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PB85-184463

ANALYSIS OF URBAN ARTERIAL ROAD AND STREET ACCIDENT EXPERIENCE

September 1982

Vol. IV. Appendixes E - I

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16. Abstract

The purpose of this research study was to examine the specific characteristics of urban arterial traffic accidents, and to identify general causal elements and related countermeasures that can be used to reduce the rate and severity of these accidents. Accident, geometric, traffic control, and volume data were collected and analyzed for 8,678 one-tenth-mile (0.16-km) roadway segments located in 19 metropolitan areas.

The result of the analyses provides further evidence that specific geometric, traffic control, volume, and environmental conditions influence accident frequency and rate on urban roadways. Guidelines that can be used to identify accident problems and to select countermeasures are provided in this report. One important product of this research was the development of a comprehensive computerized accident and roadway data base that can be used to explore in greater detail specific urban arterial accident problems and possible solutions.

This report is the fourth in a series. The series is comprised of:

FHWA/RD-82/136 - Volume I - Executive Summary
FHWA/RD-82/137 - Volume II - Final Report
FHWA/RD-82/146 - Volume III - Appendixes A-D
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FOREWORD

The purpose of this study was to examine the specific characteristics of urban arterial traffic accidents, and to identify general causal elements and related countermeasures that can be used to reduce the rate and severity of these accidents. The report will be of interest to state and local highway officials involved in safety and traffic operations on urban roadways.

The results of the study provide further evidence that geometric, traffic control, volume, and environmental conditions influence the accident frequency and rate on urban roadways. Guidelines that can be used to identify accident related problems and to select appropriate countermeasures are provided in the report. One important product of this research was the development of a comprehensive computerized accident and roadway data base that can be used by highway officials and researchers to explore in detail specific urban arterial accident problems and possible solutions. Examples illustrating the use of the data base are given in the Appendixes.

Appreciation is given to the highway safety administrators and police officials who provided the accident data for this study.

Sufficient copies of the research report are being distributed to provide two copies to each regional office, one copy to each division office, and two copies to each State highway agency. Direct distribution is being made to each division office.

Charles F. Scheffey
Director, Office of Research
Federal Highway Administration

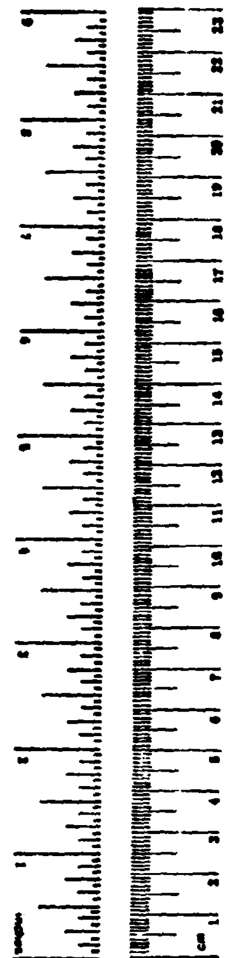
NOTICE

METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

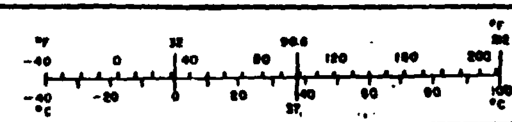
Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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APPENDIX E - DISTRIBUTIONAL CHARACTERISTICS OF ROADWAY VARIABLES

Introduction

This appendix presents the results of a series of tests conducted to identify specific roadway characteristics which are over or underrepresented in terms of urban arterial traffic accidents.

An analysis of the data was undertaken to determine if the data base provided evidence of a relationship between a single roadway feature and traffic accidents. A frequency table was constructed for each independent variable listing the range and categories of the independent variables in order to compare the number of segments within each category, and the frequency of accidents on those segments.

Operating under the hypothesis that the proportion of accidents is not influenced by the roadway variable, i.e., the null hypothesis, several statistical tests were conducted. The Chi-square test was used to determine if there is an association between two variables, e.g., accident frequency per segment of roadway and a roadway characteristic. In this nonparametric test, observed accident frequencies are compared with expected accident frequencies which would exist if the two variables were independent.

The computed Chi-square value is compared with the critical Chi-square value obtained from statistical tables at an assumed level of confidence. If the calculated value is greater than the critical value, the null hypothesis is rejected and it is concluded that there is a significant association between the variables. If the calculated value is less than the critical value, it is assumed that there is no association between the variables.

Because the Chi-square statistic is strongly affected by sample size and table size, especially when large data samples are taken, the contingency coefficient, c, was computed and used to determine if significance was attributable to sample size. The contingency coefficient ranges from 0 to 1, (depending upon table size - for example the maximum value for a 2 x 2 table is 0.707), with values close to 0 indicating that little relationship (association) exists between the variables even if the Chi-square value indicates the relationship is significant. However, for values of the coefficient close to 1, a strong relationship can be assumed between the variables.

When the Chi-square test indicated a significant associated existed between roadway segments and accidents, the Z-test was used to identify category(s) that contributed to the relationship. The Z-test is used to determine if the proportion of accidents to total accidents for a category is significantly different from the proportion of segments to total segments in that category.

The results of the Z-test identify the specific categories of a variable which may have a significant over or underrepresentation of accidents. Such findings provide useful information that can be utilized to further investigate relationships between roadway features and accidents.

Results

The Chi-square test, contingency coefficient, and Z-test were conducted for each of the geometric, environmental, and operational independent variables.

These results do not necessarily depict a cause-effect relationship, nor do they explain any possible interactional affects of various independent variables. However, the analyses do present a picture of the distribution of accidents relative to specific geometric, environmental, and operational variables. A complete set of results is shown in the following tables and figures.

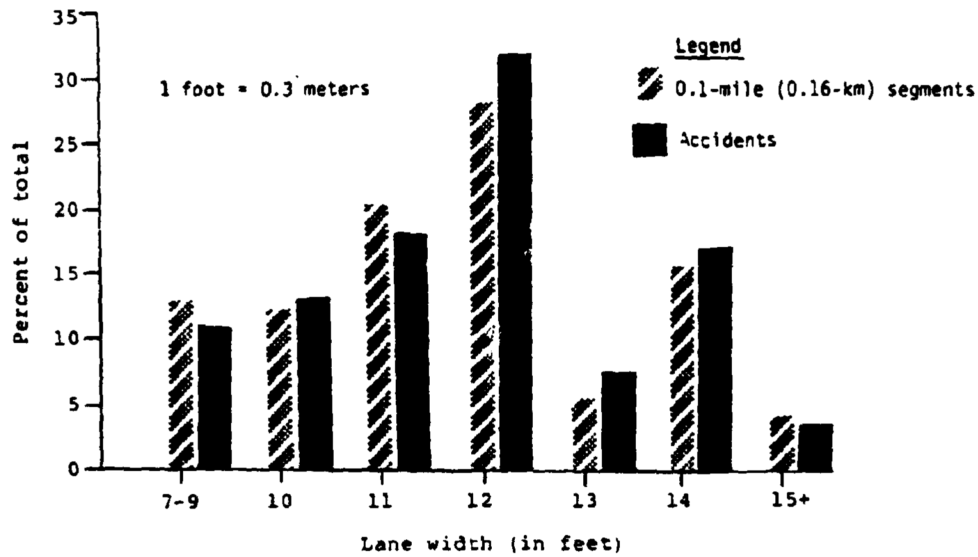


Figure 1. Distribution of roadway segments and accidents by lane width.

Table 1. Z-test and Chi-square test results for lane width.

Lane Width (Feet)	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
7 - 9	1082	12.88	9895	10.71	6.11	Yes
10	1020	12.14	11783	12.76	1.61	No
11	1718	20.45	16532	17.90	5.83	Yes
12	2386	28.42	28720	31.08	5.09	Yes
13	457	5.44	7062	7.64	7.36	Yes
14	1348	16.05	15367	16.64	1.38	No
15+	388	4.62	3017	3.27	6.57	Yes
Total	8399	100.00	92376	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 174.796 with 6 degrees of freedom

Contingency coefficient, C = 0.042

Critical Chi-square for α = 0.05 = 12.592 with 6 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 174.796 >12.592, the frequencies are significantly different.

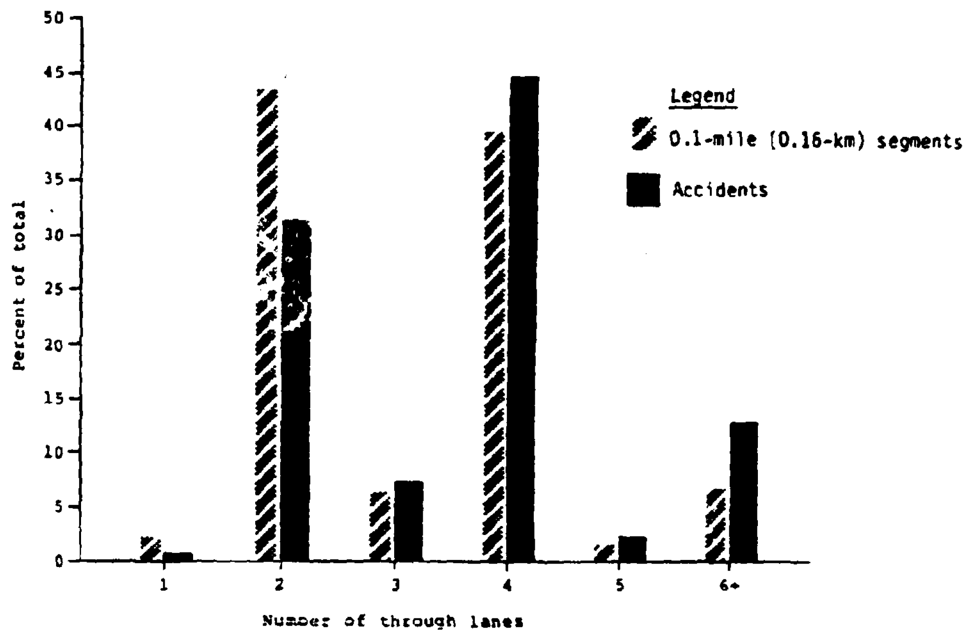


Figure 2. Distribution of roadway segments and accidents by number of through lanes.

Table 2. Z-test and Chi-square test results for the number of through lanes.

Number Of Through Lanes	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* $\alpha = 0.05$
	Number	Percent	Number	Percent		
1	189	2.18	700	0.74	13.96	Yes
2	3786	43.62	29744	31.25	23.61	Yes
3	550	6.34	7239	7.61	4.29	Yes
4	3437	39.61	42768	44.93	9.56	Yes
5	151	1.74	2485	2.61	4.94	Yes
6+	565	6.51	12244	12.86	17.23	Yes
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at $\alpha = 0.05$

Calculated Chi-square = 922.541 with 5 degrees of freedom

Contingency coefficient, C = 0.094

Critical Chi-square for $\alpha = 0.05$ = 11.070 with 5 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 922.541 >11.070, the frequencies are significantly different.

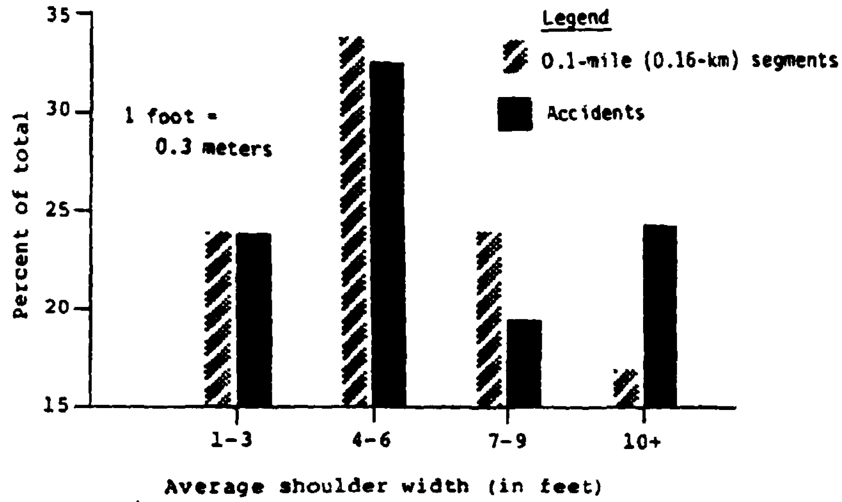


Figure 3. Distribution of roadway segments and accidents by average shoulder width.

Table 3. Z-test and Chi-square test results for average shoulder width.

Average Shoulder Width (Feet)	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
1 - 3	343	24.26	2425	23.89	0.30	No
4 - 6	479	33.87	3296	32.47	1.06	No
7 - 9	340	24.05	1952	19.23	4.26	Yes
10+	252	17.82	2478	24.41	5.47	Yes
Total	1414	100.00	10151	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 38.175 with 3 degrees of freedom

Contingency coefficent, C = 0.057

Critical Chi-square for α = 0.05 = 7.815 with 3 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 38.175 >7.815, the frequencies are significantly different.

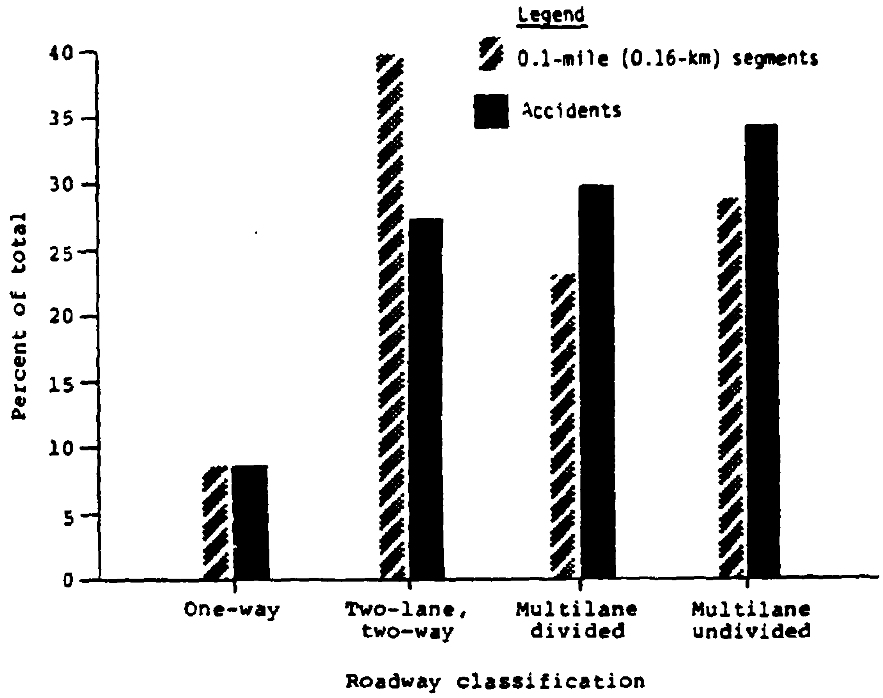


Figure 4. Distribution of roadway segments and accidents by roadway classification.

Table 4. Z-test and Chi-square test results for roadway classification.

Roadway Classification	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
One-way	726	8.37	8089	8.50	0.42	No
Two-lane, two-way	3459	39.86	25989	27.31	24.84	Yes
Multilane divided	1997	23.01	28337	29.77	13.26	Yes
Multilane undivided	2496	28.76	32765	34.42	10.66	Yes
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 641.754 with 3 degrees of freedom

Contingency coefficient, C = 0.078

Critical Chi-square for α = 0.05 = 7.815 with 3 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 641.754 >7.815, the frequencies are significantly different.

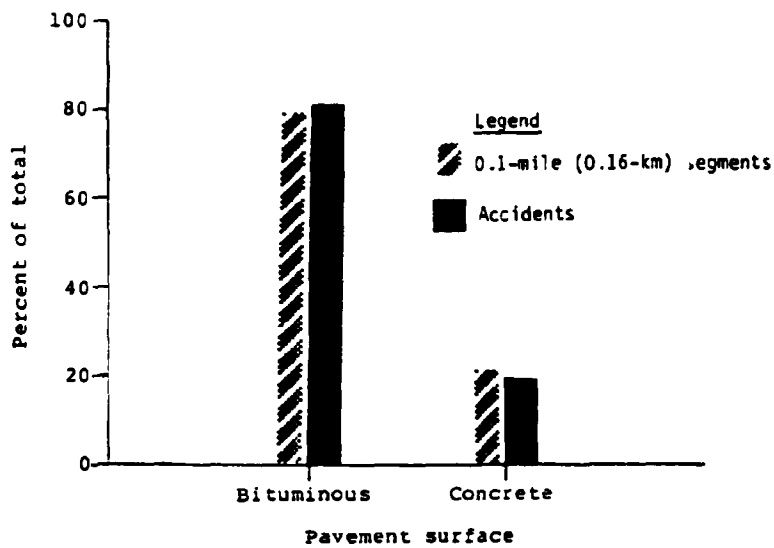


Figure 5. Distribution of roadway segments and accidents by pavement surface.

Table 5. Z-test and Chi-square test results for pavement surface.

Pavement Surface	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
Bituminous	6828	78.82	76951	80.88	4.65	Yes
Concrete	1835	21.18	18196	19.12	4.65	Yes
Total	8663	100.00	95147	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 21.462 with 1 degree of freedom

Contingency coefficient = 0.014

Critical Chi-square for α = 0.05 = 3.841 with 1 degree of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 21.462>3.841, the frequencies are significantly different.

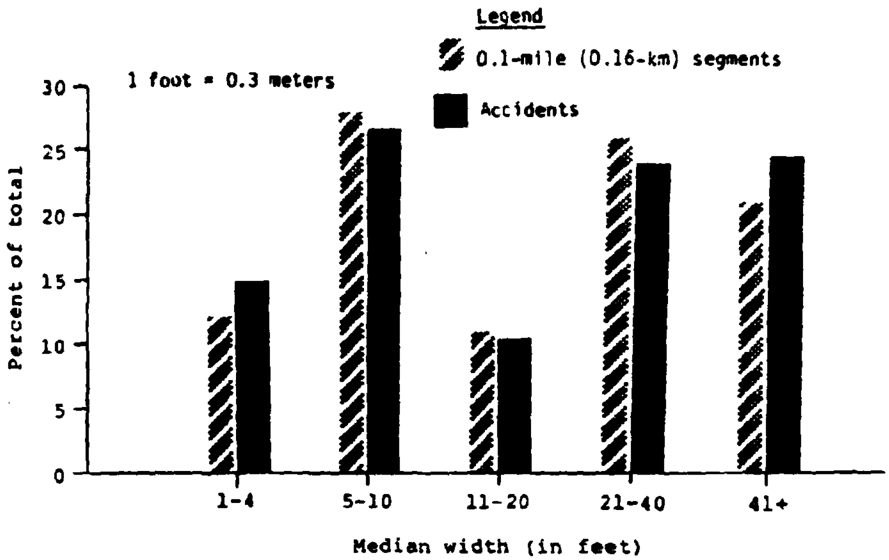


Figure 6. Distribution of roadway segments and accidents by median width.

Table 6. Z-test and Chi-square test results for median width.

Median width (feet)	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
1 - 4	192	12.35	3263	15.02	2.87	Yes
5 - 10	435	27.97	5741	26.44	1.33	No
11 - 20	167	10.74	2197	10.11	0.79	No
21 - 40	403	25.92	5188	23.88	1.81	No
41+	358	23.02	5332	24.55	1.35	No
Total	1555	100.00	21721	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 12.731 with 4 degrees of freedom

Contingency coefficient, C = 0.023

Critical Chi-square for α = 0.05 = 9.488 with 4 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 12.731 >9.488, the frequencies are significantly different.

