -.00189
  SHWDLT|    -.05415***      .02010    -2.69  .0071     -.09356   -.01475
        |Means for random parameters
   LNADT|    1.41821***      .14256     9.96  .0000     1.13950   1.69562
 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     1.95  .0659     -.00310    .10360
 HCVCRAN|     .00016***   .5935D-04     2.66  .0074      .00004    .00028
   LNLEN|     .09432***      .02092     4.51  .0000      .05331    .13532
        |Below diagonal elements of Cholesky matrix
lHCV_LNA|-.66975D-04      .6348D-04    -2.06  .0314 -.19140D-03  .27447D-04
lLNL_LNA|     .11921         .06463     1.41  .1590     -.04668    .28509
lLNL_HCV|    -.11051***      .03256    -3.39  .0007     -.17436   -.04668
        |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       .0410235
Estimation based on N =   4306, K =  11
Inf.Cr.AIC  =   1092.5 AIC/N =      .254
Model estimated: Jun 02, 2016, 19:26:34
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|    -8.32382***    1.26333    -6.58  .0000   -10.80421  -5.84343
   LNLEN|      .83527***     .07418    11.26  .0000      .68994    .98061
HCVMAXSL1|   -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    .05449
        |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
lRNY_LNA|    -.02964***     .00647    -4.58  .0000     -.04233   -.01695
        |Dispersion parameter for NegBin distribution
ScalParm|    1.25867**      .60583     2.09  .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   .9360E-03

Implied standard deviations of random parameters

S.D_Beta|             1
--------+--------------
       1|       .116878
       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  NegBinReg Model
Dependent variable                  SINJ
Log likelihood function       -169.04257
Restricted log likelihood    -4305.99999
Chi squared [   9 d.f.]       8273.91484
Significance level               .00000
McFadden Pseudo R-squared      .9607426
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
```

SINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-9.66599***	2.02749	-4.09	.0000	-14.13738	-6.97460
VCPARMA	.18686**	.09198	2.03	.0422	.00686	.36716
VCVL	-.00109	.00071	-1.92	.0777	-.00249	.00031
	Means for random parameters					
LNADT	.69264***	.25660	2.70	.0069	.18971	1.19556
LNLEN	.88895***	.14682	6.02	.0001	.60177	.97699
	Diagonal elements of Cholesky matrix					
LNADT	.11374***	.04149	2.73	.0064	.05203	.19544
LNLEN	.12909**	.05987	2.16	.0311	.01176	.24694
	Below diagonal elements of Cholesky matrix					
LNL_LNA	.27731**	.11085	2.50	.0124	.06005	.49456
	Dispersion parameter for NegBin distribution					
ScalParm	.29218***	.10568	2.80	.0036	.08826	.49512

```
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	.12945E-01	
LNLEN	.91548E-01	.99568E-01

```
Implied standard deviations of random parameters
```

S.D_Beta	1
1	.113739
2	.305563

```
Implied correlation matrix of random parameters
```

Cor.Mat.	LNADT	LNLEN
LNADT	1.00000	.92656
LNLEN	.80488	1.00000

Random Parameter Negative Binomial Model of Fatal Injury Crashes on Three lane SPF Class Roadway Segments

```
Random Coefficients  NegBinReg Model
Dependent variable                 FATAL
Log likelihood function       -170.30009
Restricted log likelihood    -4305.99999
Chi squared [   9 d.f.]       8271.99980
Significance level               .00000
McFadden Pseudo R-squared      .9604008
Estimation based on N =   4306, K =   9
Inf.Cr.AIC  =    358.6 AIC/N =    .083
Model estimated: Jun 02, 2016, 19:20:02
Sample is  2 pds and  2153 individuals
Negative binomial regression model
```

FATAL	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-9.38832***	2.66775	-3.75	.0002	-14.15302	-4.90362
LNLEN	.40609***	.17961	3.88	.0007	.25604	.96011
MCVPVTVA	.00075	.00309	1.31	.2250	-.00231	.00882
	Means for random parameters					
LNADT	.73679**	.29360	2.81	.0121	.16134	1.31224
DEG1	-.07832	.06719	-1.67	.0636	-.21002	.05335
	Diagonal elements of Cholesky matrix					
LNADT	.03693*	.01935	1.91	.0561	-.00096	.07481
DEG1	.04995	.03793	1.32	.1878	-.02455	.12429
	Below diagonal elements of Cholesky matrix					
LNG1_LNA	.01271	.09189	.40	.6974	-.04420	.07462
	Dispersion parameter for NegBin distribution					
ScalParm	.03736*	.01949	1.92	.0552	-.00053	.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	DEG1
LNADT	.13635E-02	
DEG1	.44935E-03	.24567E-02

```
Implied standard deviations of random parameters
```

S.D_Beta	1
1	.0369247
2	.0515445

```
Implied correlation matrix of random parameters
```

Cor.Mat.	LNADT	DEG1
LNADT	1.00000	.24656
DEG1	.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      -132.15367
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
ScalParm|      .05490        .03551     1.55  .1219     -.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      .0785156
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|      .21533**      .08363     2.57  .0100      .05143     .37924
   LNADT|      .06794***     .02149     3.16  .0016      .02581     .11006
VCVPTGRB|      .00133        .00116     2.19  .0276     -.00209     .00284
        |Below diagonal elements of Cholesky matrix
lLNA_LNL|    -.12408***      .03334    -3.72  .0002    -.18942    -.05874
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***     .10452     3.62  .0003      .17399     .58308
--------+--------------------------------------------------------------------
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-04

Implied standard deviations of random parameters

S.D_Beta|              1
--------+--------------
       1|        .215331
       2|        .141463
       3|      .00957309

Implied correlation matrix of random parameters

--------+---------------------------
Cor.Mat.|     LNLEN     LNADT VCVPTGRB
--------+---------------------------
   LNLEN|  1.00000   -.87714   .72053
   LNADT|  -.87714   1.00000  -.96452
VCVPTGRB|   .72053   -.96452  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 =  14
Inf.Cr.AIC  =   1210.9 AIC/N =     .281
Model estimated: Jun 02, 2016, 22:59:24
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   -16.0942  -10.8063
VCVPTGRA|    -.00455**      .00210    -2.17  .0303    -.00867   -.00043
    MCVL|    -.00061**      .00025    -2.47  .0136    -.00108   -.00012
RNYWDINC|     .03141***     .00868     3.84  .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|    -.28355**      .14093    -2.01  .0442    -.55974   -.00736
        |Diagonal elements of Cholesky matrix
   LNLEN|     .01136        .10236     2.23  .0260     .02732    .42555
   LNADT|     .02313*       .01212     1.91  .0564    -.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
lSHN_LNL|    -.09990        .18048     -.55  .5799    -.45365    .25356
lSHN_LNA|    -.27126**      .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      -.6911E-03   .4282E-02
SHNDRTCR   -.1134E-02  -.1581E-03        .1324

Implied standard deviations of random parameters

S.D_Beta|            1
--------+--------------
       1|      .0113586
       2|      .0654368
       3|       .364206