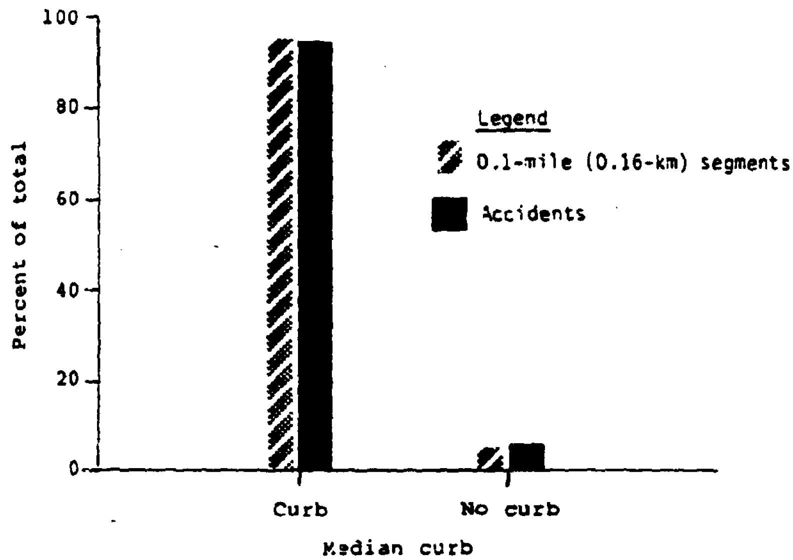


Figure 7. Distribution of roadway segments and accidents by median curb.

Table 7. Z-test and Chi-square test results for median curb.

Median Curb	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
Curb	1418	94.91	20096	94.14	1.23	No
No Curb	76	5.09	1250	5.86	1.23	No
Total	1494	100.00	21346	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 1.372 with 1 degree of freedom

Contingency coefficient = 0.008

Critical Chi-square for α = 0.05 = 3.841 with 1 degree of freedom

Thus, as the calculated Chi-square is less than the critical Chi-square, i.e., 1.372<3.841, the frequencies are not significantly different.

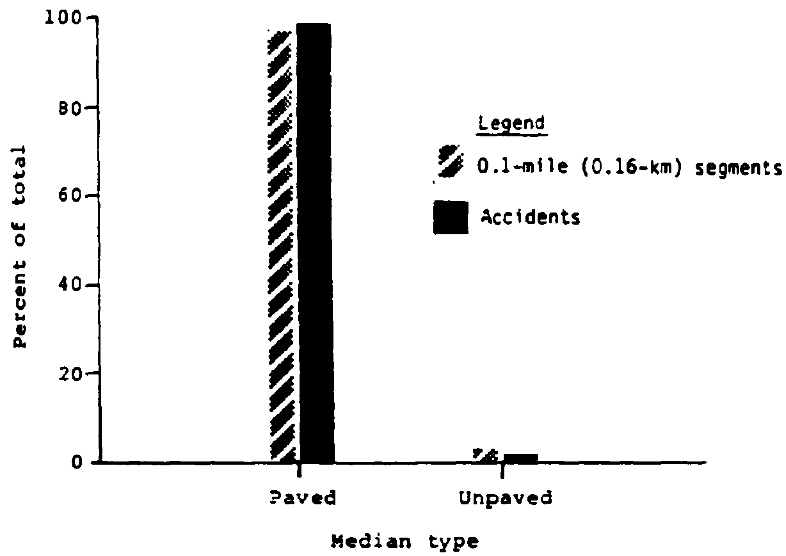


Figure 8. Distribution of roadway segments and accidents by median type.

Table 8. Z-test and Chi-square test results for median type.

Median Type	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
Paved	514	96.62	8136	99.09	5.38	Yes
Unpaved	18	3.38	75	0.91	5.38	Yes
Total	532	100.00	8211	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 26.666 with 1 degree of freedom

Contingency coefficient = 0.055

Critical Chi-square for α = 0.05 = 3.841 with 1 degree of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 26.666>3.841, the frequencies are significantly different.

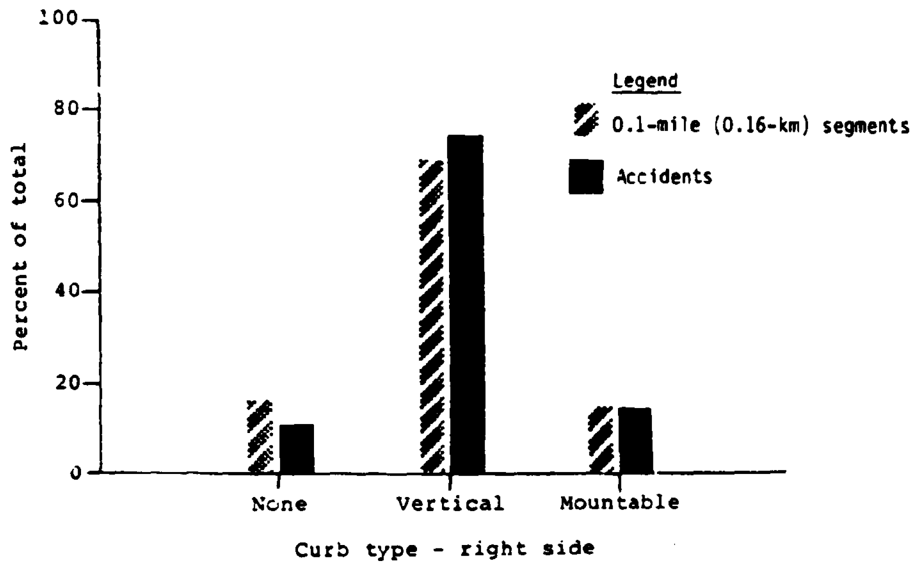


Figure 9. Distribution of roadway segments and accidents by curb type - right side.

Table 9. Z-test and Chi-square test results for curb type-right side.

Curb Type - Right Side	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
None	1403	16.17	10469	11.00	14.48	Yes
Vertical	6017	69.33	71332	74.94	11.47	Yes
Mountable	1258	14.50	13379	14.06	1.13	No
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 220.505 with 2 degrees of freedom

Contingency coefficient = 0.046

Critical Chi-square for α = 0.05 = 5.991 with 2 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 220.505>5.991, the frequencies are significantly different.

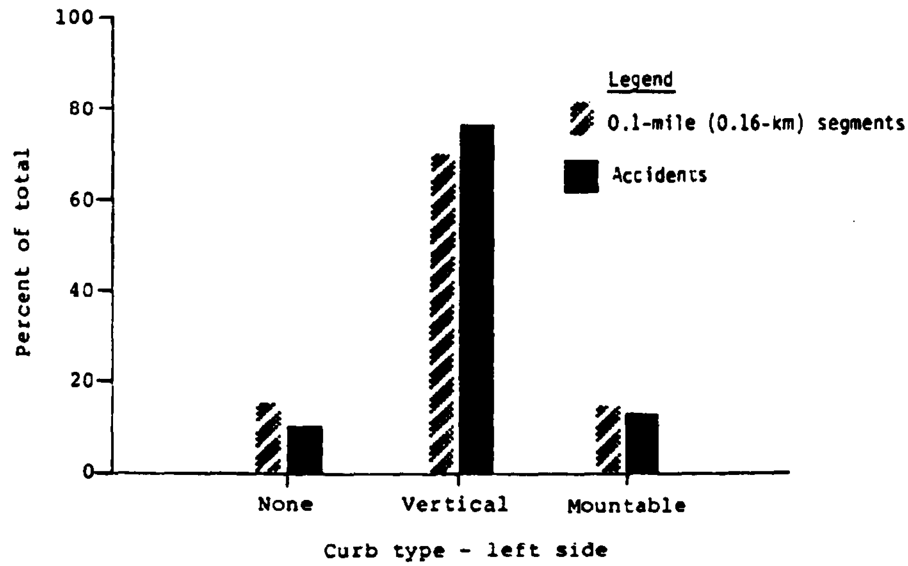


Figure 10. Distribution of roadway segments and accidents by curb type - left side.

Table 10. Z-test and Chi-square test results for curb type - left side.

Curb Type - Left Side	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
None	1319	15.20	9590	10.08	14.90	Yes
Vertical	6081	70.07	72718	76.40	13.19	Yes
Mountable	1278	14.73	12872	13.52	3.13	Yes
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 249.175 with 2 degrees of freedom

Contingency coefficient = 0.049

Critical Chi-square for α = 0.05 = 5.991 with 2 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 249.175>5.991, the frequencies are significantly different.

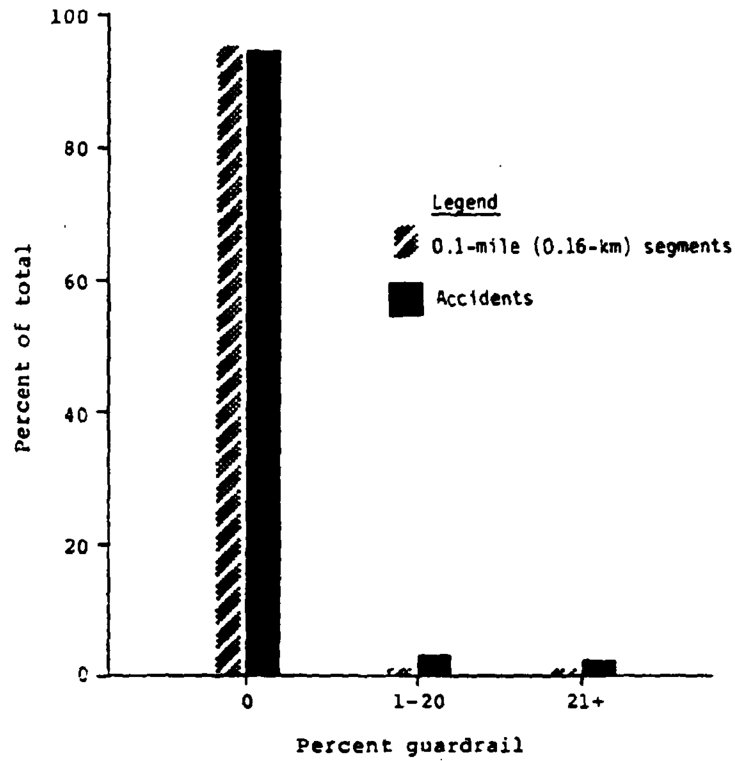


Figure 11. Distribution of roadway segments and accidents by percent guardrail.

Table 11. Z-test and Chi-square test results for percent guardrail.

Percent Guardrail	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
0	8332	96.02	90415	94.99	4.20	Yes
1 - 20	180	2.07	2703	2.84	4.16	Yes
21+	166	1.91	2062	2.17	1.56	No
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 20.048 with 2 degrees of freedom

Contingency coefficient, C = 0.014

Critical Chi-square for α = 0.05 = 5.991 with 2 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 20.048 >5.991, the frequencies are significantly different.

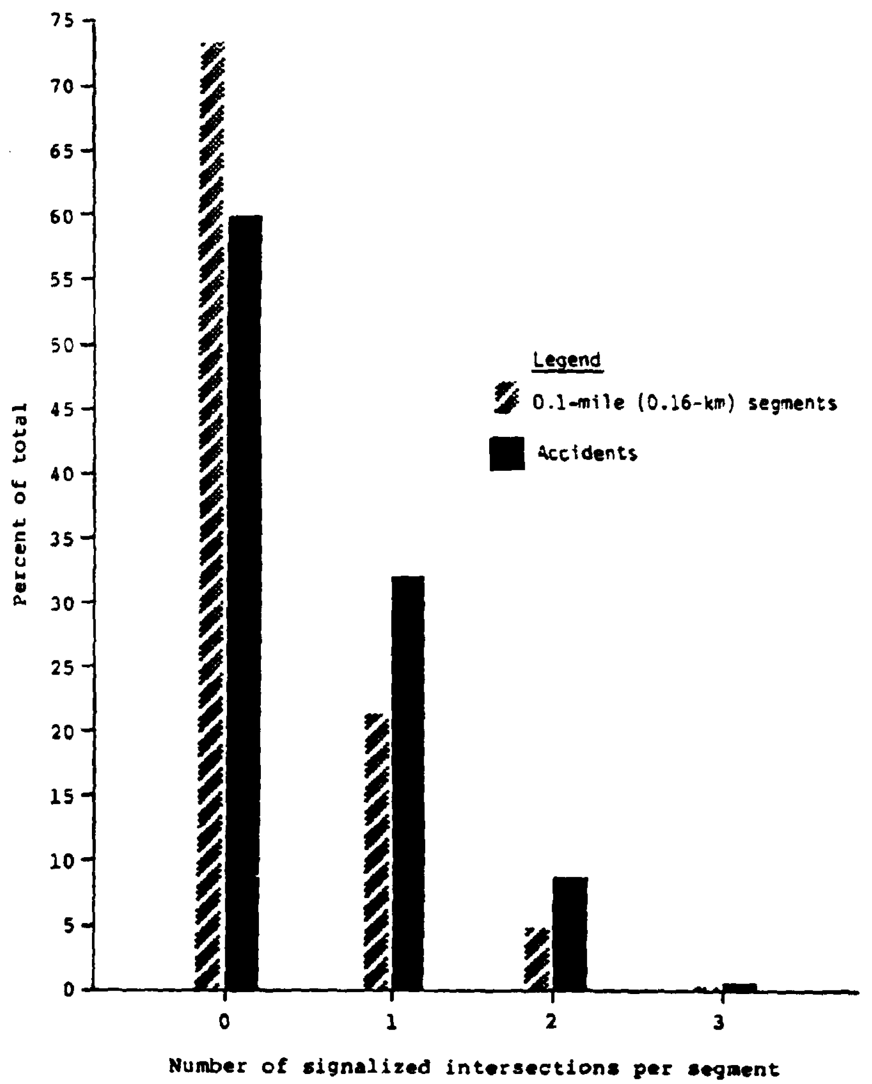


Figure 12. Distribution of roadway segments and accidents by number of signalized intersections per segment.

Table 12. Z-test and Chi-square test results for the number of signalized intersections per segment.

Number Of Signalized Intersections	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* $\alpha = 0.05$
	Number	Percent	Number	Percent		
0	6382	73.54	56439	59.30	25.99	Yes
1	1851	21.33	30261	31.79	20.19	Yes
2	428	4.93	8101	8.51	11.63	Yes
3	17	0.20	379	0.40	2.93	Yes
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at $\alpha = 0.05$

Calculated Chi-square = 681.026 with 3 degrees of freedom

Contingency coefficient, C = 0.081

Critical Chi-square for $\alpha = 0.05$ = 7.815 with 3 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 681.026 >7.815, the frequencies are significantly different.

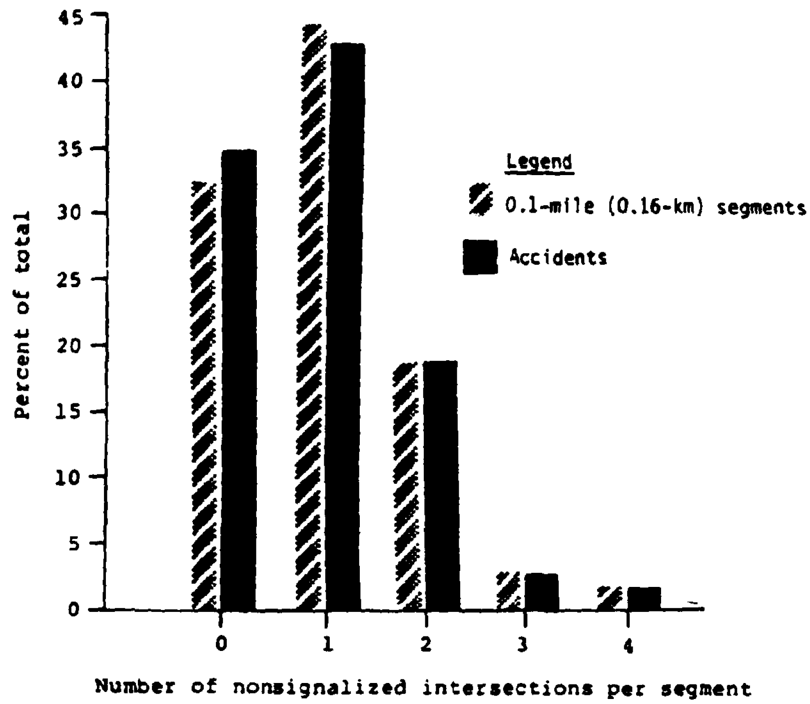


Figure 13. Distribution of roadway segments and accidents by number of nonsignalized intersections per segment.

Table 13. Z-test and Chi-square test results for the number of nonsignalized intersections per segment.

Number Of Nonsignalized Intersections	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* $\alpha = 0.05$
	Number	Percent	Number	Percent		
0	2818	32.47	33055	34.73	4.23	Yes
1	3876	44.67	40678	42.74	3.47	Yes
2	1613	18.59	17636	18.53	0.13	No
3	230	2.65	2467	2.59	0.33	No
4	141	1.62	1344	1.41	1.60	No
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at $\alpha = 0.05$

Calculated Chi-square = 21.237 witn 4 degrees of freedom

Contingency coefficient, C = 0.014

Critical Chi-square for $\alpha = 0.05$ = 9.488 with 4 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 21.237 > 9.488, the frequencies are significantly different.

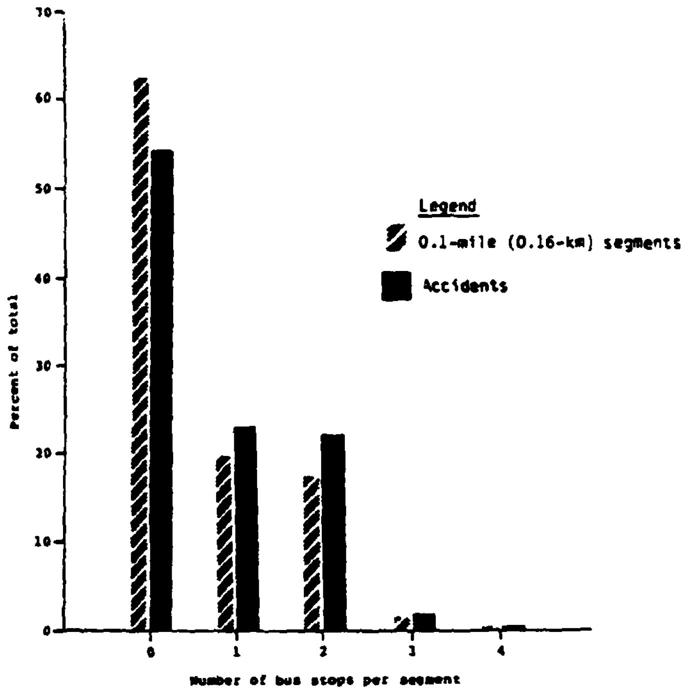


Figure 14. Distribution of roadway segments and accidents by number of bus stops per segment.

Table 14. Z-test and Chi-square test results for number of bus stops per segment.

Number Of Bus Stops	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
0	5410	62.34	51086	53.68	15.52	Yes
1	1695	19.53	21867	22.97	7.33	Yes
2	1495	17.23	20915	21.97	10.29	Yes
3	65	0.75	1176	1.24	3.99	Yes
4	13	0.15	136	0.14	0.16	No
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 250.220 with 4 degrees of freedom

Contingency coefficient = 0.049

Critical Chi-square for α = 0.05 = 9.488 with 4 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 250.220>9.488, the frequencies are significantly different.

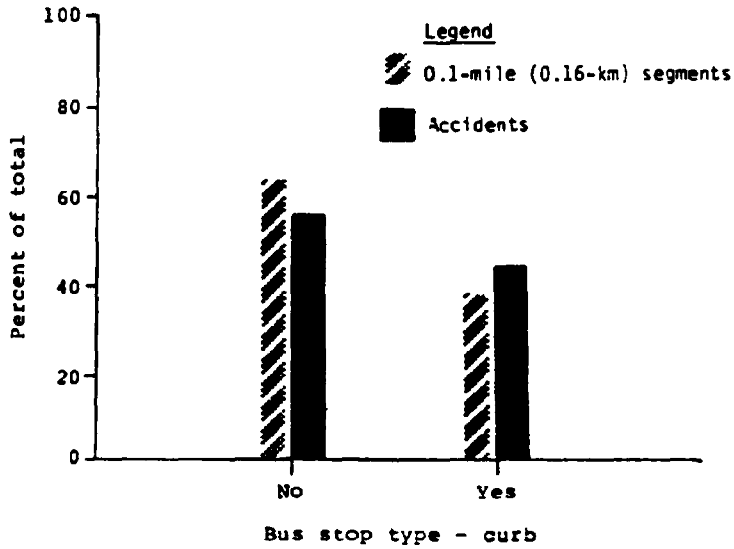


Figure 15. Distribution of roadway segments and accidents by bus stop type - curb.

Table 15. Z-test and Chi-square test results for bus stop type-curb.

Bus Stop Type - Curb	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
No	5439	62.68	51410	54.01	15.52	Yes
Yes	3239	37.32	43770	45.99	15.52	Yes
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 240.511 with 1 degree of freedom

Contingency coefficient = 0.048

Critical Chi-square for α = 0.05 = 3.841 with 1 degree of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 240.511>3.841, the frequencies are significantly different.

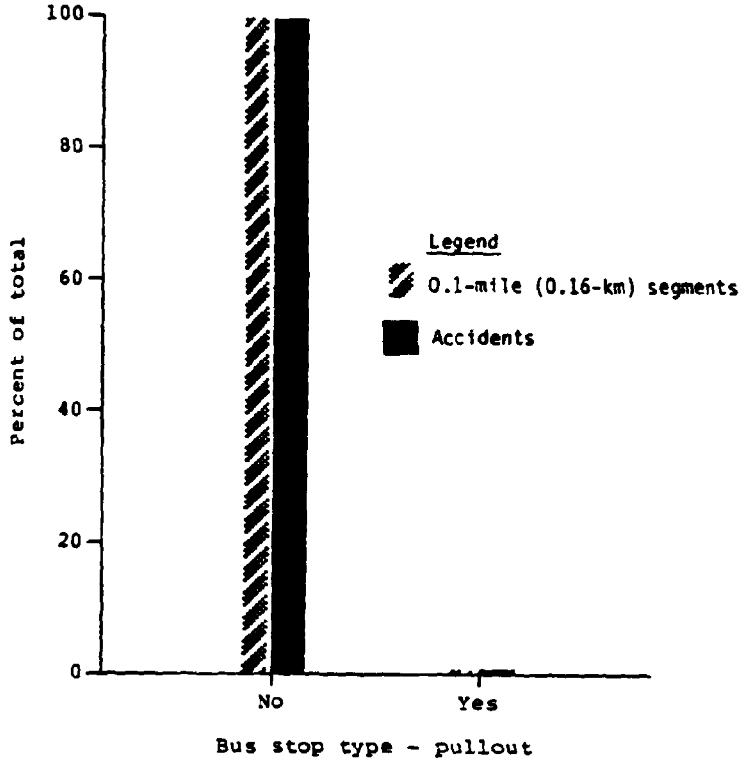


Figure 16. Distribution of roadway segments and accidents by bus stop type - pull out.

Table 16. Z-test and Chi-square test results for bus stop type - pullout.

Bus Stop Type-Pullout	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
No	8645	99.62	94804	99.60	0.21	No
Yes	33	0.38	376	0.40	0.21	No
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 0.015 with 1 degree of freedom

Contingency coefficient, C = 0.0004

Critical Chi-square for α = 0.05 = 3.841 with 1 degree of freedom

Thus, as the calculated Chi-square is less than the critical Chi-square, i.e., 0.015 <3.841, the frequencies are not significantly different.

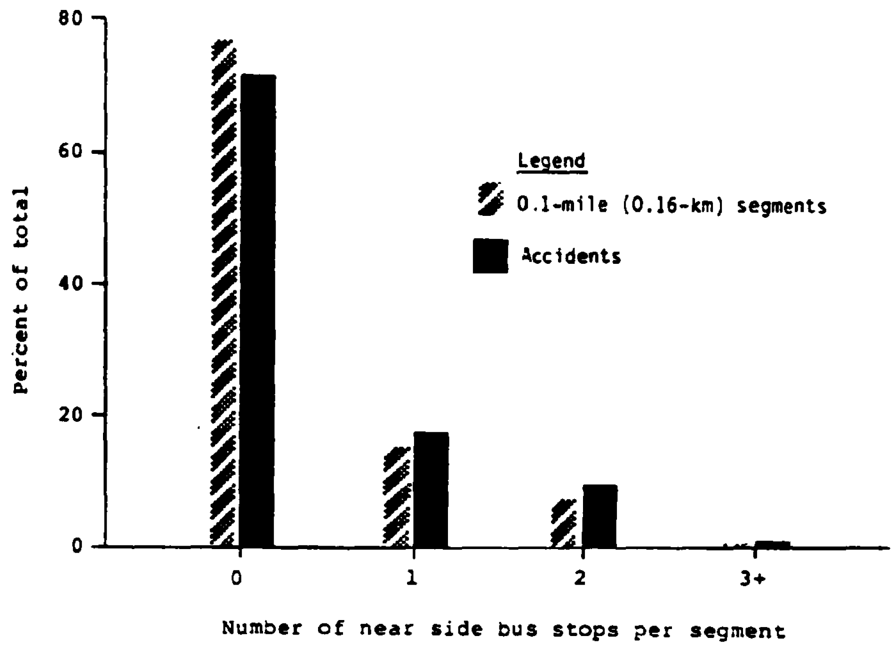


Figure 17. Distribution of roadway segments and accidents by number of near side bus stops per segment.

Table 17. Z-test and Chi-square test results for number of near side bus stops per segment.

Bus Stop - Near Side	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
0	6678	76.95	68051	71.50	10.83	Yes
1	1304	15.03	16934	17.78	6.48	Yes
2	644	7.42	9305	9.78	7.14	Yes
3+	52	0.60	890	0.94	3.16	Yes
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 123.468 with 3 degrees of freedom

Contingency coefficient, C = 0.034

Critical Chi-square for α = 0.05 = 7.815 with 3 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 123.468 >7.815, the frequencies are significantly different.

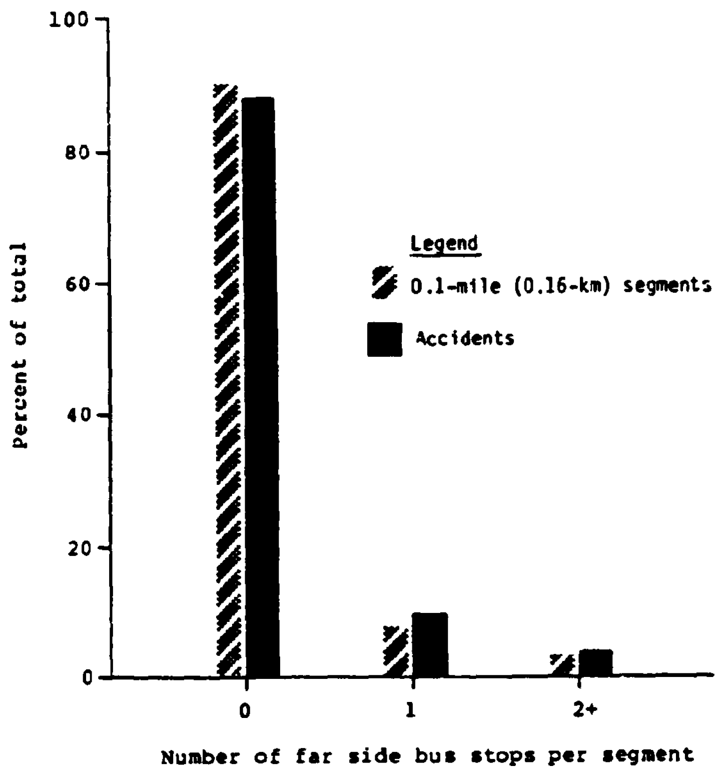


Figure 18. Distribution of roadway segments and accidents by number of far side bus stops per segment.

Table 18. Z-test and Chi-square test results for number of far side bus stops per segment.

Bus Stop - Far Side	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
0	7789	89.75	83454	87.68	5.67	Yes
1	642	7.40	8645	9.08	5.27	Yes
2+	247	2.85	3081	3.24	1.98	Yes
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 32.934 with 2 degrees of freedom

Contingency coefficient, C = 0.018

Critical Chi-square for α = 0.05 = 5.991 with 2 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 32.934 >5.991, the frequencies are significantly different.

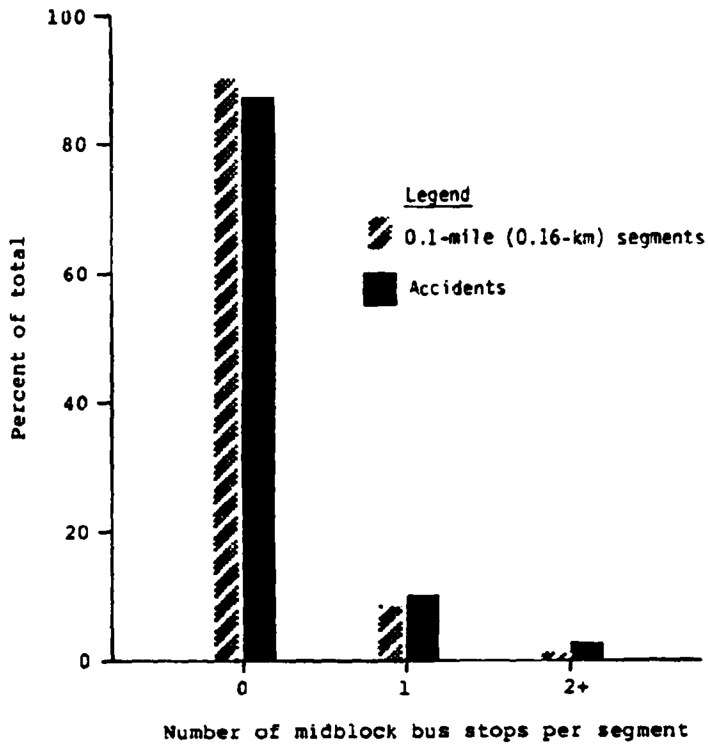


Figure 19. Distribution of roadway segments and accidents by number of midblock bus stops per segment.

Table 19. Z-test and Chi-square test results for number of midblock bus stops per segment.

Bus Stop - Midblock	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
0	7804	89.92	83055	87.26	7.19	Yes
1	719	8.29	9630	10.12	5.46	Yes
2+	155	1.79	2495	2.62	4.72	Yes
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 55.009 with 2 degrees of freedom

Contingency coefficient, C = 0.023

Critical Chi-square for α = 0.05 = 5.991 with 2 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 55.009 >5.991, the frequencies are significantly different.

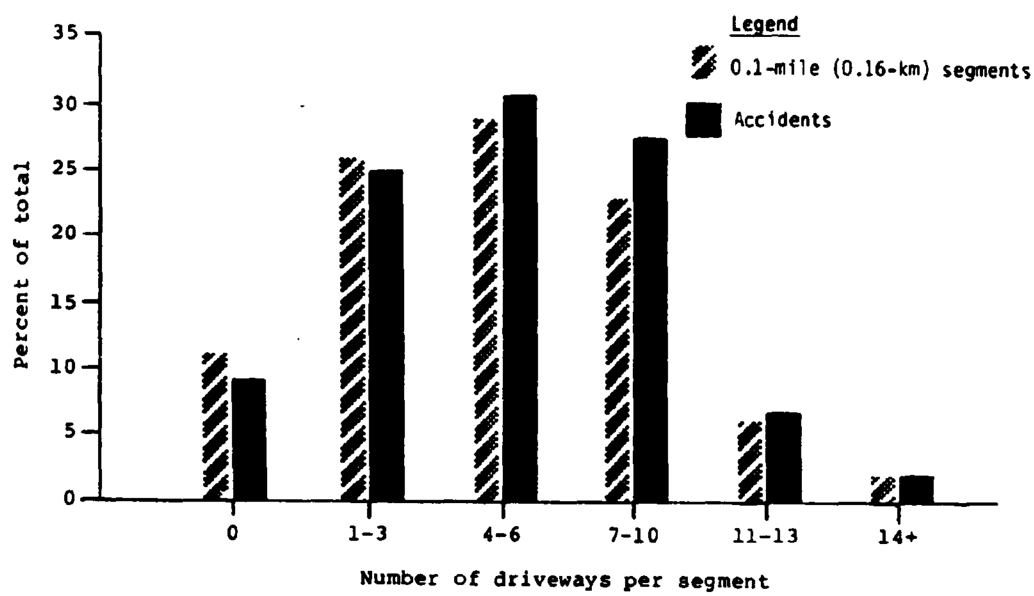


Figure 20. Distribution of roadway segments and accidents by number of driveways per segment.

Table 20. Z-test and Chi-square test results for number of driveways per segment.

Number Of Driveways	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
0	996	11.48	8206	8.62	8.96	Yes
1 - 3	2289	26.38	23331	24.51	3.86	Yes
4 - 6	2550	29.37	29444	30.94	2.99	Yes
7 - 10	2113	24.35	26277	27.61	6.52	Yes
11 - 13	542	6.25	6077	6.38	0.51	No
14+	188	2.17	1845	1.94	1.47	No
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 123.864 with 5 degrees of freedom

Contingency coefficient, C = 0.035

Critical Chi-square for α = 0.05 = 11.070 with 5 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 123.864 >11.070, the frequencies are significantly different.

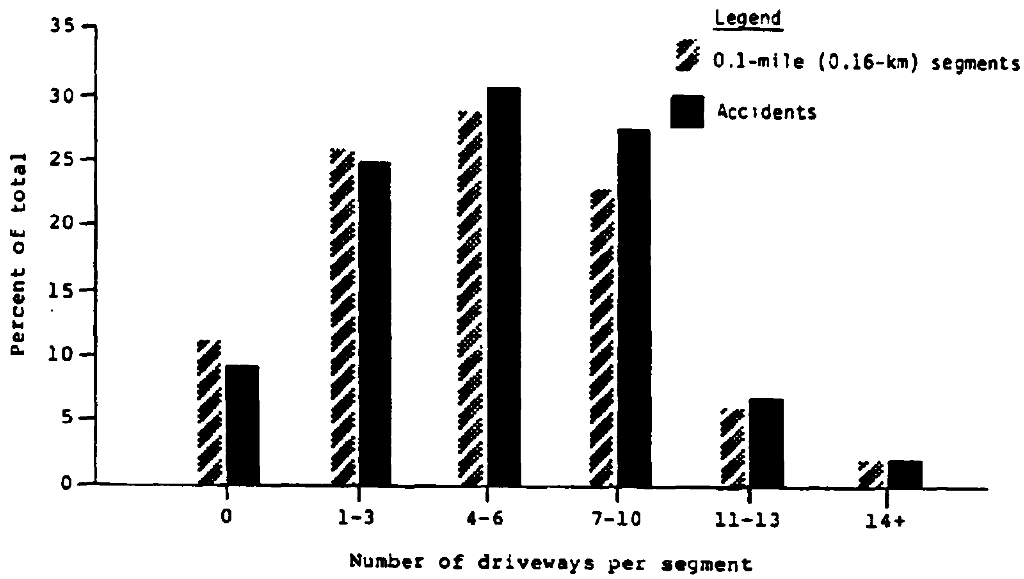


Figure 20. Distribution of roadway segments and accidents by number of driveways per segment.

Table 20. Z-test and Chi-square test results for number of driveways per segment.

Number Of Driveways	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
0	996	11.48	8206	8.62	8.96	Yes
1 - 3	2289	26.38	23331	24.51	3.86	Yes
4 - 6	2550	29.37	29444	30.94	2.99	Yes
7 - 10	2113	24.35	26277	27.61	6.52	Yes
11 - 13	542	6.25	6077	6.38	0.51	No
14+	188	2.17	1845	1.94	1.47	No
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 123.864 with 5 degrees of freedom

Contingency coefficient, C = 0.035

Critical Chi-square for α = 0.05 = 11.070 with 5 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 123.864 >11.070, the frequencies are significantly different.

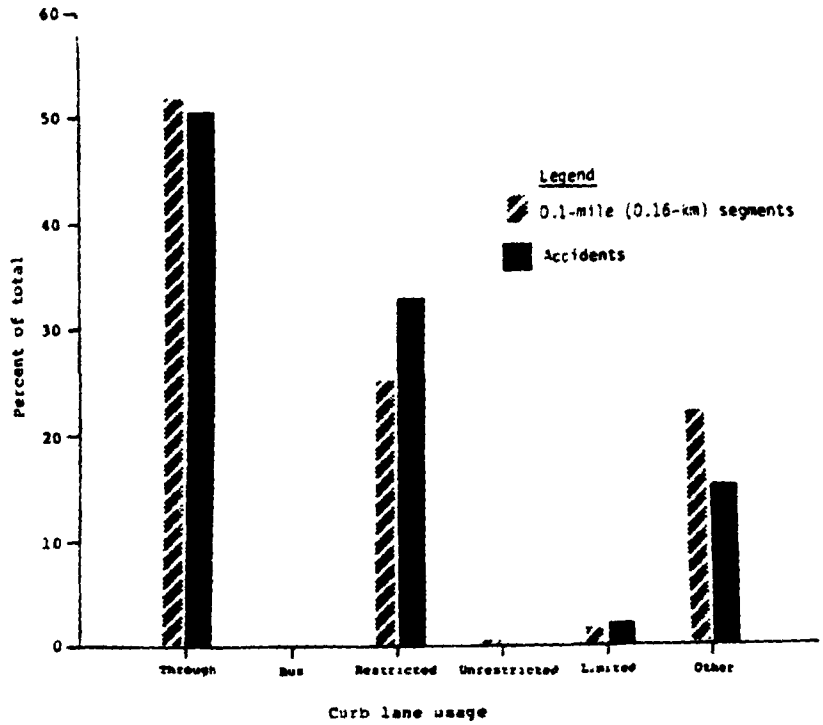


Figure 21. Distribution of roadway segments and accidents by curb lane usage.

Table 21. Z-test and Chi-square test results for curb lane usage.

Curb Lane Usage	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
Through	4499	51.84	47860	50.29	2.78	Yes
Bus	1	0.01	1	0.00	2.13	Yes
Restricted	2198	25.33	31447	33.04	14.69	Yes
Unrestricted	10	0.12	23	0.03	3.90	Yes
Limited	68	0.78	1038	1.09	2.67	Yes
Other	1902	21.92	14805	15.55	15.44	Yes
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 376.749 with 5 degrees of freedom

Contingency coefficient = 0.060

Critical Chi-square for α = 0.05 = 11.07 with 5 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 376.749>11.07, the frequencies are significantly different.

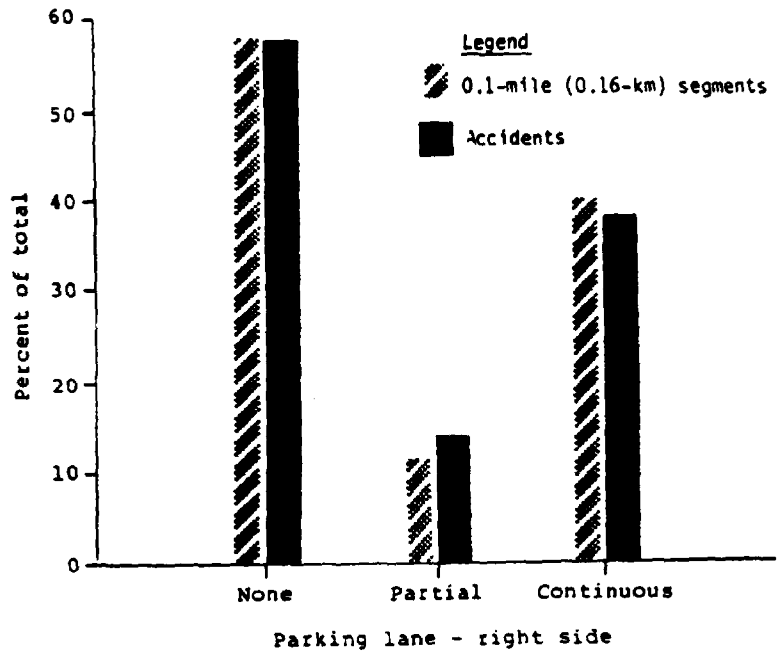


Figure 22. Distribution of roadway segments and accidents by parking lane - right side.