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      -2147.38609
Restricted log likelihood    -3902.12688
Chi squared [   6 d.f.]      3509.48158
Significance level                .00000
McFadden Pseudo R-squared       .4496557
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   -12.9632  -10.3262
VCVPTGRA|    -.00389***     .00098    -3.96  .0001    -.00582   -.00195
    MCVL|    -.00064***     .00012    -5.14  .0000    -.00088   -.00039
RNYWDINC|     .01684***     .00469     3.44  .0006     .00725    .02643
 MCVCRAN|     .00014***   .2048D-04    6.81  .0000     .00010    .00018
MCVMXHL1|   -19.1274**     6.22624    -2.11  .0350   -29.3306   -.3242
        |Means for random parameters
   LNLEN|     .85008***     .05478    15.52  .0000     .74275    .95740
   LNADT|    1.37595***     .07803    18.34  .0000    1.22888   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     1.35  .0608    -.00120    .02070
        |Below diagonal elements of Cholesky matrix
lLNA_LNL|    -.12511***     .02297    -5.45  .0000    -.17012   -.08009
lSHN_LNL|    -.01991        .01405    -1.42  .1565    -.04746    .00763
lSHN_LNA|     .01241        .01252      .99  .3215    -.01213    .03696
        |Dispersion parameter for NegBin distribution
ScalParm|     .31044***     .02258    13.74  .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|       .310228
       2|       .137530
       3|      .0254118

Implied correlation matrix of random parameters

--------+--------------------------
Cor.Mat.|    LNLEN     LNADT    SHNDLT
--------+--------------------------
   LNLEN| 1.00000  -.90968  -.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  -63981.55178
Chi squared [   6 d.f.]     76030.81953
Significance level               .00000
McFadden Pseudo R-squared      .5979000
Estimation based on N =  25432, K =  25
Inf.Cr.AIC  =  51178.3 AIC/N =    1.500
Model estimated: Jun 04, 2016, 17:47:18
Sample is  2 pds and  14216 individuals
Negative binomial regression model
```

TOTALACC	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence 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	.00419
HCVLIMI	-1.24201***	.07996	-15.53	.0000	-1.39871	-1.08530
VCVPTSRB	.03773***	.00756	4.99	.0000	.02291	.05256
VCVL	-.03557***	.00764	-4.66	.0000	-.05054	-.02060
HCVCRAN	.90365D-04***	.6302D-05	14.34	.0000	.78033D-04	.10274D-03
RWYMDDEC	.01068***	.00198	5.37	.0000	.00674	.01454
VCVL1	184.308***	40.30723	4.57	.0000	105.306	263.306
HCVMNXL1	-6.00774***	.84056	-7.15	.0000	-7.65423	-4.36124
VCVEVCA	-.00080***	.00029	-2.73	.0064	-.00137	-.00022
SHNDLTCR	-.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
SHNDLT	-.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
SHNDLT	.00397***	.00147	2.70	.0070	.00108	.00686
	Below diagonal elements of Cholesky matrix					
lVCP_LNA	-.05760***	.01023	-5.63	.0000	-.07764	-.03755
lSHN_LNA	.04121***	.00311	13.26	.0000	.03511	.04730
lSHN_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	SHNDLT
LNADT	.4324E-02		
VCPARMA	-.3787E-02	.4312E-02	
SHNDLT	.2710E-02	-.3018E-02	.2123E-02

Implied standard deviations of random parameters

S.D_Beta	1
1	.0657566
2	.0656655
3	.0461333

Implied correlation matrix of random parameters

Cor.Mat.	LNADT	VCPARMA	SHNDLT
LNADT	1.00000	-.87708	.89319
VCPARMA	-.87708	1.00000	-.99542
SHNDLT	.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    -20521.45086
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 =    1.446
Model estimated: Jun 04, 2016, 13:49:03
Sample is  2 pds and  14216 individuals
Negative binomial regression model
```

PDO	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-7.53677***	.24730	-30.48	.0000	-8.02147	-7.05206
LNLEN	.80661***	.01296	62.26	.0000	.78121	.83200
DES1	.00601*	.00326	1.85	.0646	-.00036	.01238
VCVL1	-3.34225***	.38578	-8.66	.0000	-4.09837	-2.58613
HCVLIMI	-1.12481***	.10321	-10.91	.0000	-1.32550	-.92421
RWYMDDEC	.01056***	.00231	4.56	.0000	.00602	.01509
VCVPTGRB	.00214***	.00048	4.46	.0000	.00120	.00309
HCVCRAN	.67673D-04***	.81400D-05	8.30	.0000	.51825D-04	.83533D-04
VCVEVCA	-.00085**	.00033	-2.57	.0102	-.00150	-.00020
VCPARMA	.08832***	.01177	7.51	.0000	.06526	.11139
HCVMNXL1	-6.34921***	.99612	-6.37	.0000	-8.29758	-4.39284
VCVL16	1.49733***	.37741	3.97	.0001	.75762	2.23704
	Means for random parameters					
LNADT	.95295***	.02463	38.68	.0000	.90469	1.00126
VCK	-.13823**	.06803	-2.00	.0452	-.26936	-.00289
SHNDRT	-.08928***	.00296	-30.13	.0000	-.09508	-.08347
	Diagonal elements of Cholesky matrix					
LNADT	.05539***	.00221	25.11	.0000	.05107	.05972
VCK	.29577**	.11891	2.49	.0127	.06276	.52379
SHNDRT	.00583***	.00182	3.20	.0014	.00226	.00939
	Below diagonal elements of Cholesky matrix					
lVCK_LNA	-.19587	.13508	-1.44	.1512	-.45868	.07089
lSHN_LNA	.02925***	.00349	8.39	.0000	.02242	.03609
lSHN_VCK	-.01911***	.00234	-8.16	.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	SHNDRT
LNADT	.3069E-02		
VCK	-.1074E-01	.1269	
SHNDRT	.1620E-02	-.1135E-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	SHNDRT
LNADT	1.00000	-.54433	.82576
VCK	-.54433	1.00000	-.90205
SHNDRT	.82578	-.90205	1.00000

Random Parameter Negative Binomial Model of Possible Injury Crashes on Four lane SPF Class Roadway Segments

```
Random Coefficients  NegBinReg Model
Dependent variable                  PINJ
Log likelihood function    -10843.21465
Restricted log likelihood  -16726.75610
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, 18:41:37
Sample is  2 pds and  14216 individuals
Negative binomial regression model
```

PINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
Nonrandom parameters						
Constant	-8.23557***	.37760	-21.82	.0000	-8.97585	-7.49579
LNLEN	.76281***	.01819	41.93	.0000	.72716	.79847
HCVLIMI	-2.40658***	.17457	-13.84	.0000	-2.78642	-2.06246
VCV	-.25188***	.07751	-3.25	.0012	-.40380	-.09996
VCVL	-.02928***	.01072	-2.73	.0063	-.05030	-.00827
HCVCHAR	.57623D-04***	.1251D-04	4.48	.0000	.32322D-04	.82923D-04
SHMDLT	-.09972***	.00681	-20.75	.0000	-.10914	-.09030
HCVMHAEL	.00341***	.00051	6.64	.0000	.00241	.00442
VCVEVCA	-.00259***	.00052	-5.51	.0000	-.00352	-.00166
HCVR	-.20101D-04***	.6001D-05	-3.35	.0008	-.31863D-04	-.83393D-05
VCVLLNI	183.704***	36.40814	3.71	.0046	42.762	264.936
Means for random parameters						
LNADT	.97224***	.03701	26.27	.0000	.89970	1.04479
VCVPTGRA	.05468***	.01063	3.26	.0011	.01385	.05552
SHMDCR	-.02238***	.00681	-3.85	.0001	-.09576	-.01100
Diagonal elements of Cholesky matrix						
LNADT	.03249***	.00299	11.06	.0000	.02689	.03818
VCVPTGRA	.00291***	.00038	7.66	.0000	.00217	.00365
SHMDCR	.01126***	.00436	2.58	.0098	.00272	.01981
Below diagonal elements of Cholesky matrix						
LVCV_LNA	.00090	.00053	.94	.3455	-.00096	.00193
LSHM_LNA	.06377***	.00774	5.24	.0000	.04860	.07894
LSHM_VCV	.03170***	.00608	5.22	.0000	.01978	.04361
Dispersion parameter for NegBin distribution						
ScalParm	.32569***	.01150	27.85	.0000	.30316	.34823

```
Implied covariance matrix of random parameters

Covariance  matrix
```