Table 22. Z-test and Chi-square test results for parking lane-right side.

Parking Lane - Right Side	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
None	5008	57.71	54749	57.53	0.34	No
Partial	1027	11.83	13662	14.35	6.45	Yes
Continuous	2643	30.46	26769	28.12	4.62	Yes
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 51.007 wigh 2 degrees of freedom

Contingency coefficient = 0.022

Critical Chi-square for α = 0.05 = 5.991 with 2 degrees of freedom

Thus, as the calculation Chi-square is greater than the critical Chi-square, i.e., 51.007>5.991, the frequencies are significantly different.

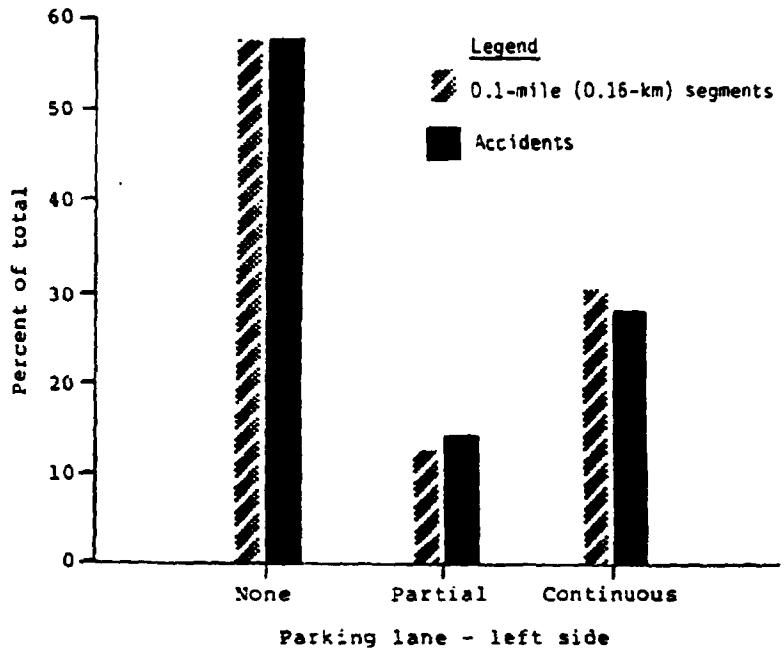


Figure 23. Distribution of roadway segments and accidents by parking lane - left side.

Table 23. Z-test and Chi-square test results for parking lane-left side.

Parking Lane - Left Side	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
None	5018	57.83	55213	58.01	0.33	No
Partial	1014	11.68	13465	14.15	6.34	Yes
Continuous	2646	30.49	26502	27.84	5.25	Yes
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 54.481 with 2 degrees of freedom

Contingency coefficient = 0.023

Critical Chi-square for α = 0.05 = 5.991 with 2 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 54.481>5.991, the frequencies are significantly different.

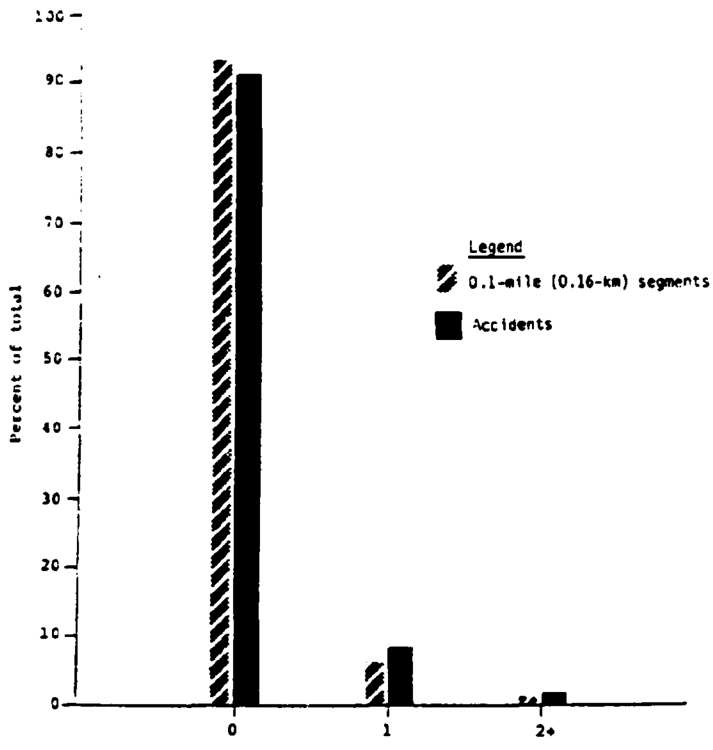


Figure 24. Distribution of roadway segments and accidents by the number of right turn bays at intersections.

Table 24. Z-test and Chi-square test results for the number of right turn bays at intersections.

Right Turn Bays at Intersections	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
0	8082	93.13	86414	90.79	7.29	Yes
1	540	6.22	7824	8.22	6.55	Yes
2+	56	0.65	942	0.99	3.15	Yes
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 54.016 with 2 degrees of freedom

Contingency coefficient = 0.023

Critical Chi-square for α = 0.05 = 5.991 with 2 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e. 54.016>5.991, the frequencies are significantly different.

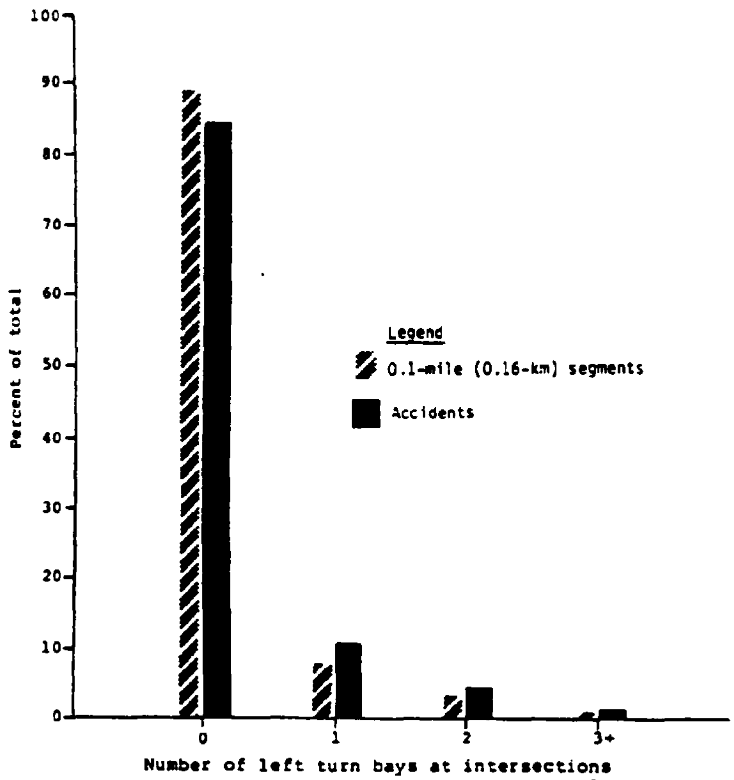


Figure 25. Distribution of roadway segments and accidents by the number of left turn bays at intersections.

Table 25. Z-test and Chi-square test results for the number of left turn bays at intersections.

Left Turn Bays at Intersections	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
0	7724	89.00	80451	84.52	11.16	Yes
1	663	7.64	10053	10.56	8.57	Yes
2	248	2.86	4062	4.27	6.30	Yes
3+	43	0.50	614	0.65	1.68	No
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 125.536 with 3 degrees of freedom

Contingency coefficient = 0.035

Critical Chi-square for α = 0.05 = 7.815 with 3 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e. 125.536>7.815, the frequencies are significantly different.

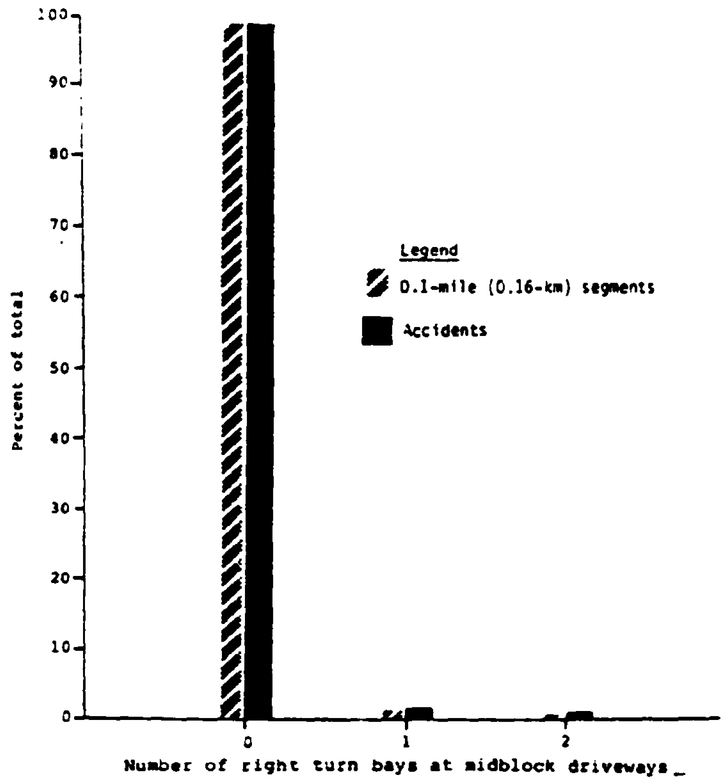


Figure 26. Distribution of roadway segments and accidents by the number of right turn bays at midblock driveways.

Table 26. Z-test and Chi-square test results for the number of right turn bays at midblock driveways.

Right Turn Bays at Midblock Driveways	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* $\alpha = 0.05$
	Number	Percent	Number	Percent		
0	8580	98.88	93976	98.73	1.09	No
1	82	0.94	912	0.96	0.12	No
2	16	0.18	292	0.31	2.01	Yes
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at $\alpha = 0.05$

Calculated Chi-square = 4.048 with 2 degrees of freedom

Contingency coefficient = 0.006

Critical Chi-square for $\alpha = 0.05$ = 5.991 with 2 degrees of freedom

Thus, as the calculated Chi-square is less than the critical Chi-square, i.e., 4.048 <5.991, the frequencies are not significantly different.

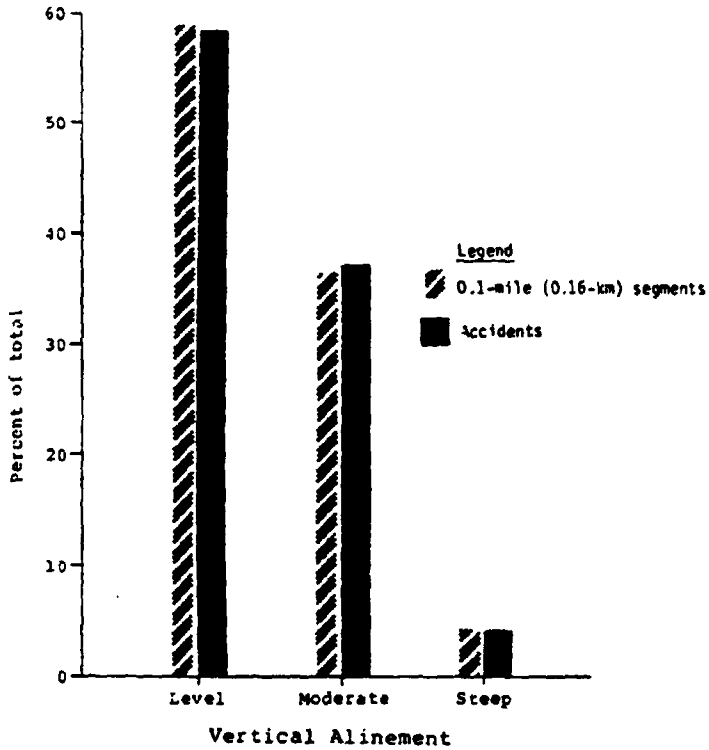


Figure 27. Distribution of roadway segments and accidents by vertical alinement.

Table [illegible]. Z-test and Chi-square test results for vertical alinement.

Vertical Alinement	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
Level	5094	58.86	55576	58.56	0.54	No
Moderate	3167	36.59	35344	37.24	1.20	No
Steep	394	4.55	3984	4.20	1.57	No
Total	8655	100.00	94904	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 3.376 with 2 degrees of freedom

Contingency coefficient, C = 0.006

Critical Chi-square for α = 0.05 = 5.991 with 2 degrees of freedom

Thus, as the calculated Chi-square is less than the critical Chi-square, i.e., 3.376 <5.991, the frequencies are not significantly different.

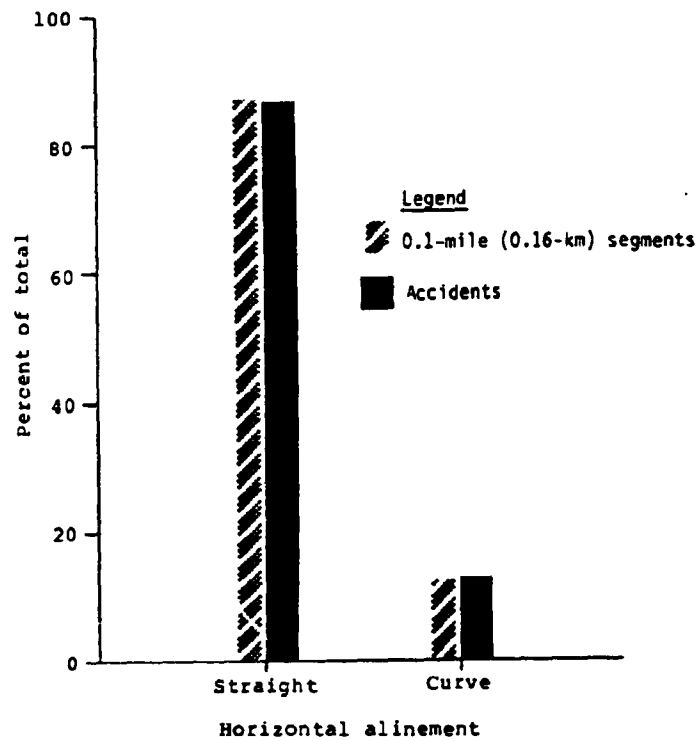


Figure 28. Distribution of roadway segments and accidents by horizontal alinement.

Table 28. Z-test and Chi-square test results for horizontal alinement.

Horizontal Alinement	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
Straight	7572	87.58	83012	87.52	0.16	No
Curve	1074	12.42	11840	12.48	0.16	No
Total	8646	100.00	94852	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 0.021 with 1 degree of freedom

Contingency coefficient, C = 0.0005

Critical Chi-square for α = 0.05 = 3.841 with 1 degree of freedom

Thus, as the calculated Chi-square is less than the critical Chi-square, i.e., 0.021 <3.841, the frequencies are not significantly different.

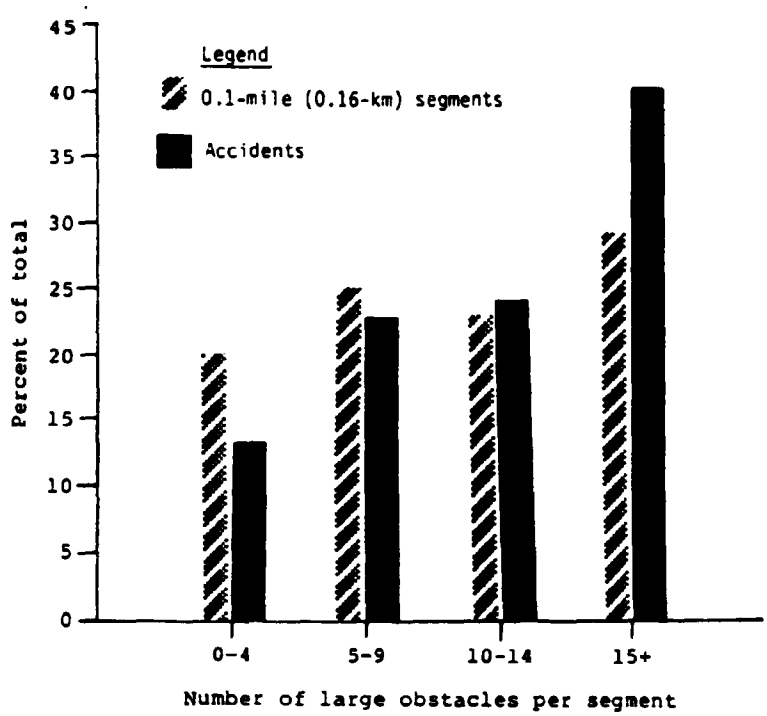


Figure 29. Distribution of roadway segments and accidents by the number of large obstacles per segment.

Table 29. Z-test and Chi-square test results for the number of large obstacles per segment.

Number Of Large Obstacles	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* $\alpha = 0.05$
	Number	Percent	Number	Percent		
0 - 4	1704	19.64	12514	13.15	16.83	Yes
5 - 9	2217	25.55	21667	22.76	5.90	Yes
10 - 14	1962	22.61	22593	23.74	2.37	Yes
15+	2795	32.20	38406	40.35	14.84	Yes
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at $\alpha = 0.05$

Calculated Chi-square = 408.551 with 3 degrees of freedom

Contingency coefficient, C = 0.063

Critical Chi-square for $\alpha = 0.05$ = 7.815 with 3 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 408.551 >7.815, the frequencies are significantly different.

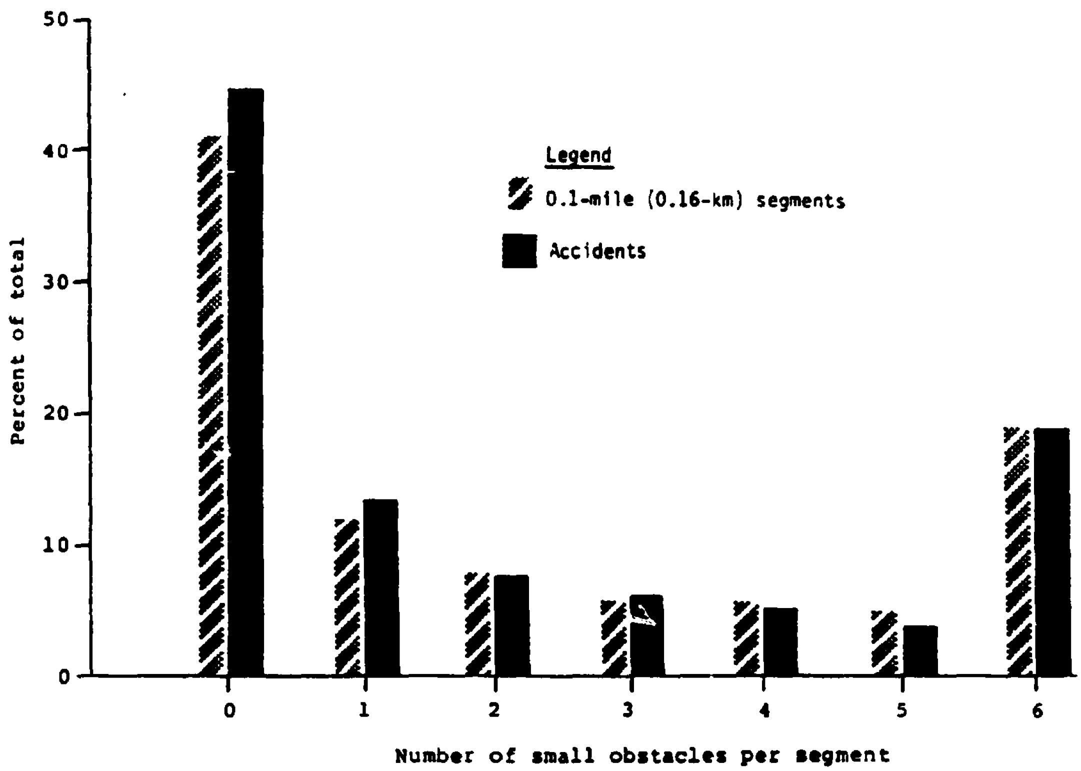


Figure 30. Distribution of roadway segments and accidents by the number of small obstacles per segment.

Table 30. Z-test and Chi-square test results for the number of small obstacles per segment.

Number Of Small Obstacles	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* $\alpha = 0.05$
	Number	Percent	Number	Percent		
0	3524	40.60	41808	43.94	5.96	Yes
1	1071	12.34	12880	13.53	3.11	Yes
2	721	8.31	7381	7.75	1.84	No
3	563	6.49	5940	6.24	0.91	No
4	551	6.35	5210	5.47	3.41	Yes
5	471	5.43	3988	4.19	5.44	Yes
6+	1777	20.48	17973	18.88	3.62	Yes
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at $\alpha = 0.05$

Calculated Chi-square = 82.322 with 6 degrees of freedom

Contingency coefficient, C = 0.028

Critical Chi-square for $\alpha = 0.05$ = 12.592 with 6 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 82.322 >12.592, the frequencies are significantly different

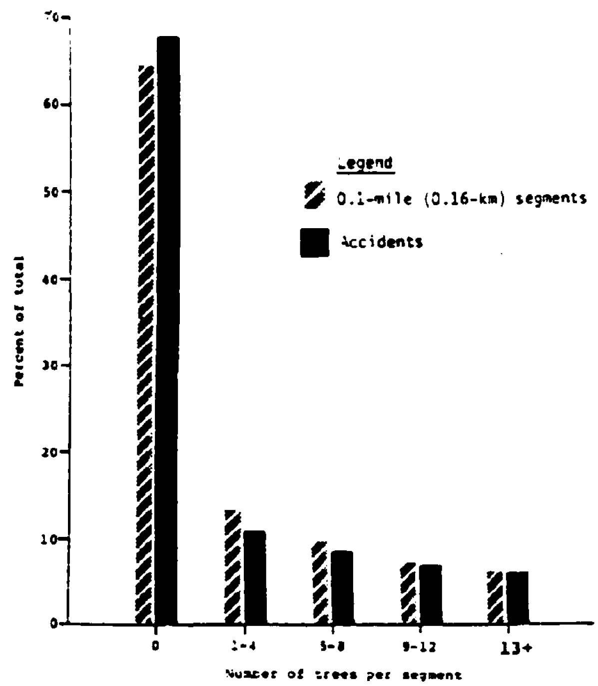


Figure 31. Distribution of roadway segments and accidents by number of trees per segment.

Table 31. Z-test and Chi-square test results for number of trees per segment.

Number Of Trees	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
0	5588	64.39	64526	67.80	6.48	Yes
1 - 4	1136	13.09	10474	11.00	5.90	Yes
5 - 8	812	9.36	8095	8.50	2.71	Yes
9 - 12	608	7.01	6422	6.75	0.92	No
13+	534	6.15	5663	5.95	0.77	No
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 52.661 with 4 degrees of freedom

Contingency coefficient = 0.023

Calculated Chi-square for α = 0.05 = 9.488 with 4 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 52.661 >9.488, the frequencies are significantly different.

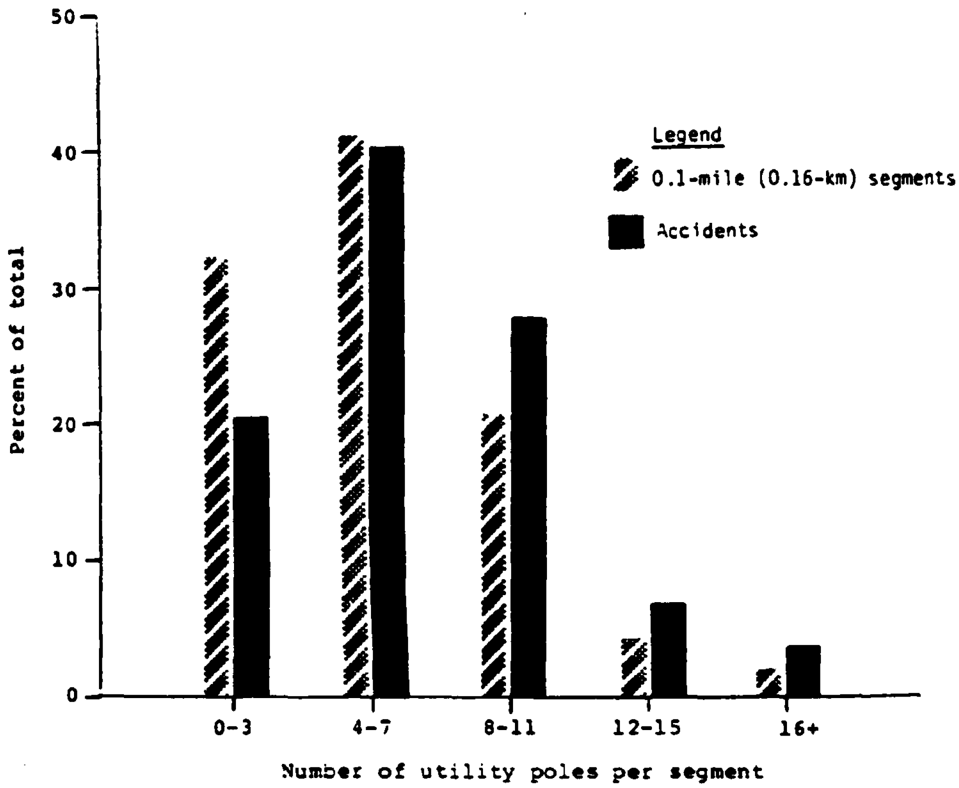


Figure 32. Distribution of roadway segments and accidents by number of utility poles per segment.

Table 32. Z-test and Chi-square test results for number of utility poles per segment.

Number Of Utility Poles	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
0 - 3	2777	32.00	19819	20.82	24.16	Yes
4 - 7	3564	41.07	38516	40.48	1.10	No
8 - 11	1790	20.63	26444	27.78	14.34	Yes
12 - 15	382	4.40	6561	6.89	8.90	Yes
16+	165	1.90	3840	4.03	9.88	Yes
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 774.926 with 4 degrees of freedom

Contingency coefficient = 0.086

Critical Chi-square for α = 0.05 = 9.488 with 4 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 774.926 >9.488, the frequencies are significantly different.

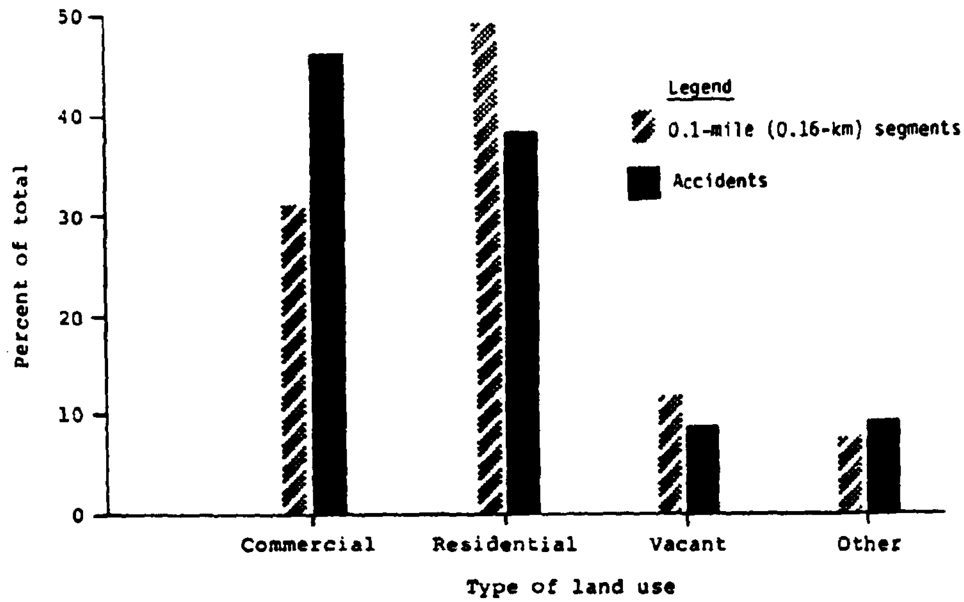


Figure 33. Distribution of roadway segments and accidents by type of land use.

Table 33. Z-test and Chi-square test results for type of land use.

Type Of Land Use	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
Commercial	2618	30.83	43144	46.39	27.59	Yes
Residential	4194	49.39	34994	37.63	21.31	Yes
Vacant	992	11.68	7274	7.82	12.45	Yes
Other	688	8.10	7588	8.16	0.19	No
Total	8492	100.00	93000	100.00		

*Critical z-value = 1.96 α = 0.05

Calculated Chi-square = 839.054 with 3 degrees of freedom

Contingency coefficient, C = 0.091

Critical Chi-square for α = 0.05 = 7.815 with 3 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 839.054 >7.815, the frequencies are significantly different.

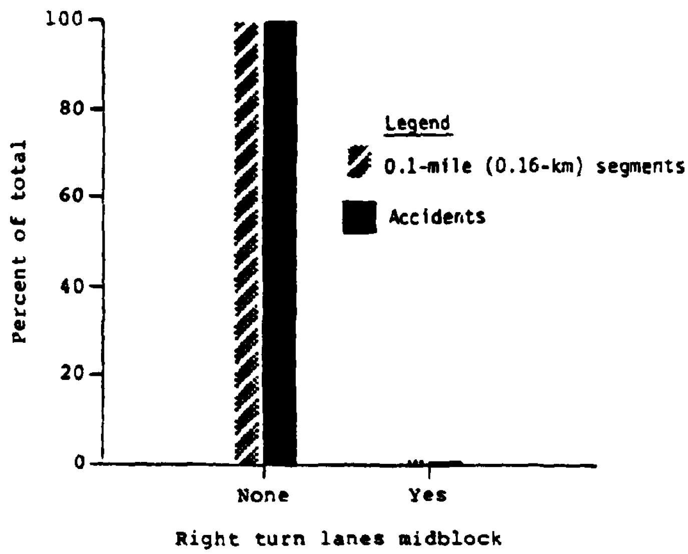


Figure 34. Distribution of roadway segments and accidents by midblock right turn lanes.

Table 34. Z-test and Chi-square test results for midblock right turn lanes.

Right Turn Lanes Midblock	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
None	8675	99.97	95168	99.99	1.63	No
Yes	3	0.03	12	0.01	1.63	No
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 1.353 with 1 degree of freedom

Contingency coefficient = 0.004

Critical Chi-square for α = 0.05 = 3.841 with 1 degree of freedom

Thus, as the calculated Chi-square is less than the critical Chi-square, i.e., 1.353 < 3.841, the frequencies are not significantly different.

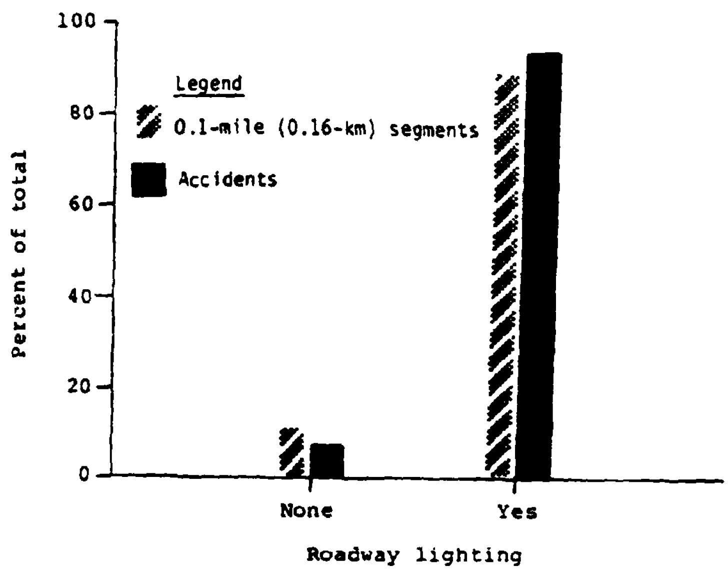


Figure 35. Distribution of roadway segments and accidents by roadway lighting.

Table 35. Z-test and Chi-square test results for roadway lighting.

Roadway Lighting	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
None	959	11.05	5932	6.23	17.26	Yes
Yes	7719	88.95	89248	93.77	17.26	Yes
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 297.300 with 1 degree of freedom

Contingency coefficient = 0.053

Critical Chi-square for α = 0.05 = 3.841 with 1 degree of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 297.300>3.841, the frequencies are significantly different.

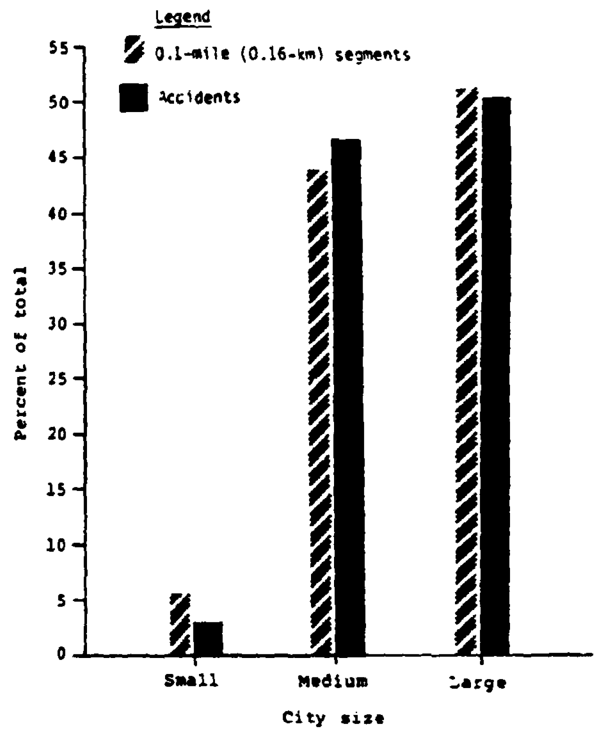


Figure 36. Distribution of roadway segments and accidents by city size.

Table 36. Z-test and Chi-square test results for city size.

City Size	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
Small	448	5.16	2875	3.02	10.85	Yes
Medium	3806	43.86	44469	46.72	5.12	Yes
Large	4424	50.98	47836	50.26	1.29	No
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 128.878 with 2 degrees of freedom

Contingency coefficient, C = 0.035

Critical Chi-square for α = 0.05 = 5.991 with 2 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 128.878 >5.991, the frequencies are significantly different.

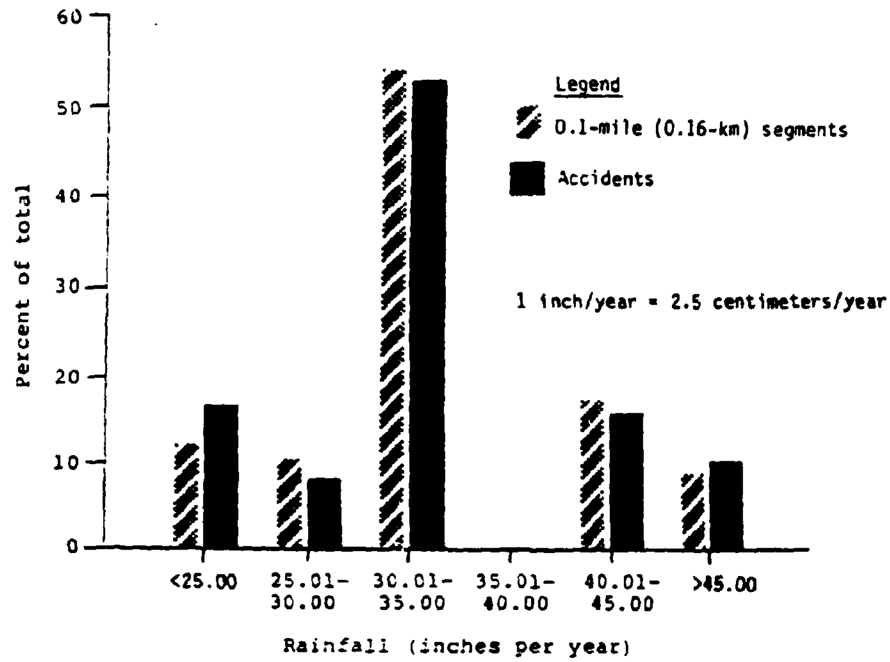


Figure 37. Distribution of roadway segments and accidents by amount of rainfall.

Table 37. Z-test and Chi-square test results for amount of rainfall.

Rainfall (inches per year)	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
<25.00	774	11.49	11726	16.16	10.04	Yes
25.01 - 30.00	676	10.04	5502	7.58	7.20	Yes
30.01 - 35.00	3589	53.30	37954	52.29	1.58	No
35.01 - 40.00	0	0.00	0	0.00	0.00	No
40.01 - 45.00	1125	16.71	10449	14.40	5.13	Yes
>45.00	570	8.46	6947	9.57	2.97	Yes
Total	6734	100.00	72578	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 164.460 with 5 degrees of freedom

Contingency coefficient = 0.045

Critical Chi-square for α = 0.05 = 11.07 with 5 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 164.460 >11.07, the frequencies are significantly different.

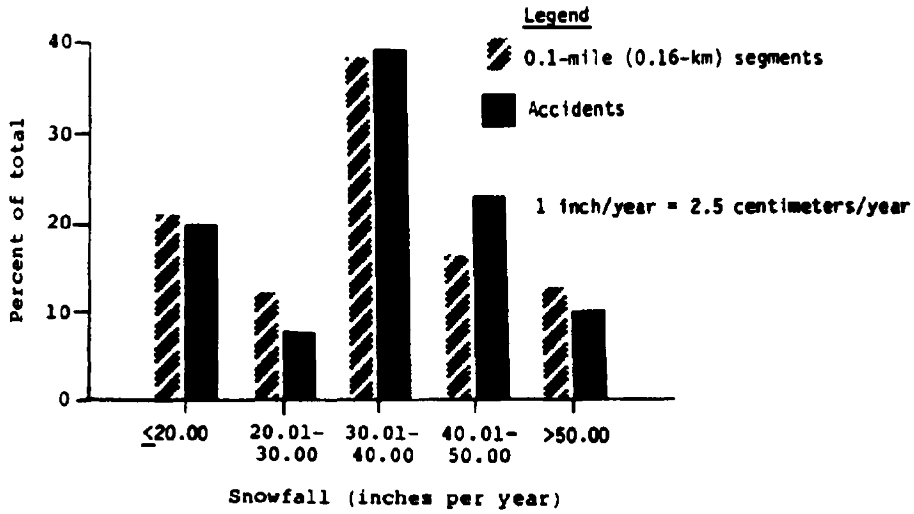


Figure 38. Distribution of roadway segments and accidents by amount of snowfall.

Table 38. Z-test and Chi-square test results for amount of snowfall.

Snowfall (inches per year)	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
≤20.00	1125	20.87	10449	19.38	2.63	Yes
20.01 - 30.00	647	12.00	4104	7.61	11.32	Yes
30.01 - 40.00	2067	38.36	21388	39.68	1.90	No
40.01 - 50.00	875	16.23	12465	23.12	11.55	Yes
>50.00	676	12.54	5502	10.21	5.35	Yes
Total	5390	100.00	53908	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 254.673 with 4 degrees of freedom

Contingency coefficient = 0.065

Critical Chi-square for α = 0.05 = 9.488 with 4 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 254.673 >9.488, the frequencies are significantly different.