	LNADT	VCVPTGRA	SHMDCR
LNADT	.1056E-02		
VCVPTGRA	.1410E-04	.8714E-06	
SHMDCR	.2048E-03	.1239E-03	.5158E-02

```
Implied standard deviations of random parameters
```

S.D_Beta	1
1)	.0324912
2)	.00298202
3)	.0718970

```
Implied correlation matrix of random parameters
```

Cor.Mat.	LNADT	VCVPTGRA	SHMDCR
LNADT	1.00000	.16819	.88449
VCVPTGRA	.16819	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  NegBinReg Model
Dependent variable                  EVI
Log likelihood function     -8864.64734
Restricted log likelihood   -9382.73454
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  =  17737.3 AIC/N =     .624
Model estimated: Jun 06, 2016, 17:15:50
Sample is  2 pds and  14216 individuals
Negative binomial regression model
```

EVI	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
Nonrandom parameters						
Constant	-5.47614***	.47200	-11.61	.0000	-6.40324	-4.55304
LNLEN	.75013***	.02249	34.75	.0000	.73613	.82413
DEDI	.01074**	.00501	2.14	.0322	.00091	.02067
VCVL1	-1.17497***	.34742	-3.38	.0007	-1.85680	-.49344
HCVLIMI	-18287.5**	8806.914	-2.08	.0379	-35948.3	-1025.8
HCV1	3.46332**	1.66738	2.08	.0379	.18414	6.73250
VCVPTGRA	.00213***	.00061	3.46	.0005	.00092	.00333
HCVHKHEL	-3.45998**	1.66758	-2.07	.0380	-6.72859	-.19137
Means for random parameters						
LNADT	.87928***	.04668	12.41	.0000	.48778	.67080
SHMDRT	-.06343***	.00800	-10.60	.0000	-.07540	-.05167
Diagonal elements of Cholesky matrix						
LNADT	.02918***	.00300	9.69	.0000	.02324	.03501
SHMDRT	.009035**	.00373	2.42	.0154	.00172	.01634
Below diagonal elements of Cholesky matrix						
LSHM_LNA	.06072***	.00422	9.64	.0000	.05244	.06899
Dispersion parameter for NegBin distribution						
ScalParm	.53868***	.04589	11.79	.0000	.44868	.62870

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

```
Covariance  matrix
```

	LNADT	SHMDRT
LNADT	.8483E-03	
SHMDRT	.1156E-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     -1415.95234
Restricted log likelihood   -1435.75846
Chi squared [   3 d.f.]        39.66023
Significance level               .00000
McFadden Pseudo R-squared      .0137853
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
 MCVLINI|  -1.91603***      .60745   -3.15  .0016   -3.10667   -.72550
RNYMDDEC|    -.02320*       .01222   -1.90  .0575    -.04715    .00074
MCVMRSEL|     .00499***     .00154    3.24  .0012     .00197    .00801
        |Means for random parameters
   LNADT|     .48969***     .10038    4.88  .0000     .29295    .68644
  SMWDCR|    -.07831***     .01705   -4.59  .0000    -.11173   -.04489
        |Diagonal elements of Cholesky matrix
   LNADT|     .02879***     .00540    5.33  .0000     .01819    .03938
  SMWDCR|     .02117*       .01283    1.95  .0488    -.00398    .04632
        |Below diagonal elements of Cholesky matrix
lSMW_LNA|     .06111***     .01150    5.13  .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 =   5
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        .04874    1.57  .0621    -.02250    .15680
HCVMRSLI|  -13.7728*       7.42993   -1.95  .0538   -28.3390     .7894
  VCVL15|    5.26175***    1.96770    2.67  .0075    1.40512   9.11837
        |Means for random parameters
   LNADT|     .35750**      .17301    2.07  .0388     .01841    .69659
        |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     .01841    .69659
--------+--------------------------------------------------------------------
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, 19:59:16
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|   -8.15546***   1.52503    -4.03  .0001    -9.15046  -5.16047
   LNLEN|     .78844***    .05744    13.74  .0000      .68048    .90642
BCVMAXSEL|    .00589***    .00168     3.50  .0005      .00260    .00919
    MCVL|   -.00048***  .7525D-04    -6.40  .0000    -.00063   -.00033
  SHWDRT|   -.09162***    .02068    -4.43  .0000    -.13215   -.05110
SWYWDINC|   -.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  .0444      .00031    .02531
SHWDRTCR|     .03838       .02739     1.89  .0642    -.01570    .09245
        |Below diagonal elements of Cholesky matrix
1SHW_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   .4748E-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     -6754.19810
Restricted log likelihood   -7467.43023
Chi squared [   3 d.f.]      1426.46425
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 03, 2016, 13:55:25
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|   -4.85066***    .52726    -9.38  .0000    -5.88407  -3.81725
   LNLEN|     .80053***    .01983    40.38  .0000      .76167    .83939
    MCVL|   -.00013***  .2655D-04    -4.94  .0000    -.00018   -.00008
 HOFLDEC|   -.42471**      .18761    -2.26  .0236    -.79243   -.05700
SHWDRTCR|     .15114***    .03790     3.98  .0001      .07670    .22558
    DEG1|     .01036**     .00498     2.08  .0372      .00061    .02012
  SHWDRT|   -.05963***     .00591   -10.08  .0000    -.07122   -.04804
BCVMAXSEL|    .00315***    .00059     5.32  .0000      .00199    .00431
    MCVR|-.19411D-04***  .6423D-05   -3.02  .0025 -.31999D-04 -.65234D-05
        |Means for random parameters
   LNADT|     .61546***    .03828    16.07  .0000      .54041    .69051
  SHWDCR|   -.07176***     .02052    -3.55  .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
1SHW_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|      .0287769
       2|      .0490446

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      .1784561
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***	.51363	-16.18	.0000	-9.31852	-7.30434
LNLEN	.75201***	.02340	32.13	.0000	.70614	.79788
SRNDCR	-.11385***	.03188	-3.57	.0004	-.17633	-.05137
RRNDRTCR	.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
SRNDRI	-.07898***	.01010	-7.82	.0000	-.09874	-.06017
MCVR	-.26816D-04***	.6833D-05	-3.90	.0001	-.40010D-04	-.13223D-04
	Means for random parameters					
LNADT	.92575***	.05160	18.00	.0000	.82762	1.02388
MCVMXSEL	.00419***	.00067	6.29	.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					
lMCV_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	.0176132
2	.00341969

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
SRNDRI	-.08410***	.00281	-29.85	.0000	-.08961	-.07859
RNYWIDEC	.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	-40310.8	-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	1.98	.0488	-.00001	.00073
	Below diagonal elements of Cholesky matrix					
lSRN_LNA	.02406***	.00868	2.77	.0056	.00706	.04107
lVCV_LNA	-.00678***	.00032	-21.37	.0000	-.00740	-.00615
lVCV_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	-.3288E-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	-.85978
VCVFTGRA	-.87650	-.85978	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
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
TOTALACC|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -6.02263***     .72079    -8.36  .0000     -7.43535  -4.60990
   LNLEN|     .85801***     .03887    22.07  .0000       .78182    .93419
 MCVLIMI|  -1.95320***      .40765    -4.81  .0000     -2.75824  -1.16016
  ZMWDRT|   -.06140***      .01891    -3.25  .0012     -.09847   -.02433
   VCVL1|   -.00039***      .00014    -2.70  .0069     -.00067   -.00011
 VCPARMA|    .09541***      .03115     3.06  .0022      .03435    .15647
SMNDLTCR|    .04079***      .01590     2.55  .0099      .00981    .07176
HCVMAXLL|  -5.35864**      2.43512    -2.20  .0277    -10.13260   -.58709
        |Means for random parameters
   LNADT|    .90781***      .06922    13.11  .0000       .77214   1.04348
  SMWDLT|   -.07238***      .01853    -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   .20740D-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**   .2676D-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    .6453E-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   .72680
  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
--------+--------------------------------------------------------------------
        |                  Standard            Prob.      95% Confidence
     PDO|  Coefficient       Error       z    |z|>Z*         Interval
--------+--------------------------------------------------------------------
        |Nonrandom parameters
Constant|   -4.79925***     .83977    -5.71  .0000     -6.44520  -3.15536
   LNLEN|     .89394***     .04372    20.45  .0000       .80829    .97963
    DES1|     .01698***     .00564     3.01  .0026       .00592    .02805
   VCVL1|  -3.06848***      .79650    -3.85  .0001     -4.62959  -1.50737
 MCVLIMI|  -1.33507***      .43990    -3.04  .0024     -2.19531   -.47484
VCVPTGRS|     .00208**      .00090     2.30  .0216       .00031    .00385
    HCVR|-.28202D-04**   .1249D-04   -2.02  .0436 -.49665D-04 -.71648D-06
 VCPARMA|    .11570***      .03645     3.17  .0015       .04425    .18714
MCVPTCVA|     .00223***     .00067     3.33  .0009       .00092    .00354
  ZMWDCR|     .11033**      .04376     2.52  .0117       .02460    .19615
RWYWDINC|    -.01384**      .00603    -2.21  .0269      -.02616   -.00152
        |Means for random parameters
   LNADT|    .87319***      .07840    11.14  .0000       .71953   1.02685
RWYWDDEC|   -.01348**       .00525    -2.55  .0107      -.02384   -.00314
  SMWDRT|   -.13196***      .01312   -10.05  .0000      -.15768   -.10623
        |Diagonal elements of Cholesky matrix
   LNADT|    .04359***      .01497     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|    .02575***      .00964     2.85  .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     .2590E-02   .4015E-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|   -8.17706***    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
MCVPTCVA|     .00182*       .00109     1.97  .0658     -.00032     .00397
    MCVL|    -.00040***     .00012    -3.20  .0014     -.00064    -.00015
RNYWDINC|    -.01709**      .00817    -2.09  .0364     -.03310    -.00108
        |Means for random parameters
   LNADT|     .90776***     .10846     8.37  .0000      .69517    1.12034
RNYWDDEC|    -.01863**      .00791    -2.36  .0185     -.03413    -.00313
  SMNDRT|    -.14855***     .01614    -5.25  .0000     -.18013    -.11403
        |Diagonal elements of Cholesky matrix
   LNADT|     .00368**      .00155     2.37  .0176      .00064     .00673
RNYWDDEC|     .01039***     .00230     4.50  .0000      .00583     .01483
  SMNDRT|     .02633***     .00897     2.93  .0033      .00875     .04391
        |Below diagonal elements of Cholesky matrix
lRNY_LNA|     .00873        .00771     1.13  .2578     -.00638     .02384
lSMN_LNA|     .01078        .01960      .55  .5823     -.02764     .04921
lSMN_RNY|     .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.
--------------------------------------------------------------------------------
```