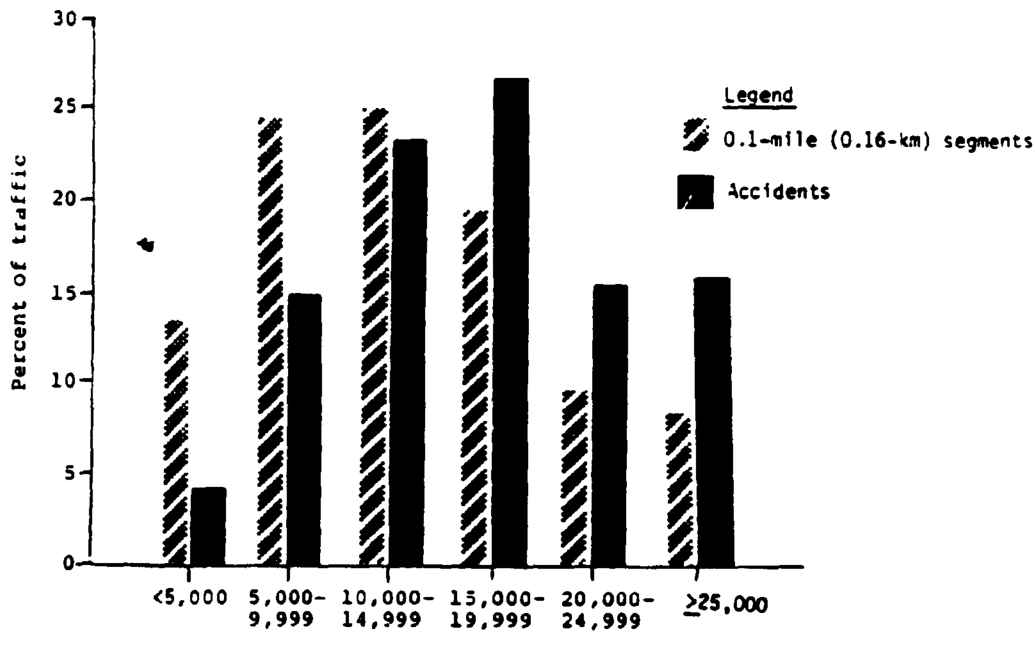


Figure 39. Distribution of roadway segments and accidents by average daily traffic.

Table 39. Z-test and Chi-square test results for average daily traffic.

Average Daily Traffic	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* $\alpha = 0.05$
	Number	Percent	Number	Percent		
<5000	1172	13.51	3657	3.84	40.93	Yes
5000 - 9999	2086	24.04	13947	14.65	23.16	Yes
10,000 - 14,999	2180	25.12	22251	23.38	3.67	Yes
15,000 - 19,999	1660	19.12	25548	26.85	15.64	Yes
20,000 - 24,999	839	9.67	14583	15.32	14.18	Yes
≥25,000	741	8.54	15194	15.96	18.37	Yes
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at $\alpha = 0.05$

Calculated Chi-square = 2698.655 with 5 degrees of freedom

Contingency coefficient = 0.159

Critical Chi-square for $\alpha = 0.05$ = 11.07 with 5 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 2698.655>11.07, the frequencies are significantly different.

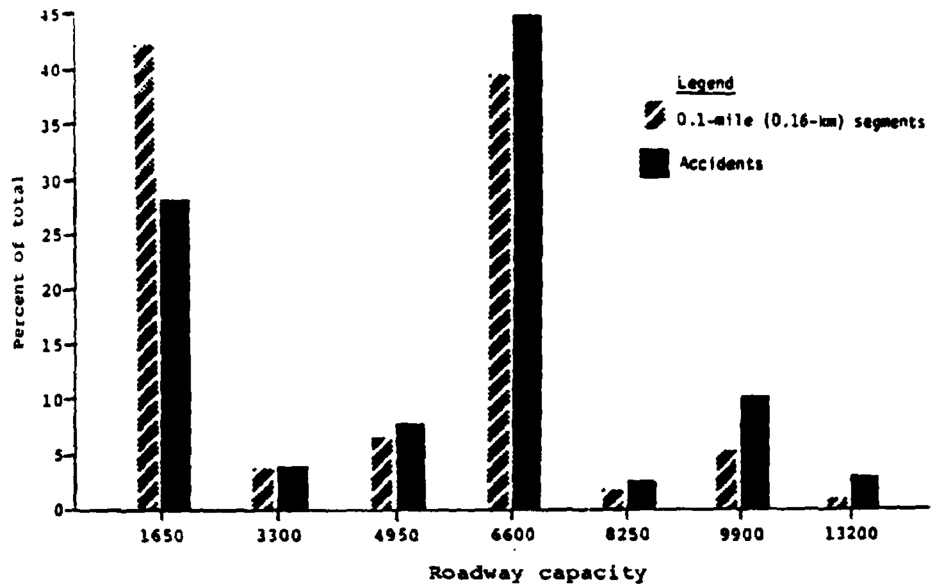


Figure 40. Distribution of roadway segments and accidents by roadway capacity.

Table 40. Z-test and Chi-square test results for roadway capacity.

Roadway Capacity	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* $\alpha = 0.05$
	Number	Percent	Number	Percent		
1650	3648	42.03	26669	28.02	27.50	Yes
3300	327	3.77	3774	3.97	0.90	No
4950	550	6.34	7239	7.61	4.29	Yes
6600	3437	39.61	42769	44.93	9.56	Yes
8250	151	1.74	2485	2.61	4.94	Yes
9900	451	5.20	9622	10.11	14.80	Yes
13200	114	1.31	2622	2.75	8.02	Yes
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at $\alpha = 0.05$

Calculated Chi-square = 888.258 with 6 degrees of freedom

Contingency coefficient, C = 0.092

Critical Chi-square for $\alpha = 0.05$ = 12.592 with 6 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 888.258 >12.592, the frequencies are significantly different.

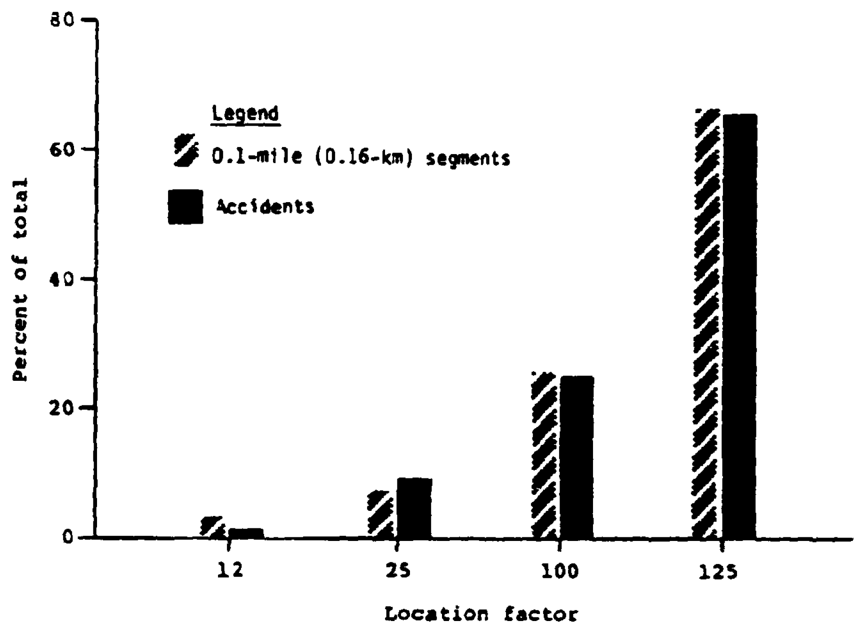


Figure 41. Distribution of roadway segments and accidents by location factor.

Table 41. Z-test and Chi-square test results for location factor.

Location Factor	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* $\alpha = 0.05$
	Number	Percent	Number	Percent		
12	132	2.39	764	1.35	6.18	Yes
25	369	6.67	4857	8.58	4.88	Yes
100	1431	25.88	14427	25.48	0.64	No
125	3598	65.06	36566	64.59	0.71	No
Total	5530	100.00	56614	100.00		

*Critical z-value = 1.96 at $\alpha = 0.05$

Calculated Chi-square = 59.867 with 3 degrees of freedom

Contingency coefficient, C = 0.031

Critical Chi-square for $\alpha = 0.05$ = 7.815 with 3 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 59.867 >7.815, the frequencies are significantly different.

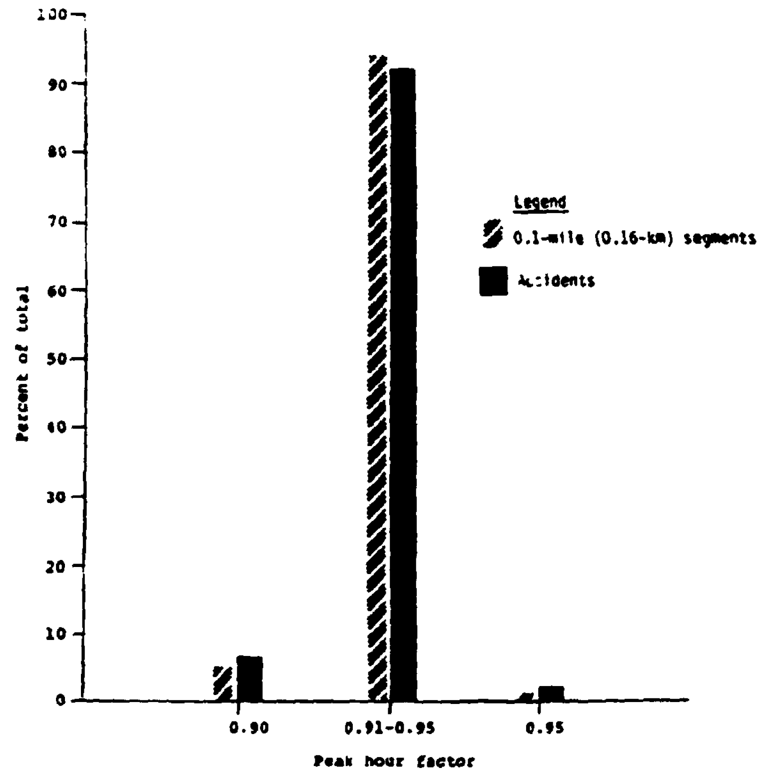


Figure 42. Distribution of roadway segments and accidents by peak hour factor.

Table 42. Z-test and Chi-square test results for peak hour factor.

Peak Hour Factor	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
≤0.90	356	5.19	4657	6.35	3.80	Yes
0.91 - 0.95	6452	94.08	67295	91.80	6.65	Yes
>0.95	50	0.73	1353	1.85	6.74	Yes
Total	6858	100.00	73305	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 61.756 with 2 degrees of freedom

Contingency coefficient = 0.028

Critical Chi-square for α = 0.05 = 5.991 with 2 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 61.756 >5.991, the frequencies are significantly different.

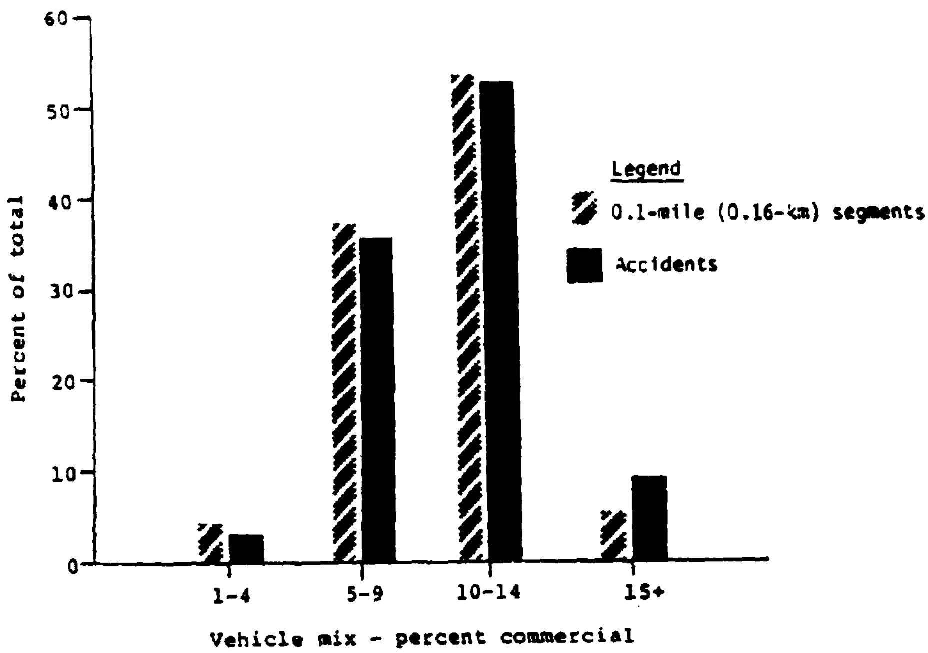


Figure 43. Distribution of roadway segments and accidents by vehicle mix - percent commercial.

Table 43. Z-test and Chi-square test results for vehicle mix - percent commercial.

Vehicle Mix - Percent Commercial	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
1 - 4	259	4.40	1955	3.15	5.16	Yes
5 - 9	2187	37.12	22050	35.50	2.48	Yes
10 - 14	3143	53.34	32552	52.40	1.38	No
15+	303	5.14	5559	8.95	9.95	Yes
Total	5892	100.00	62116	100.00		

*Critical z-value = 1.96 at α 0.05

Calculated Chi-square = 121.109 with 3 degrees of freedom

Contingency coefficient = 0.042

Critical Chi-square for α = 0.05 = 7.815 with 3 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 121.109 >7.815, the frequencies are significantly different.

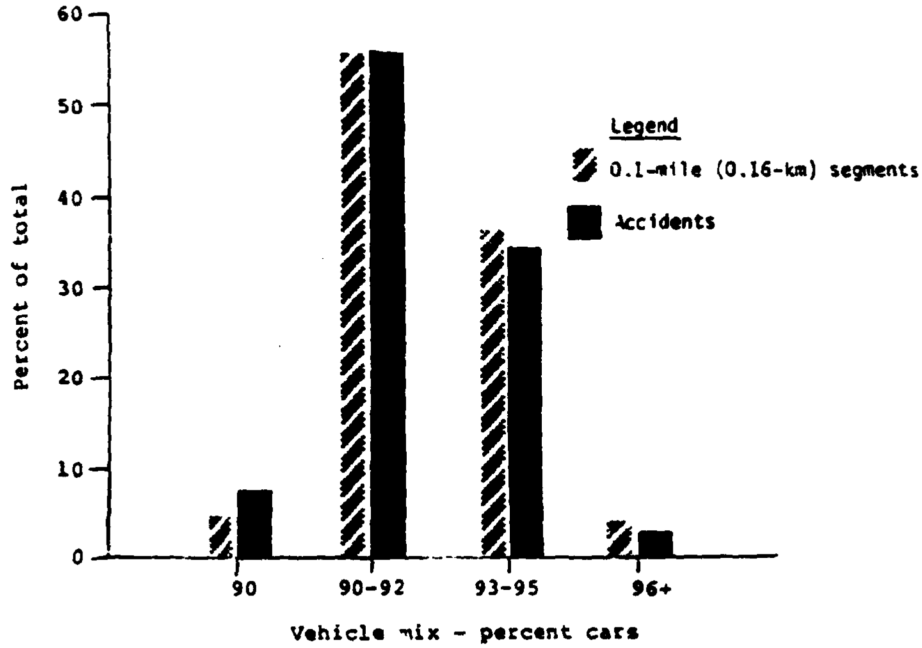


Figure 44. Distribution of roadway segments and accidents by vehicle mix - percent cars.

Table 44. Z-test and Chi-square test results for vehicle mix - percent cars.

Vehicle Mix - Percent Cars	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
<90	303	4.42	5559	7.58	9.63	Yes
90 - 92	3802	55.44	40845	55.72	0.44	No
93 - 95	2494	36.37	24948	34.03	3.90	Yes
96+	259	3.77	1955	2.67	5.36	Yes
Total	6858	100.00	73307	100.00		

*Critical z-value = 1.96 at $\alpha = 0.05$

Calculated Chi-square = 123.942 with 3 degrees of freedom

Contingency coefficient = 0.039

Critical Chi-square for $\alpha = 0.05$ = 7.815 with 3 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 123.942 >7.815, the frequencies are significantly different.

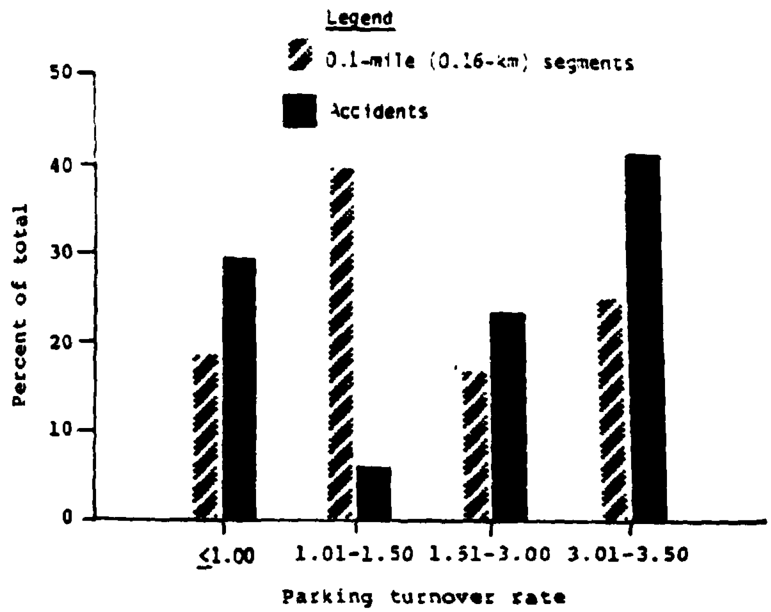


Figure 45. Distribution of roadway segments and accidents by parking turnover rate.

Table 45. Z-test and Chi-square test results for parking turnover rate.

Parking Turnover Rate	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
≤1.00	31	18.45	165	29.62	2.86	Yes
1.01 - 1.50	67	39.88	32	5.75	11.29	Yes
1.51 - 3.00	28	16.67	131	23.52	1.88	No
3.01 - 3.50	42	25.00	229	41.11	3.78	Yes
Total	168	100.00	557	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 127.828 with 3 degrees of freedom

Contingency coefficient = 0.387

Critical Chi-square for α = 0.05 = 7.815 with 3 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 127.828 >7.815, the frequencies are significantly different.

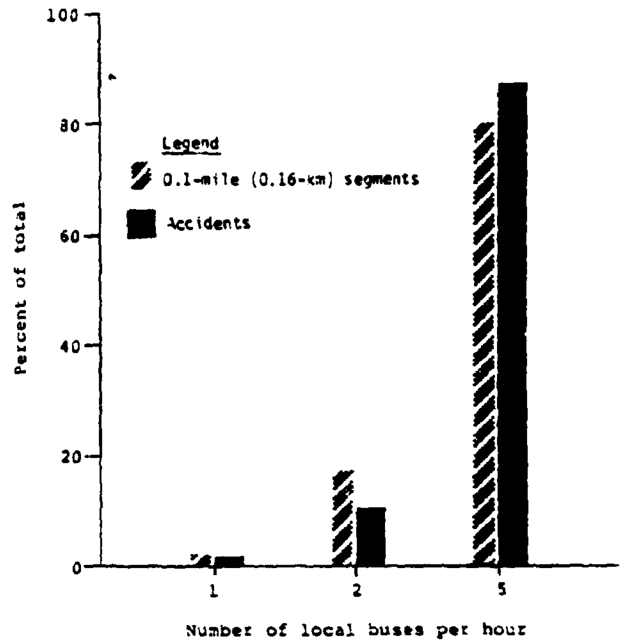


Figure 46. Distribution of roadway segments and accidents by number of local buses per hour.

Table 46. Z-test and Chi-square test results for number of local buses per hour.