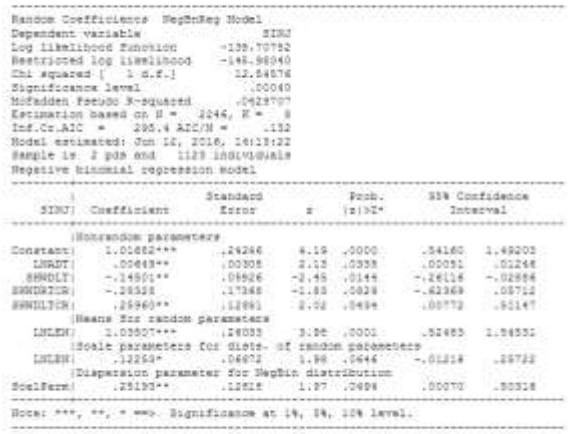
```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------------------------
                  LNADT     RNYWDDEC      SMNDRT
--------+-----------------------------------------------------------------
LNADT      .4197E-05
RNYWDDEC   .1789E-04   .1830E-03
SMNDRT     .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 RNYWDDEC   SMNDRT
--------+--------------------------
   LNADT| 1.00000   .64546   .18663
RNYWDDEC|  .64546  1.00000   .78523
  SMNDRT|  .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   -1390.45997
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, 20:49:48
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|     .47988       1.57555     2.30  .0207    -2.60613    3.56789
MCVLIMI|    -3.70270***     .84139    -4.40  .0000    -5.35180   -2.05360
MCVMKSEL|     .00391**      .00163     2.39  .0168      .00071     .00711
RNYWDINC|    -.03929***     .00995    -3.95  .0001     -.05880    -.01978
 VCVL1I|    -4.98121***    1.31474    -3.78  .0002    -7.81606   -2.38437
 NOFLDEC|    -1.48823***     .39548    -3.76  .0002    -2.26333    -.71314
    DEG1|    -.02362**      .01012    -2.33  .0196     -.04344    -.00379
        |Means for random parameters
   LNADT|     .65086***     .03162     6.35  .0000      .46126     .52022
  SHNDRT|    -.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
  SMNDRT|     .02312**      .01112     2.08  .0376      .00132     .04491
   LNLEN|     .05081***     .01898     2.76  .0057      .01478     .08684
        |Below diagonal elements of Cholesky matrix
lSMN_LNA|     .03151*       .01644     1.92  .0553     -.00071     .06373
lLNL_LNA|    -.09475*       .05418    -1.75  .0801     -.20088     .01138
lLNL_SNN|     .01280        .03151      .41  .6845     -.04896     .07456
        |Dispersion parameter for NegBin distribution
ScalParm|    1.35907***     .36488     3.73  .0002      .64338    2.07415
--------+-----------------------------------------------------------------------
Note: nnnnn.D-xx or D+xx => multiply by 10 to -xx or +xx.
Note: ***, **, * ==>  Significance at 1%, 5%, 10% level.
```