Local Buses Per Hour	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
1	85	2.42	858	2.16	1.05	No
2	610	17.40	4084	10.26	13.04	Yes
5	2811	80.18	34868	87.58	12.50	Yes
Total	3506	100.00	39810	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 172.994 with 2 degres of freedom

Contingency coefficient, C = 0.063

Critical Chi-square for α = 0.05 = 5.991 with 2 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 172.994 >5.991, the frequencies are significantly different.

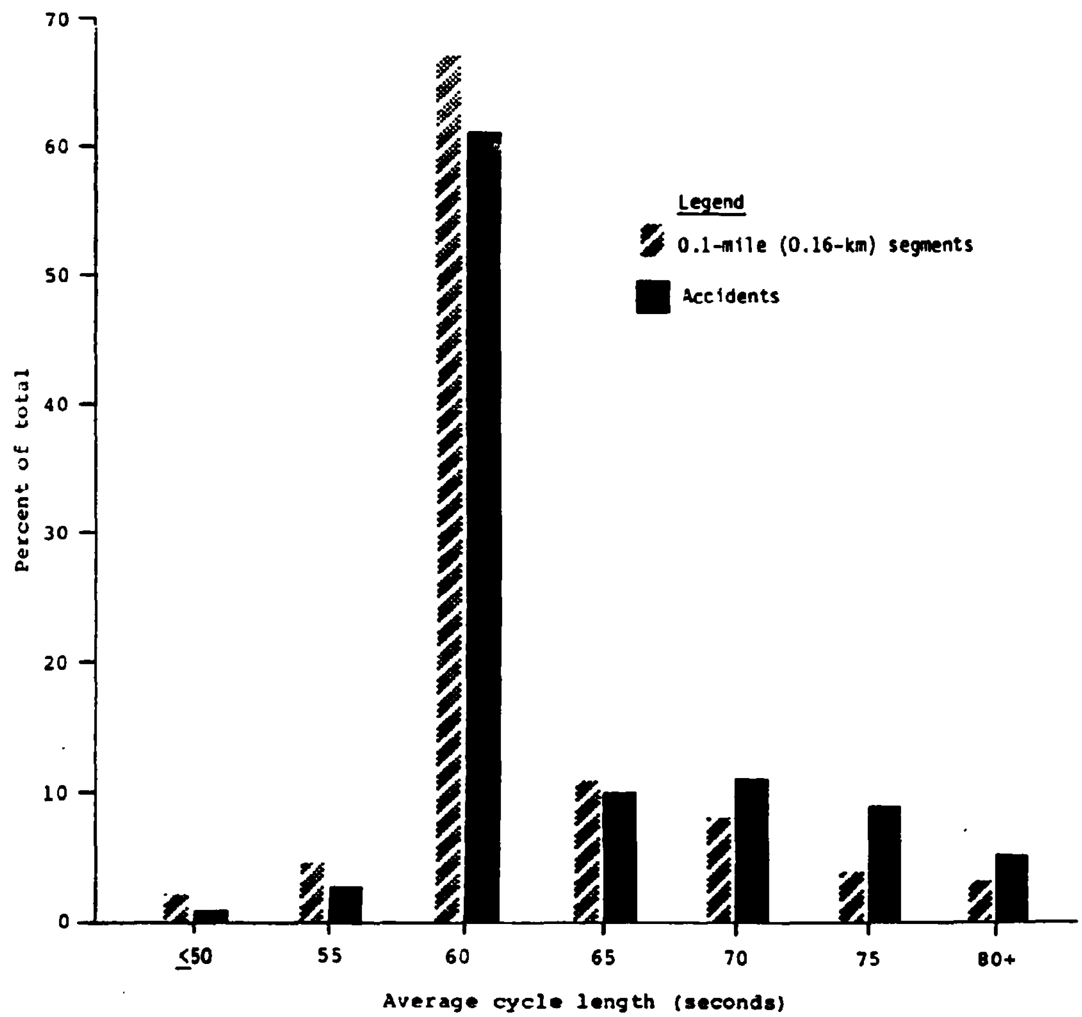


Figure 47. Distribution of roadway segments and accidents by average cycle length.

Table 47. Z-test and Chi-square test results for average cycle length.

Average Cycle Length (Seconds)	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* $\alpha = 0.05$
	Number	Percent	Number	Percent		
≤50	59	2.12	262	1.01	5.31	Yes
55	128	4.61	677	2.61	6.07	Yes
60	1867	67.18	15890	61.18	6.18	Yes
65	304	10.94	2594	9.99	1.58	No
70	225	8.10	2882	11.10	4.84	Yes
75	106	3.81	2315	8.91	9.20	Yes
80+	90	3.24	1351	5.20	4.51	Yes
Total	2779	100.00	25971	100.00		

*Critical z-value = 1.96 at $\alpha = 0.05$

Calculated Chi-square = 198.374 with 6 degrees of freedom

Contingency coefficient, C = 0.083

Critical Chi-square for $\alpha = 0.05$ = 12.592 with 6 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 198.374 >12.592, the frequencies are significantly different.

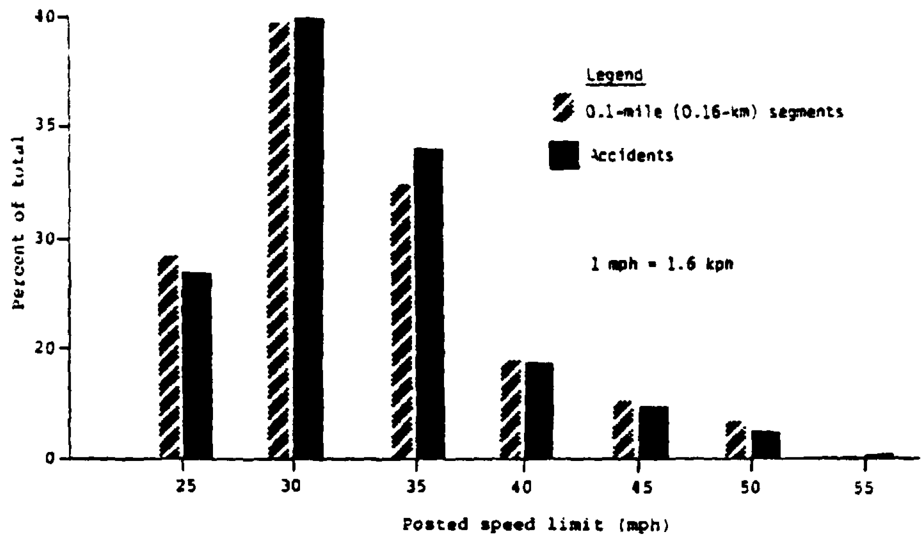


Figure 48. Distribution of roadway segments and accidents by posted speed limit.

Table 48. Z-test and Chi-square test results for posted speed limit.

Posted Speed Limit (MPH)	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
≤25	1609	18.55	15862	16.67	4.49	Yes
30	3427	39.51	37940	39.86	0.65	No
35	2152	24.81	26545	27.89	6.15	Yes
40	748	8.62	8120	8.53	0.29	No
45	439	5.06	4364	4.59	2.02	Yes
50	274	3.16	1966	2.07	6.71	Yes
55	25	0.29	369	0.39	1.44	No
Total	8674	100.00	95166	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 94.404 with 6 degrees of freedom

Contingency coefficient, C = 0.030

Critical Chi-square for α = 0.05 = 12.592 with 6 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 94.404 >12.592, the frequencies are significantly different.

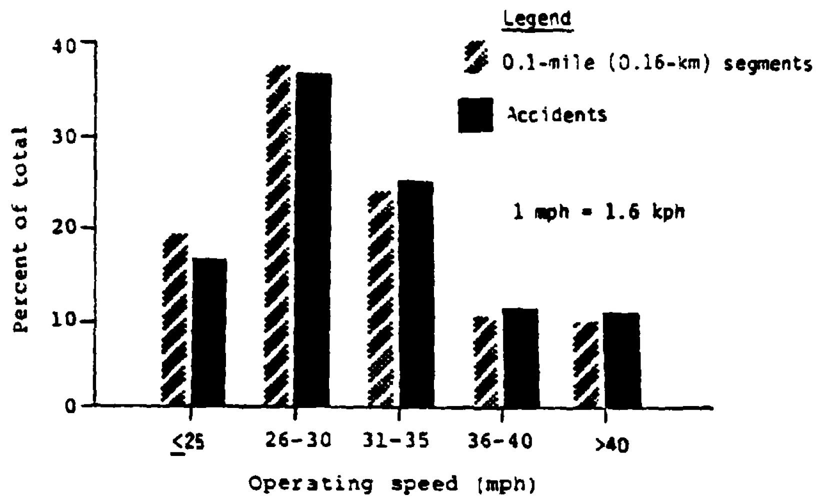


Figure 49. Distribution of roadway segments and accidents by operating speed.

Table 49. Z-test and Chi-square test results for operating speed.

Operating Speed (MPH)	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
≤25	1682	19.38	15986	16.80	6.14	Yes
26 - 30	3245	37.39	35121	36.90	0.91	No
31 - 35	2087	24.05	23869	25.07	2.12	Yes
36 - 40	859	9.90	10490	11.02	3.21	Yes
>40	805	9.28	9714	10.21	2.75	Yes
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 51.131 with 4 degrees of freedom

Contingency coefficient = 0.022

Critical Chi-square for α = 0.05 = 9.488 with 4 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 51.131 >9.488, the frequencies are significantly different.

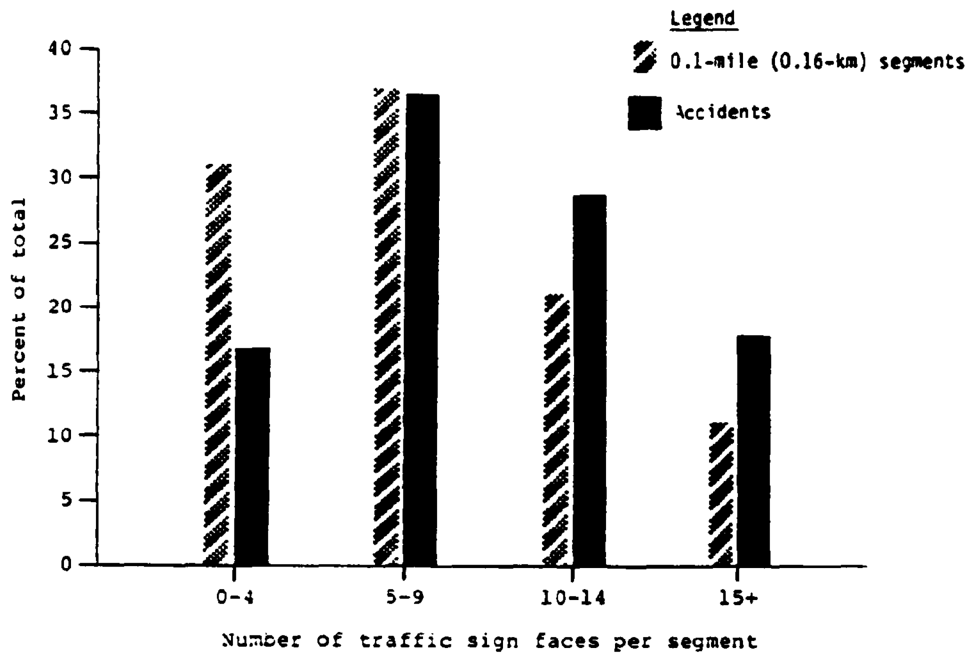


Figure 50. Distribution of roadway segments and accidents by number of traffic sign faces per segment.

Table 50. Z-test and Chi-square test results for the number of traffic sign faces per segment.

Number Of Traffic Sign Faces	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
0 - 4	2675	30.83	15969	16.78	32.64	Yes
5 - 9	3179	36.63	34654	36.41	0.42	No
10 - 14	1856	21.39	27383	28.77	14.64	Yes
15+	968	11.15	17174	18.04	16.18	Yes
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 1244.348 with 3 degrees of freedom

Contingency coefficient, C = 0.109

Critical Chi-square for α = 0.05 = 7.815 with 3 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 1244.348 >7.815, the frequencies are significantly different.

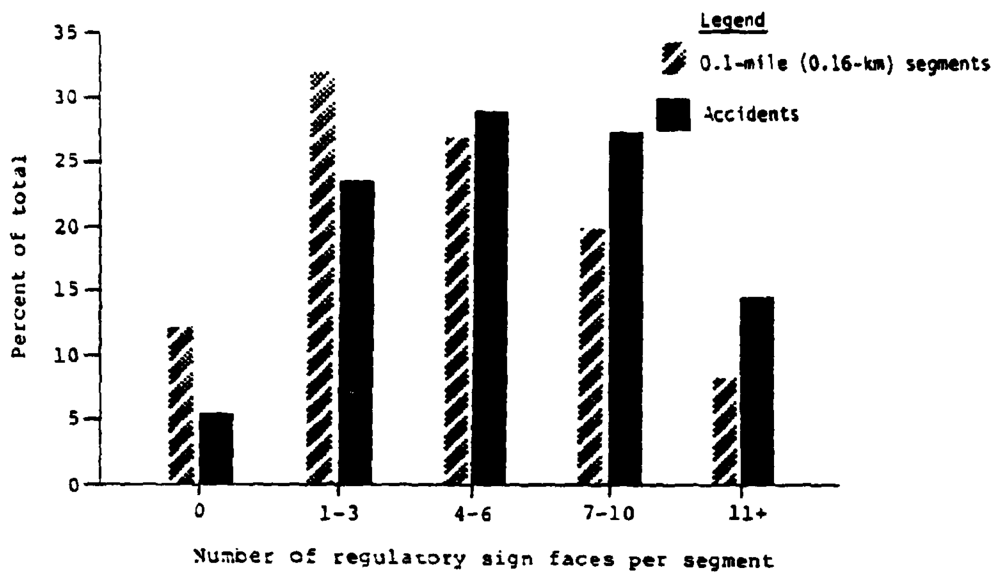


Figure 51. Distribution of roadway segments and accidents by number of regulatory sign faces per segment.

Table 51. Z-test and Chi-square test results for the number of regulatory sign faces per segment.

Number Of Regulatory Sign Faces	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* $\alpha = 0.05$
	Number	Percent	Number	Percent		
0	1019	11.74	5147	5.41	23.91	Yes
1 - 3	2744	31.63	22410	23.54	16.81	Yes
4 - 6	2351	27.09	27596	28.99	3.74	Yes
7 - 10	1747	20.13	26156	27.49	14.79	Yes
11+	817	9.41	13871	14.57	13.20	Yes
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at $\alpha = 0.05$

Calculated Chi-square = 1071.190 with 4 degrees of freedom

Contingency coefficient, C = 0.101

Critical Chi-square for $\alpha = 0.05$ = 9.488 with 4 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 1071.190 >9.488, the frequencies are significantly different.

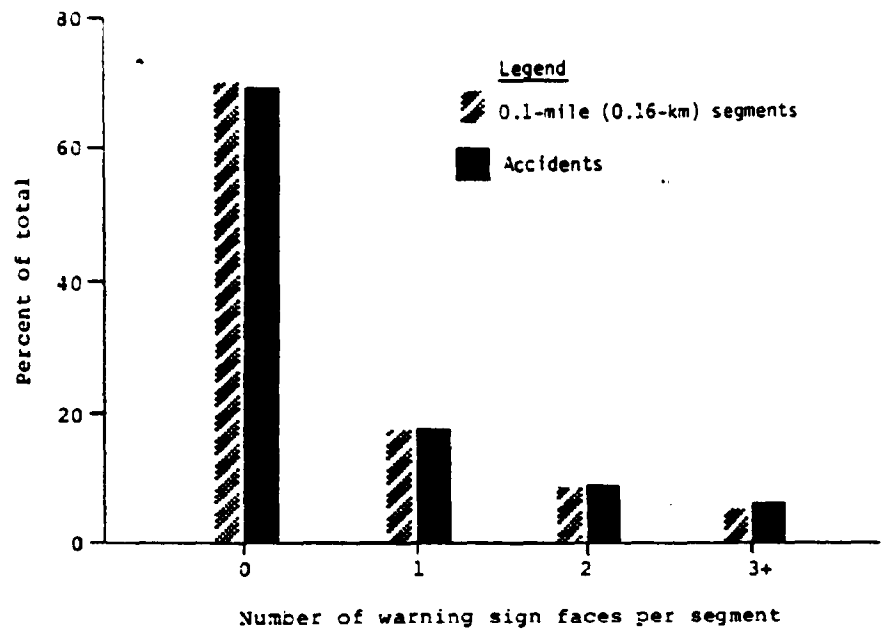


Figure 52. Distribution of roadway segments and accidents by number of warning sign faces per segment.

Table 52. Z-test and Chi-square test results for the number of warning sign faces per segment.

Number Of Warning Sign Faces	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
0	6074	69.99	65413	68.72	2.44	Yes
1	1471	16.96	16482	17.32	0.86	No
2	710	8.18	8210	8.63	1.41	No
3+	423	4.87	5075	5.33	1.82	No
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 7.444 with 3 degrees of freedom

Contingency coefficient, C = 0.008

Critical Chi-square for α = 0.05 = 7.815 with 3 degrees of freedom

Thus, as the calculated Chi-square is less than the critical Chi-square, i.e., 7.444 <7.815, the frequencies are not significantly different.

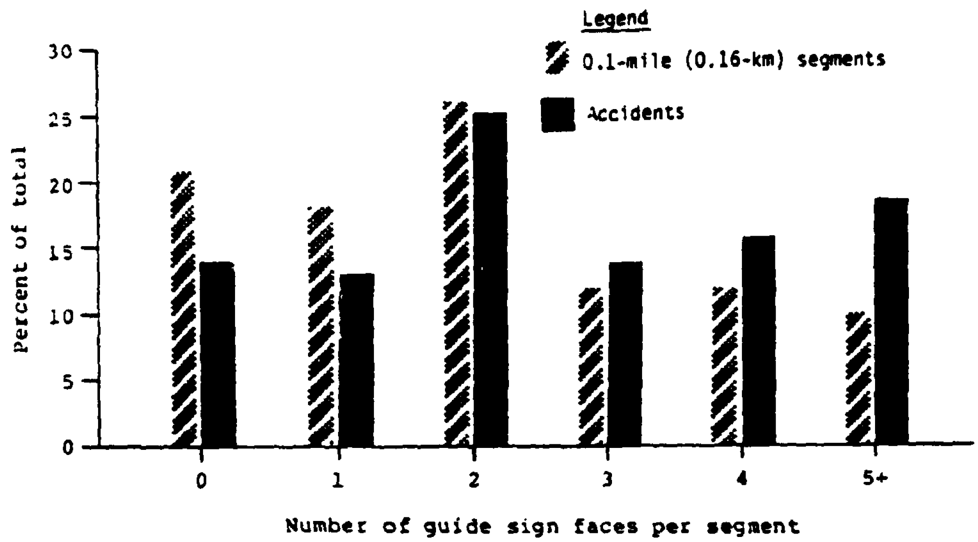


Figure 53. Distribution of roadway segments and accidents by number of guide sign faces per segment.

Table 53. Z-test and Chi-square test results for the number of guide sign faces per segment.

Number Of Guide Sign Faces	0.1-Mile (0.16-km) Segments		Number of Accidents		Calculated Z-Value	Significance* α = 0.05
	Number	Percent	Number	Percent		
0	1790	20.63	13192	13.86	17.18	Yes
1	1543	17.78	12408	13.04	12.41	Yes
2	2285	26.32	24090	25.31	2.09	Yes
3	1034	11.92	13243	13.91	5.18	Yes
4	1016	11.71	14634	15.38	9.14	Yes
5+	1010	11.64	17613	18.50	15.96	Yes
Total	8678	100.00	95180	100.00		

*Critical z-value = 1.96 at α = 0.05

Calculated Chi-square = 692.158 with 5 degrees of freedom

Contingency coefficient, C = 0.081

Critical Chi-square for α = 0.05 = 11.070 with 5 degrees of freedom

Thus, as the calculated Chi-square is greater than the critical Chi-square, i.e., 692.158 >11.070, the frequencies are significantly different.