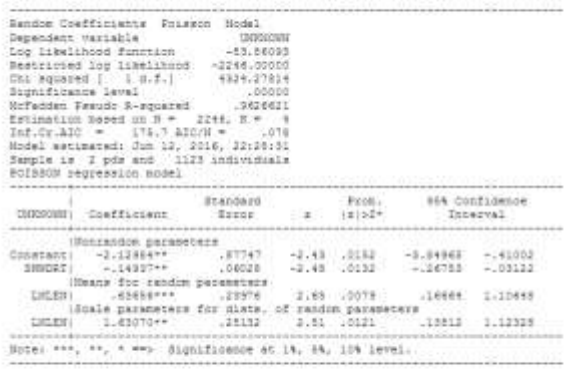
```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------------------------------
                  LNADT       SMNDRT        LNLEN
--------+-----------------------------------------------------------------
LNADT      .8198E-03
SMNDRT     .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   SMNDRT    LNLEN
--------+--------------------------
   LNADT| 1.00000   .80631  -.87509
  SMNDRT|  .80631  1.00000  -.63568
   LNLEN| -.87509  -.63568  1.00000
```

Random Parameter Negative Binomial Model of Serious Injury Crashes on Five lane SPF Class Roadway Segments



```
Random Coefficients  NegBinReg Model
Dependent variable                  SINJ
Log likelihood function       -138.70752
Restricted log likelihood     -148.98040
Chi squared [   1 d.f.]        20.54576
Significance level              .00000
McFadden Pseudo R-squared       .0628707
Estimation based on N =   2246, K =   8
Inf.Cr.AIC  =    293.4 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***       .24246     4.19  .0000      .54160   1.49203
   LNADT|      .00649**        .00305     2.13  .0333      .00051    .01246
  SHNDLT|     -.14501**        .05926    -2.45  .0144     -.26116   -.02886
SHNDRTR|     -.28328          .17348    -1.63  .1028     -.62329    .05712
SHNDLTCR|     .25960**        .12891     2.02  .0434      .00779    .51147
         |Means for random parameters
   LNLEN|     1.03507***       .24033     4.31  .0000      .56405   1.50610
         |Scale parameters for dists. of random parameters
   LNLEN|      .12253*         .06972     1.76  .0786     -.01410    .25916
         |Dispersion parameter for NegBin distribution
ScalFrm|      .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       -83.06093
Restricted log likelihood   -2246.00000
Chi squared [   1 d.f.]      4325.87814
Significance level              .00000
McFadden Pseudo R-squared      .9630621
Estimation based on N =   2246, K =   4
Inf.Cr.AIC  =    174.1 AIC/N =     .078
Model estimated: Jun 12, 2016, 22:26:51
Sample is  2 pds and   1123 individuals
POISSON regression model
---------+--------------------------------------------------------------------
         |                Standard            Prob.      95% Confidence
 UNKNOWN |  Coefficient       Error       z    |z|>Z*        Interval
---------+--------------------------------------------------------------------
         |Nonrandom parameters
Constant|    -2.12364**        .87747    -2.42  .0153     -3.84946   -.41002
  SHNDRT|     -.14937**        .06020    -2.48  .0132      -.26755   -.03122
         |Means for random parameters
   LNLEN|      .63664***       .23976     2.65  .0079      .16649   1.10679
         |Scale parameters for dists. of random parameters
   LNLEN|     1.63070**        .25132     6.51  .0121      .13812   1.12328
---------+--------------------------------------------------------------------
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     -814.38544
Chi squared [   6 d.f.]        223.19826
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  -5.14988
  SHWDRT|    -.07965***      .01782    -4.47  .0000     -.11458   -.04472
    HCVR|    -.00015***   .4681D-04    -3.20  .0014     -.00024   -.00006
        |Means for random parameters
   LNLEN|     .85530***      .06803    12.54  .0000      .71998    .98664
   LNADT|     .86374***      .12680     6.81  .0000      .61502   1.11246
HCVMKSEL|     .00427**       .00200     2.13  .0329      .00035    .00819
        |Diagonal elements of Cholesky matrix
   LNLEN|     .05728         .0[illegible]     2.02  .0394     -.05312    .16787
   LNADT|     .02624**       .01[illegible]     2.31  .0208      .00395    .04599
HCVMKSEL|     .00219**       .00[illegible]     2.38  .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***      .29094     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     -.1820E-02   .1384E-02
HCVMKSEL   .9638E-03  -.2164E-03   .4874E-04

Implied standard deviations of random parameters

S.D_Beta|             1
--------+--------------
       1|      .0572244
       2|      .0373401
       3|     .00698287

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    -1074.34690
Chi squared [   6 d.f.]        496.21816
Significance level                .00000
McFadden Pseudo R-squared       .2308591
Estimation based on N =   2246, K =  16
Inf.Cr.AIC  =   1684.5 AIC/N =      .750
Model estimated: Jun 12, 2016, 22:58:05
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    -7.66668  -2.22660
HCVMKSL1|  -11.4440**       4.78427    -2.39  .0168   -20.8248   -2.0631
    NCVL|    -.00035**       .00015    -2.26  .0240     -.00065   -.00005
RWYMDINC|    -.02229**       .00956    -2.33  .0197     -.04102   -.00356
     VCR|   -2.22005        1.37675    -1.91  .0574    -4.92246    .48225
  HCVCRAM|     .00018***   .5697D-04    3.22  .0013      .00007    .00030
        |Means for random parameters
   LNLEN|     .85461***      .07748    11.03  .0000      .70274   1.00647
   LNADT|     .69578***      .13631     5.10  .0000      .42862    .96294
  SHWDLT|    -.16209***      .01962    -8.26  .0000     -.20056   -.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         .03057     -.33  .7431     -.07085    .05055
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|      .0555126

Implied correlation matrix of random parameters

--------+----------------------------
Cor.Mat.|    LNLEN     LNADT   SHWDLT
--------+----------------------------
   LNLEN| 1.00000  -.89785  -.18282
   LNADT| -.89785  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, 15:35:15
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  -2.85555
HCVMXSL1|    -4.81185*       2.54727    -1.89  .0589    -9.80442    .18067
    HCVL|    -.00046***    .8280D-04    -5.60  .0000    -.00063   -.00030
RWYMDDEC|    -.01114**        .00454    -2.45  .0141    -.02003   -.00224
     VCH|   -1.24594**        .51778    -2.41  .0161   -2.26077   -.23111
  SHWDRT|    -.06747***       .01955    -3.45  .0006    -.10579   -.02915
HCVPTTYA|     .00173**        .00076     2.27  .0229     .00024    .00323
  SHWDLT|    -.07252***       .02038    -3.56  .0001    -.11543   -.03561
 HCVCRAN|     .00011***    .3114D-04     3.57  .0004     .00005    .00017
VCVBTGRB|     .00224***       .00076     2.95  .0031     .00075    .00372
        |Means for random parameters
   LNLEN|     .91875***       .04424    20.72  .0000     .83004   1.00545
   LNADT|     .82019***       .07926    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***       .00843     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  .4590    -.03307    .02091
lSHW_LNA|     .02628**        .01033     2.54  .0109     .00604    .04652
        |Dispersion parameter for NegBin distribution
ScalParm|     .70145***       .04734    14.82  .0000     .60867    .79423
--------+--------------------------------------------------------------------
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    .8559E-02
SHWDCR    -.1751E-02    .9272E-03    .1255E-02

Implied standard deviations of random parameters

S.D_Beta|              1
--------+-------------
       1|        .288094
       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.]      26983.66558
Significance level                .00000
McFadden Pseudo R-squared       .6913813
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
 HCVCRAN|  .85598D-04***   .1589D-04     5.26  .0000  .52998D-04 .11468D-03
   VCVL1|   -2.53173***       .47968    -5.28  .0000    -3.47226  -1.59118
 VCPARMA|     .09202***       .01988     4.63  .0000     .05306    .13097
HCVMXSEL|     .00334***       .00076     4.55  .0000     .00130    .00479
RWYNDDEC|    -.02915***       .00483    -6.03  .0000    -.03862   -.01968
  VCVL16|    1.26527***       .46624     2.73  .0063     .35537   2.17516
  VCVL11|    3.39912**       1.43640     2.37  .0178     .58775   6.21049
    DEG1|    -.01007***       .00383    -2.63  .0087    -.01758   -.00255
        |Means for random parameters
   LNADT|     .94183***       .04013    23.47  .0000     .86327   1.02039
  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    .04339
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    .7706E-03
SHWDLTCR   .4024E-03   -.3462E-03    .3696E-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   -.91871    .45577
  SHWDRT| -.91871   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 =   5415, 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
```

PDO	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-5.97102***	.47915	-12.46	.0000	-6.91014	-5.03190
LNLEN	.89579***	.02219	40.37	.0000	.85230	.93928
HCVLIMI	-2.25446***	.30128	-7.48	.0000	-2.84433	-1.66404
HCVCRAH	.62206D-04***	.18480D-04	3.37	.0008	.26051D-04	.98561D-04
SHNDCR	-.01085***	.00401	-2.70	.0068	-.01872	-.00299
VCVLI	-1.14085***	.37591	-3.04	.0024	-1.87646	-.40524
VCFARMA	.08151***	.02004	4.07	.0000	.04223	.12079
HWYNDINC	-.03556***	.00498	-7.13	.0000	-.04532	-.02579
DESI	-.00086**	.00038	-2.29	.0246	-.00161	-.00011
VCVEVCA	-.00077**	.00038	-2.03	.0429	-.00152	-.00002
	Means for random parameters					
LNADT	.98975***	.04462	22.18	.0000	.90229	1.07720
SHMDRT	-.12180***	.00648	-18.80	.0000	-.13449	-.10910
HCVMXSEL	.00269***	.00079	3.41	.0007	.00114	.00423
	Diagonal elements of Cholesky matrix					
LNADT	.05228***	.00552	9.48	.0000	.04147	.06309
SHMDRT	.04408***	.00470	9.37	.0000	.03487	.05330
HCVMXSEL	.00055*	.00028	1.97	.0516	.00000	.00110
	Below diagonal elements of Cholesky matrix					
LSHM_LNA	-.00425	.00729	-.58	.5596	-.01854	.01003
LHCV_LNA	-.00535***	.00071	-7.54	.0000	-.00674	-.00396
LHCV_SHM	.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	SHMDRT	HCVMXSEL
LNADT	.2733E-02		
SHMDRT	-.2224E-03	.1960E-02	
HCVMXSEL	-.2796E-03	.2748E-03	.6184E-04

Implied standard deviations of random parameters

S.D_Beta	1
1	.0522810
2	.0442874
3	.00786124

Implied correlation matrix of random parameters

Cor.Mat.	LNADT	SHMDRT	HCVMXSEL
LNADT	1.00000	-.09606	-.68156
SHMDRT	-.09606	1.00000	.79050
HCVMXSEL	-.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 =     .787
Model estimated: Jun 06, 2016, 14:31:26
Sample is  2 pds and  2709 individuals
Negative binomial regression model
```

PINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-8.69880***	.38941	-22.34	.0000	-9.46204	-7.93557
LNLEN	.75609***	.01546	41.07	.0000	.72151	.79426
HCVLIMI	-2.83132***	.16887	-16.77	.0000	-3.16231	-2.50034
VCVL	-.00047***	.8441D-04	-5.58	.0000	-.00064	-.00031
HCVMXSEL	.00287***	.00048	6.09	.0000	.00222	.00393
SHNDCR	-.01685***	.00509	-3.29	.0012	-.02688	-.00687
	Means for random parameters					
LNADT	1.00817***	.03751	26.88	.0000	.93468	1.08169
VCVPTGRB	.00262***	.00056	4.66	.0000	.00151	.00372
SHMDLT	-.10457***	.00523	-20.05	.0000	-.11513	-.09482
	Diagonal elements of Cholesky matrix					
LNADT	.03966***	.00359	11.05	.0000	.03263	.04670
VCVPTGRB	.00156***	.00041	3.79	.0002	.00075	.00236
SHMDLT	.01000***	.00308	3.24	.0012	.00396	.01605
	Below diagonal elements of Cholesky matrix					
lVCV_LNA	-.00089	.00055	-1.61	.1066	-.00197	.00019
lSHW_LNA	.01117*	.00584	1.91	.0560	-.00028	.02262
lSHW_VCV	-.01416***	.00423	-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	SHMDLT
LNADT	.1573E-02		
VCVPTGRB	-.3522E-04	.3172E-05	
SHMDLT	.4428E-03	-.3177E-04	.4281E-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	SHMDLT
LNADT	1.00000	-.49861	.54151
VCVPTGRB	-.49861	1.00000	-.86518
SHMDLT	.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
 NCVLIMI|   -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
NCVCRAN | .597210-04*     .5977D-04      1.97  .0652  -.17415D-04  .21666D-03
MSFLDEC |   -1.48823***      .39646     -3.76  .0002     -2.26333   -.71314
   DES1 |   -.02362**        .01012     -2.33  .0196     -.04344   -.00379
        |Means for random parameters
  LNADT |    .64064***       .09162      8.39  .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 |    .02963**        .01347      2.13  .0336      .00224    .05502
  SHWDRT|    .02312**        .01112      2.08  .0376      .00132    .04491
  LNLEN |    .05051***       .01838      2.76  .0057      .01475    .08654
        |Below diagonal elements of Cholesky matrix
1SHW_LNA|    .03151*         .01646      1.92  .0553     -.00071    .06373
1LNL_LNA|   -.09475*         .05418     -1.75  .0801     -.20086    .01136
1LNL_SHW|    .01280          .03151       .41  .6845     -.04888    .07456
        |Dispersion parameter for NegBin distribution
ScalParm|   1.35907***       .36488      3.78  .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  -.87503
  SHWDRT|  .80631  1.00000  -.63546
   LNLEN| -.87503  -.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    -363.37496
Chi squared [   1 d.f.]        1.66745
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|   -2.03928***      .01485     -2.64  .0083     -.06845   -.01010
  1NLEN |    .77646***       .10048      7.73  .0000      .57951    .97341
  SHWDRT|   -.14474***       .03392     -4.27  .0000     -.21122   -.07827
BWYWDINC|   -.10065***       .03278     -3.07  .0021     -.16481   -.03648
   DEG1 |    .02746*         .01538      1.88  .0342     -.00248    .05762
        |Means for random parameters
  LNADT |    .47600**        .23583      2.02  .0433      .01457    .93742
        |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      -258.12453
Restricted log likelihood    -261.69146
Chi squared [   1 d.f.]         5.13430
Significance level               .02346
McFadden Pseudo R-squared      .0098095
Estimation based on N =   5418, K =   7
Inf.Cr.AIC  =    532.2 AIC/N =     .098
Model estimated: Jun 17, 2016, 23:11:52
Sample is  2 pds and   2709 individuals
Negative binomial regression model
```

UNKNOWN	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-4.21247	2.76711	-1.52	.0879	-9.63591	1.21097
LNADT	.51027**	.24035	2.12	.0337	.03923	.98131
LNLEN	1.01072***	.11503	8.79	.0000	.78525	1.23618
SHWDRT	-.11645***	.03161	-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**	.00362	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     -1643.08134
Restricted log likelihood   -1915.80341
Chi squared [   8 d.f.]       545.44294
Significance level               .00000
McFadden Pseudo R-squared      .1423536
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
```

HIINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-6.78413***	.77944	-8.70	.0000	-8.31180	-5.25645
MCVLINI	-1.03381***	.39031	-2.65	.0081	-1.79880	-.26881
SHWDRT	-.08727***	.01216	-7.18	.0000	-.11110	-.06344
VCVL1	-2.81785***	.77926	-3.62	.0003	-4.34517	-1.29052
VCVL16	3.05877***	.87061	3.51	.0004	1.35260	4.76499
RWYMDINC	-.02889***	.00748	-3.87	.0001	-.04366	-.01430
VCVL12	3.83426***	1.42220	2.70	.0070	1.04678	6.62172
	Means for random parameters					
LNLEN	.81445***	.03592	22.67	.0000	.74404	.88485
SHNDRTCR	-.04423***	.01525	-2.90	.0037	-.07412	-.01434
LNADT	.81773***	.07824	10.45	.0000	.66435	.97108
	Diagonal elements of Cholesky matrix					
LNLEN	.06388	.03972	1.94	.0678	-.01397	.14176
SHNDRTCR	.04720***	.01605	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_SHN	-.01128*	.00677	-1.67	.0957	-.02455	.00199
	Dispersion parameter for NegBin distribution					
ScalParm	1.08613***	.16625	6.35	.0000	.73028	1.38198

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

Implied covariance matrix of random parameters

Covariance matrix

	LNLEN	SHNDRTCR	LNADT
LNLEN	.4081E-02		
SHNDRTCR	.3383E-02	.5032E-02	
LNADT	-.3554E-03	-.8544E-03	.2531E-03

Implied standard deviations of random parameters

S.D_Beta	1
1	.0638841
2	.0709349
3	.0159094

Implied correlation matrix of random parameters

Cor.Mat.	LNLEN	SHNDRTCR	LNADT
LNLEN	1.00000	.74653	-.35211
SHNDRTCR	.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      -1706.81495
Restricted log likelihood    -2194.54156
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, 20:31:16
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|    .84541***      .04101    20.69  .0000      .76502     .92579
 HCVLINI|   -3.95442***      .74975    -5.27  .0000    -5.42390   -2.48493
  SHNDRT|   -.21180***      .01768   -11.97  .0000     -.24646    -.17713
RWYNDINC|   -.05852***      .00797    -7.34  .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
  SHWDCR|   -.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
lSHW_HCV|    .00378      .01117      .34  .7340     -.01809     .02566
lLNA_HCV|   -.03295***     .00951    -3.46  .0005     -.05160    -.01430
lLNA_SHW|    .02984***     .00624     4.78  .0000      .01760     .04208
        |Dispersion parameter for NegBin distribution
ScalParm|    .80798***     .10802     7.48  .0000      .59624    1.01969
--------+--------------------------------------------------------------------
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      SHWDCR       LNADT
----------+--------------------------------------------------
HCVMXSEL   .2064E-04
SHWDCR     .1724E-04   .2552E-02
LNADT     -.1497E-03   .1387E-02   .2070E-02

Implied standard deviations of random parameters

S.D_Beta|            1
--------+---------------
       1|      .00454282
       2|       .0505176
       3|       .0454996


Implied correlation matrix of random parameters

----------+---------------------------
Cor.Mat.|HCVMXSEL    SHWDCR     LNADT
----------+---------------------------
HCVMXSEL| 1.00000    .07468  -.72422
  SHWDCR|  .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      .6494657
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|    .97376***      .04366    22.35  .0000      .88019    1.06134
 HCVLINI|   -2.46262***      .29269    -8.41  .0000    -3.03626   -1.88895
  SHWDCR|   -.00919**      .00392    -2.34  .0192     -.01688    -.00150
RWYNDINC|   -.04431***      .00496    -8.93  .0000     -.05403    -.03459
  VCVL13|   -2.20341***      .62673    -3.52  .0004    -3.43177    -.97504
 HCVCRAN| .67087D-04***  .18130D-04     3.70  .0002  .31469D-04  .10263D-03
  VCVL18|   -1.00387***      .34575    -2.90  .0037    -1.68148    -.32626
 HOFLDEC|   -.79653***      .22646    -3.52  .0004    -1.24038    -.35269
 VCPANSA|    .04129***      .01502     2.75  .0060      .01185     .07073
        |Means for random parameters
HCVMXSEL|    .00214***      .00070     3.04  .0024      .00076     .00351
  SHWDRT|   -.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
lSHW_HCV|   -.01722***      .00666    -2.58  .0097     -.03028    -.00416
lLNL_HCV|    .06656***      .01721     3.87  .0001      .03284     .10029
lLNL_SHW|    .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      SHWDRT       LNLEN
----------+--------------------------------------------------
HCVMXSEL   .4290E-05
SHWDRT    -.3542E-04   .6296E-03
LNLEN      .1368E-03   .1459E-02   .2511E-01

Implied standard deviations of random parameters

S.D_Beta|            1
--------+---------------
       1|      .00209876
       2|       .0250910
       3|        .158461


Implied correlation matrix of random parameters

----------+---------------------------
Cor.Mat.|HCVMXSEL    SHWDRT     LNLEN
----------+---------------------------
HCVMXSEL| 1.00000   -.68637    .42005
  SHWDRT| -.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        -1335.66694
Restricted log likelihood      -5632.69899
Chi squared [    6 d.f.]       8594.02411
Significance level                  .00000
McFadden Pseudo R-squared         .7624830
Estimation based on N =   1160, K =  22
Inf.Cr.AIC  =   2721.4 AIC/N =    2.346
Model estimated: Jun 25, 2016, 11:46:05
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
SMWDLTCR|   -.08407***       .01528    -5.50  .0000     -.11401   -.05413
   DEG1 |   -.02451**        .01042    -2.35  .0187     -.04494   -.00409
RMYMDDEC|    .00989          .00623     1.59  .0524     -.00232    .02210
  SHWDLT|    .04646***       .01655     2.81  .0050      .01403    .07890
    MCVR|   -.00015***     .3351D-04   -4.58  .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
  SMWDRT|   -.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
  SHWDRT|    .03274***       .00584     5.61  .0000      .02130    .04419
MCVPTCVA|    .00123**        .00051     2.42  .0156      .00023    .00222
        |Below diagonal elements of Cholesky matrix
lSHW_LNA|   -.02387**        .01184    -2.02  .0437     -.04706   -.00067
lMCV_LNA|   -.00021          .00071     -.29  .7710     -.00159    .00118
lMCV_SHW|   -.00085*         .00051    -1.97  .0754     -.00184    .00015
        |Dispersion parameter for NegBin distribution
ScalParm|   1.33951***       .17204     8.35  .0000     1.20212   1.57690
--------+--------------------------------------------------------------------
```

```
Implied covariance matrix of random parameters

Covariance  matrix
--------+-----------------------------------------
                LNADT       SHWDRT     MCVPTCVA
--------+-----------------------------------------
LNADT       .2530E-03
SHWDRT    -.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    SHWDRT MCVPTCVA
--------+------------------------------
   LNADT| 1.00000   -.58904   -.13638
  SHWDRT| -.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        -1131.92897
Restricted log likelihood      -3625.11795
Chi squared [    3 d.f.]       4986.37576
Significance level                  .00000
McFadden Pseudo R-squared         .6877540
Estimation based on N =   1160, K =  15
Inf.Cr.AIC  =   2293.9 AIC/N =    1.977
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|  -3.26894***       .77234    -4.28  .0000    -4.80270  -1.77518
  SMWDRT|   -.01451          .01082    -1.95  .0476     -.03513    .00610
  SHWDCR|   -.04112***       .00744    -5.53  .0000     -.05569   -.02654
MCVPTCVA|    .00251***       .00078     3.18  .0015      .00096    .00405
    DEG1|   -.03967***       .01098    -3.60  .0003     -.06035   -.01795
 MCVCRAR|    .00016***     .4243D-04    3.77  .0002      .00008    .00024
     VCR|  -1.47828***       .63100    -2.65  .0079    -2.81302   -.43553
    VCVL|   -.00024*         .00013    -1.94  .0519     -.00049    .00002
        |Means for random parameters
   LNLEN|    .87874***       .04300    20.46  .0000      .79546    .96403
   LNADT|    .86390***       .04495    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.] 1000.76534
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

PINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-11.9159***	1.04655	-11.39	.0000	-13.9659	-9.8678
TNADT	1.28733***	.08781	14.66	.0000	1.11522	1.45943
MCVLIMI	-6.19625***	1.07722	-5.75	.0000	-8.30760	-4.08489
SWNDCR	-.04516***	.01066	-4.23	.0000	-.06606	-.02426
VCFARMA	.11301*	.05801	1.95	.0514	-.00068	.22671
MCVCRAN	.00025***	.5602D-04	4.37	.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***	.06189	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					
IVCV_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	.91958
VCVFTGRB	.91958	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 -320.09716
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

EVI	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence 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
HCVCRAN	.00021**	.9124D-04	2.26	.0237	.00003	.00038
RWYMDDEC	.01508	.01139	1.32	.1853	-.00724	.03740
VCVFTGRB	-.00275	.03236	-2.60	.0093	-.00841	.00085
	Means for random parameters					
LNLEN	.89730***	.09069	9.34	.0000	.71329	1.08132
SMWDCR	-.06440***	.02212	-2.91	.0036	-.10775	-.02105
	Diagonal elements of Cholesky matrix					
LNLEN	.08824***	.03112	2.84	.0046	.02725	.14924
SMWDCR	.03330**	.01533	2.16	.0304	.00316	.06344
	Below diagonal elements of Cholesky matrix					
LSMW_LNL	-.05219***	.01321	-3.95	.0001	-.07808	-.02630
	Dispersion parameter for NegBin distribution					
ScalParm	1.92299*	1.11618	2.72	.0049	-.26468	4.11066

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	SMWDCR
LNLEN	.7787E-02	
SMWDCR	-.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	SMWDCR
LNLEN	1.00000	-.84298
SMWDCR	-.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 23, 2016, 13:31:07
Sample is 2 pds and 580 individuals
Negative binomial regression model

HIINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence 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
HCVCRAW	.00028***	.7254D-04	3.81	.0001	.00013	.00042
HCVSHSEL	.00756**	.00341	2.22	.0266	.00088	.01424
DEG1	-.02327**	.01170	-1.99	.0466	-.04620	-.00033
RWINDINC	.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	1.99	.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 -453.25550
Chi squared [3 d.f.] 191.61592
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

JUSTINJ	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Nonrandom parameters					
Constant	-11.2759***	1.46046	-7.72	.0000	-14.1612	-8.4166
LNLEN	.79256***	.06719	11.80	.0000	.66088	.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
RWTWDINC	-.03139***	.01000	-3.16	.0017	-.05095	-.01180
VCPARMA	.32971***	.06634	4.86	.0000	.19969	.45973
VCVL1S	-10.4034**	4.13332	-2.52	.0118	-18.5070	-2.3036
SHNDRT	-.04103**	.01607	-2.55	.0107	-.07252	-.00954
	Means for random parameters					
LNADT	1.21004***	.12614	9.59	.0000	.96282	1.45727
HCVLIMI	-3.50465***	1.32474	-2.65	.0082	-6.10135	-.90838
	Diagonal elements of Cholesky matrix					
LNADT	.03610***	.00631	5.72	.0000	.02372	.04847
HCVLIMI	.98240**	.44103	2.23	.0258	.11600	1.84880
	Below diagonal elements of Cholesky matrix					
lHCV_LNA	-.07756**	.03148	-2.46	.0140	.01877	.13904
	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  NegBinReg Model
Dependent variable                 LOIN7
Log likelihood function      -1211.64559
Restricted log likelihood    -4457.76765
Chi squared [   9 d.f.]       6492.25412
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, 14:15:00
Sample is  2 pds and    580 individuals
Negative binomial regression model
```

LOIN7	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
Nonrandom parameters						
Constant	-8.65955***	.54719	-15.39	.0000	-8.75702	-8.61237
LNADT	.87553***	.04797	18.46	.0000	.78248	.96836
HCVLIN	-3.95105***	.75399	-4.71	.0000	-5.02856	-2.07326
SHWDCR	-.04417***	.00721	-6.82	.0000	-.06930	-.03504
HCVCRAB	.00013***	.4581D-04	3.05	.0023	.00005	.00022
VCVL	-.00074***	.00015	-5.02	.0000	-.00103	-.00045
VCPARKA	.10959**	.04116	2.62	.0116	.02828	.19481
VCVL11	-12.8547**	5.98027	-2.15	.0316	-24.5738	-1.1356
DEG1	-.04325***	.01073	-4.03	.0001	-.06425	-.02221
VCVVE1A	.001358**	.00064	2.14	.0310	.00013	.00263
Means for random parameters						
LNLEN	.91465***	.04206	21.76	.0000	.83229	.99700
HCVWKSEL	.00757***	.00156	4.84	.0000	.00450	.01063
Diagonal elements of Cholesky matrix						
LNLEN	.05390***	.01654	3.26	.0011	.02148	.08632
HCVWKSEL	.00207***	.00057	3.64	.0003	.00096	.00318
Below diagonal elements of Cholesky matrix						
LHCV_LNL	-.00126*	.00070	-1.80	.0717	-.00264	.00011
Dispersion parameter for NegBin distribution						
ScalParm	1.94886***	.19871	7.77	.0000	1.15439	1.98331

```
Note: nnnn.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     HCVWKSEL
--------+-----------------------------------------------------------------------
LNLEN       .29058E-02
HCVWKSEL  -.68018E-04   .1842E-05

Implied standard deviations of random parameters

S.D_Beta|             1
--------+--------------
       1|      .0538892
       2|      .00242118

Implied correlation matrix of random parameters


--------+--------------------------
Cor.Mat.|   LNLEN HCVWKSEL
--------+--------------------------
   LNLEN| 1.00000  -.52145
HCVWKSEL| -.52145  1.00000
```

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