APPENDIX F - BRANCHING RESULTS

Introduction

Branching analysis was used to identify the independent variables that explain the variation in accident rates and frequencies and to establish an inter-relational framework among the variables. The branching program selected the independent variables that account for the highest amount of explained variation. This process provided guidelines for later analysis work, including the selection of independent variables for inclusion in regression analysis, the analysis of variance and the partitioning of the data file to identify key classification variables. The branching results also were used to identify possible accident causal factors and to select appropriate countermeasures.

Background

One of the major objectives of this analysis was to identify and quantify factors which are associated with the number of accidents reported on a specific roadway segment. Although a series of cross-tabulations could have been used to isolate and identify these characteristics, this approach is time consuming and can result in a failure to identify important combinations of factors. To minimize the possibility of overlooking significant factors, a search or branching analysis was employed. The analysis was conducted by utilizing the SEARCH program which is an elaboration of the OSIRIS II AID and THAID programs [1]*. The mathematical procedure used in the program is based on the Automatic Interaction Detection (AID) analysis developed by Sonquist, et al. [2].

Branching analysis is a multivariate technique used for determing the value of dependent variables (such as urban arterial accident frequencies or rates) with a combination of several independent variables. The SEARCH program makes dichotomous splits in the independent variables (i.e., geometric, environmental, and operational variables) which maximize the reduction in the total sum of squares between the current branch and the previous cell. If the reduction in the total sum of squares is greater than a user specified reduction, the branch is maintained. If the specified reduction is not attained, the data are retained in a single cell until a new independent variable is input. Terminal cells are created when none of the independent variables reduces the total sum of squares beyond the specified limit. The objective of branching is to classify

---

* The numbers in brackets refers to the publication included on the reference list provided at the end of this appendix.

the observations into mutually exclusive groups such that the observations in each group are similar to one another, yet are significantly different from the observations in all other groups. The analysis requries no assumption regarding linearity or collinearity of the independent variables. Nominal and ordinal data can be used as independent variables. The technique is not intended to identify causal effects of accident occurrences, but simply to identify those variables which maximize the explained variance in the dependent variables. The primary advantage of using the SEARCH program is that a comparative analysis of all possible combinations of variables is conducted in one step.

The branching technique has been used successfully in a variety of traffic safety research applications. For example, Vaughan, et al. used branching analysis to examine the characteristics of fatal utility pole crashes [3]. The primary finding of Vaughan's study was that fatal pole crashes are overrepresented on horizontal curves in urban areas. Other users of branching include Golomb, et al., who examined factors which affected fatal accidents in Texas during the energy crisis; Cleveland, et al., who identified variables which affected roadside accidents on rural highways in Michigan; and Parker et al., who recently identified geometric factors which affect passing accidents on rural, two-lane highways [4,5,6].

Codes For Cities

The branches for many of the accident rates and frequencies was initiated by a split based on the city from which the data were obtained. A list of cities and respective codes used on the branching diagrams is given below.

City		Code
San Francisco	-	1
Fort Wayne	-	2
Topeka	-	3
New Orleans	-	4
Big Rapids	-	5
Birmingham	-	6
Farmington	-	7
Farmington Hills	-	8
Kalamazoo	-	9
Lansing	-	10
Novi	-	11
Oak Park	-	12
Royal Oak	-	13
Saginaw	-	14
Southfield	-	15

City		Code
Troy	-	16
Minneapolis	-	17
Seattle	-	18
Milwaukee	-	19

A number of confounding factors may be responsible for this result. Some of these factors are differences in accident reporting practices in the cities, differences in levels of law enforcement, safety programs, etc.

Results For Accident Type By Roadway Classification

For each of the four urban arterial roadway groups included in the data base, i.e., two-lane, two-way; one-way; multilane divided; and multilane undivided a branching analysis was conducted using the following accident types.

- Angle
- Rear-end
- Sideswipe
- Head-on

These branching diagrams were used to identify roadway factors which may have contributed to the urban arterial accidents and to select appropriate countermeasures as outlined in the research report. The branching results are presented in Figures 54 through 69 of this appendix.

Results For Large Cities By Roadway Classification

Over 50 percent of the roadway segments included in the data base were obtained in large cities, i.e., cities with a population exceeding 250,000 persons. A branching analysis was conducted for the roadway segments in large cities for each of the four roadway classifications and the results are given in Figures 70 through 73.

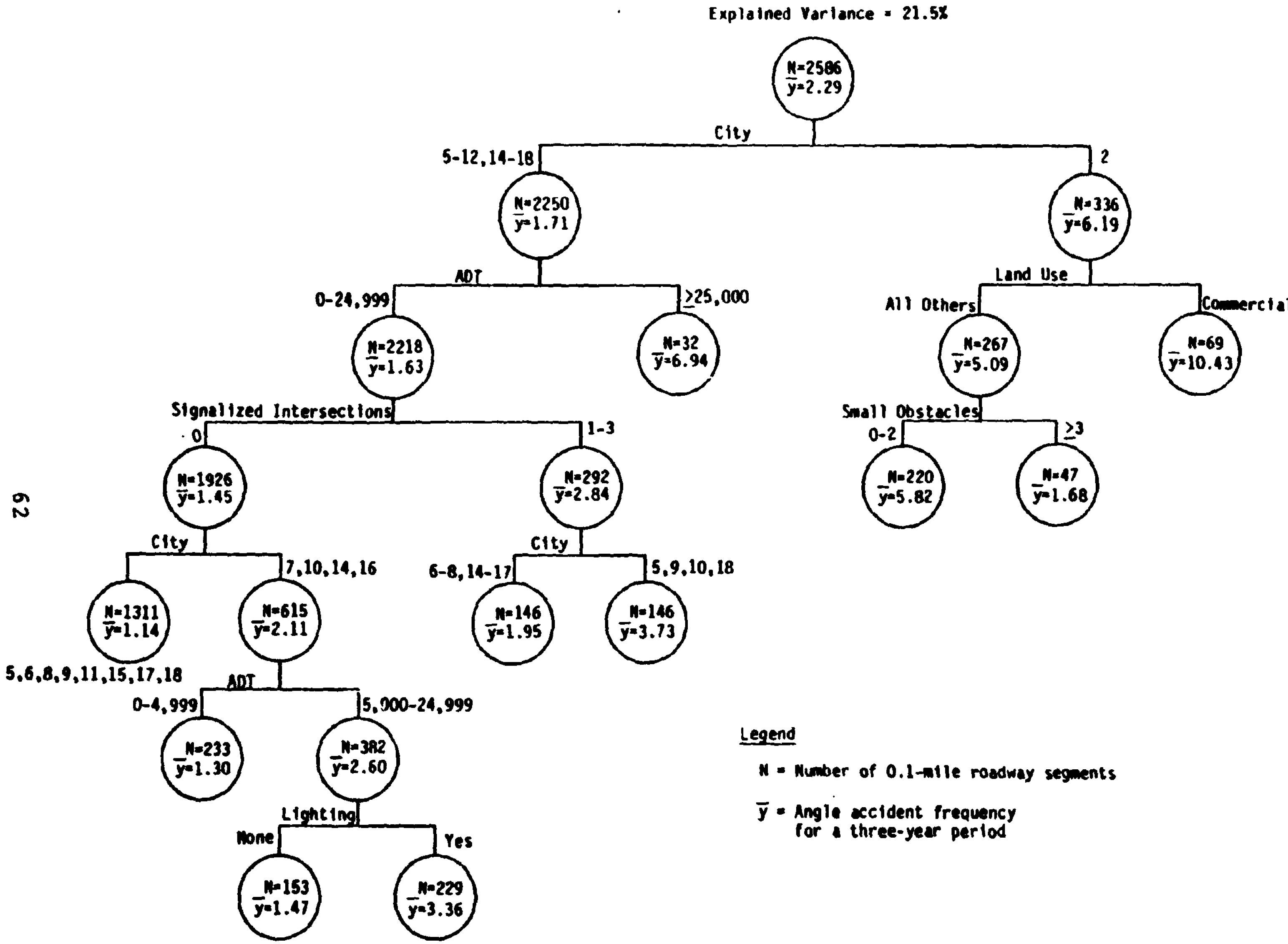


Figure 54. Branching diagram for angle accident frequency using two-lane, two-way segments.

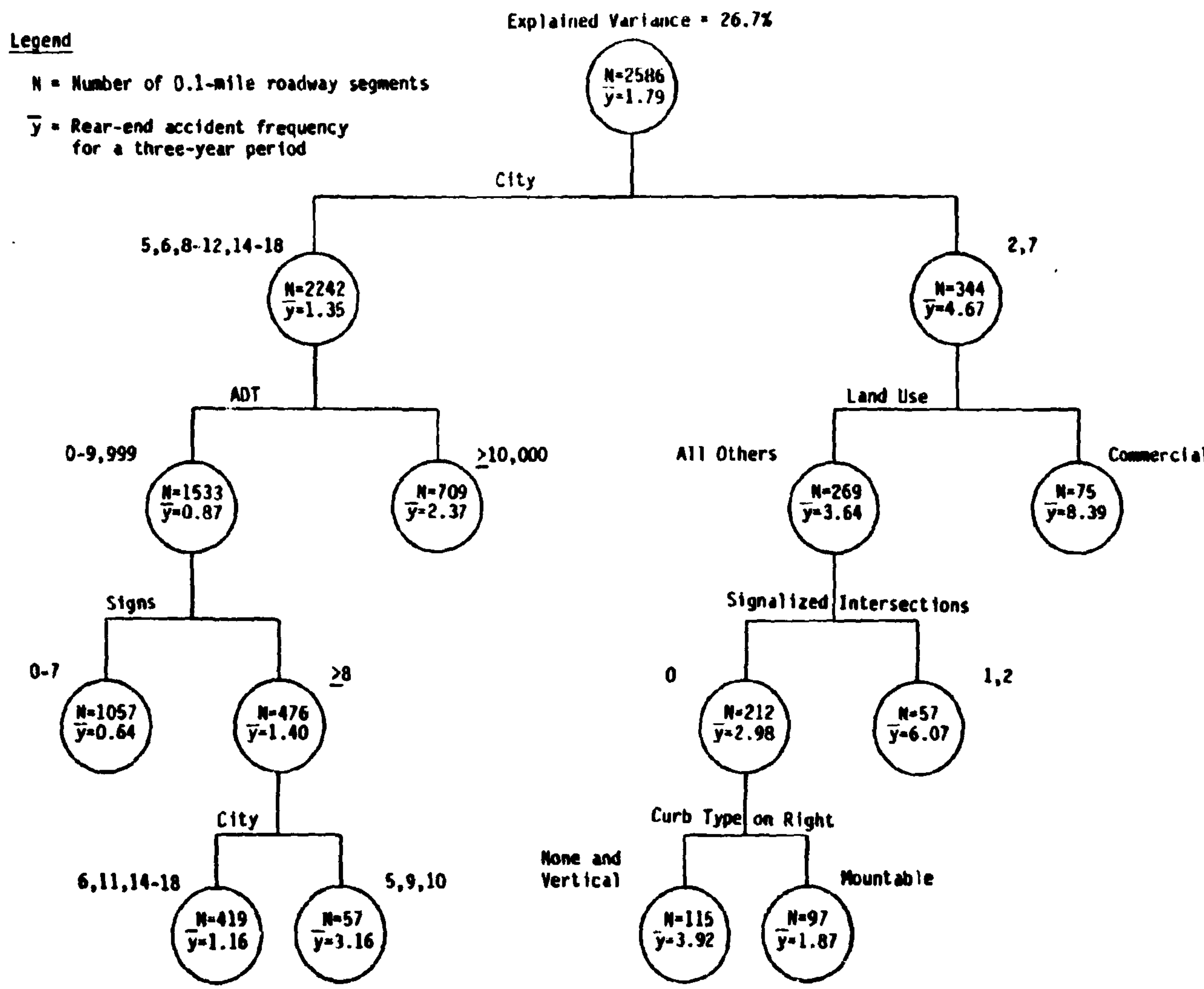


Figure 55. Branching diagram for rear-end accident frequency using two-lane, two-way segments.

Explained Variance = 14.8%

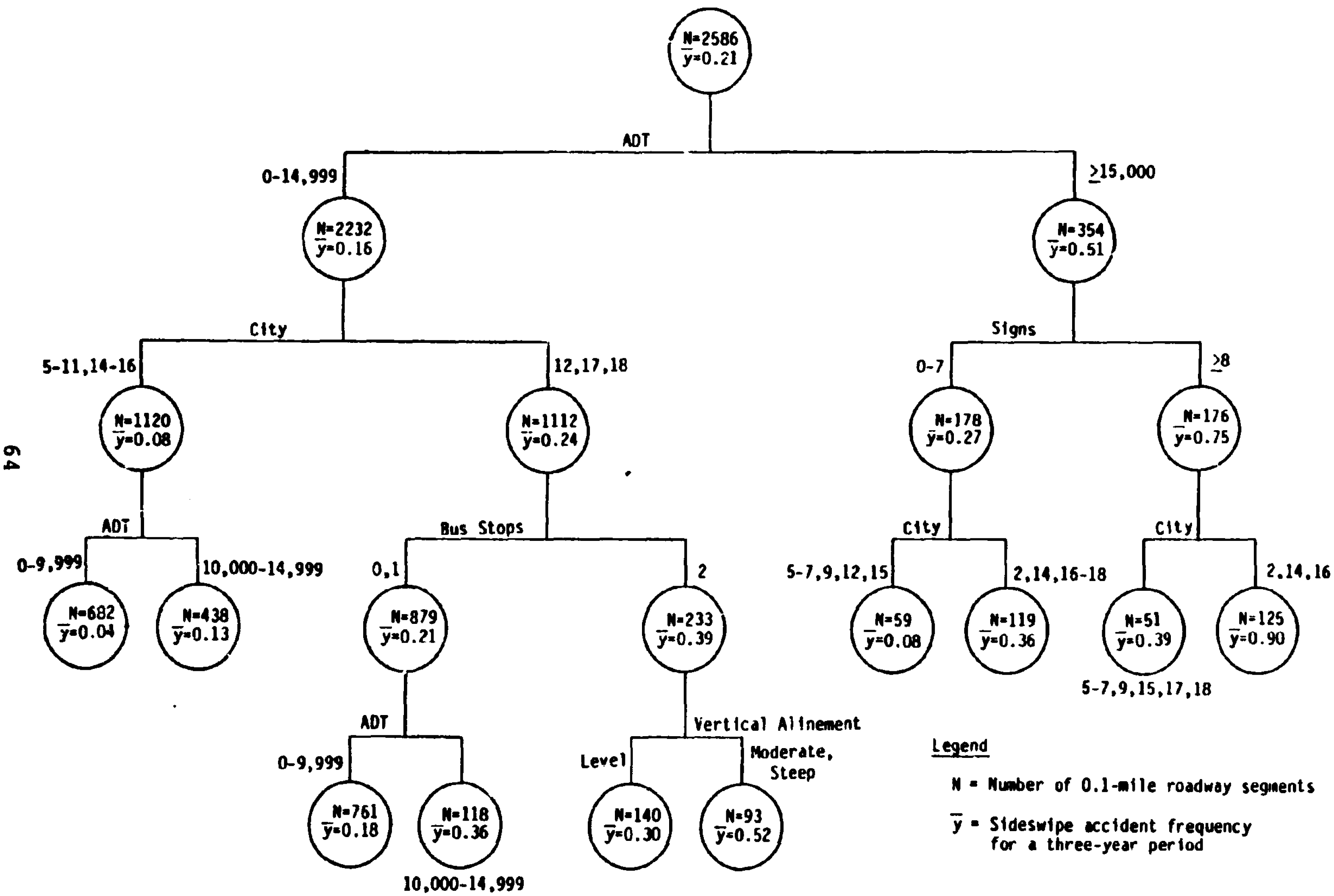


Figure 56. Branching diagram for sideswipe accident frequency using two-lane, two-way segments.

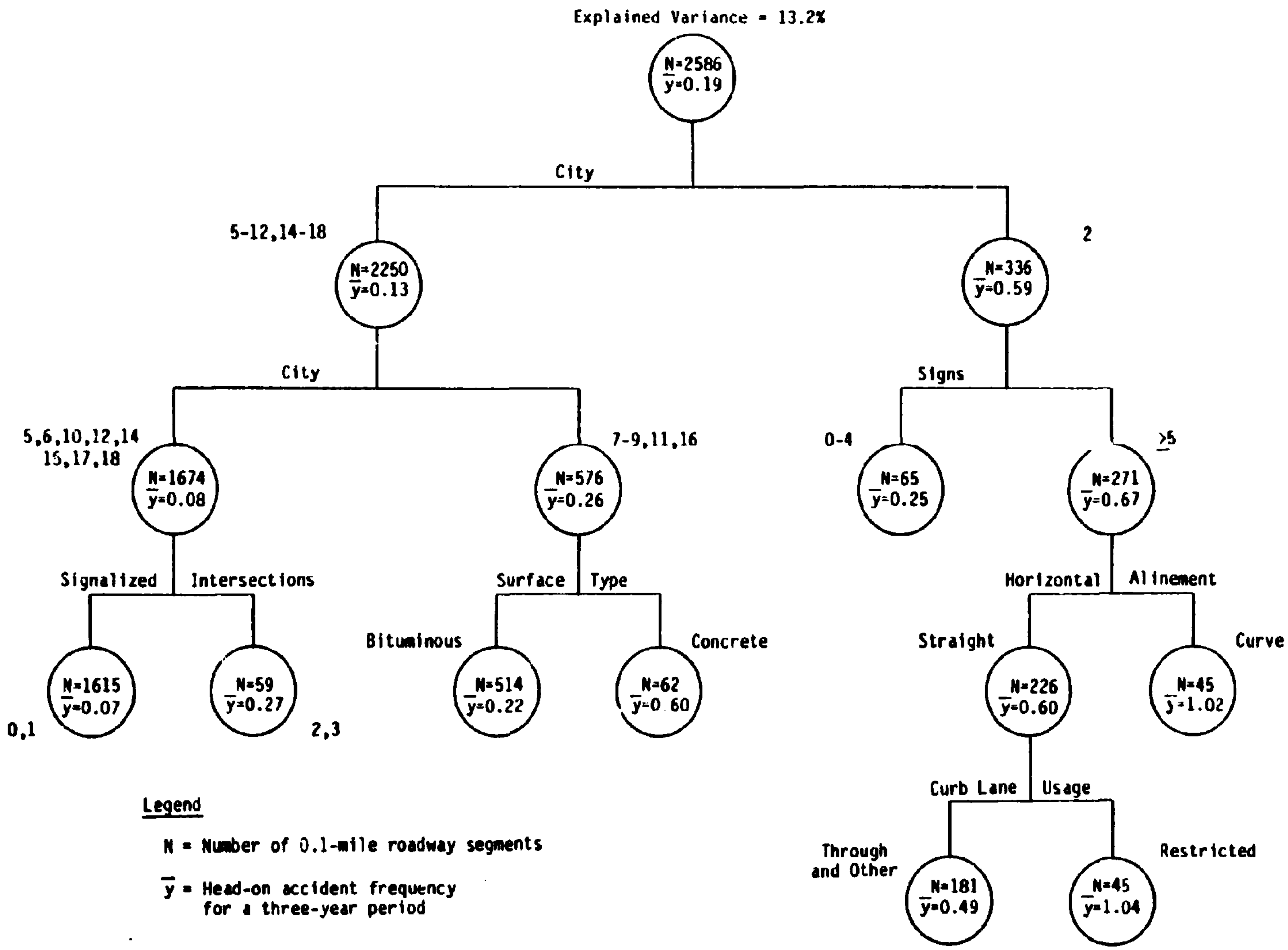
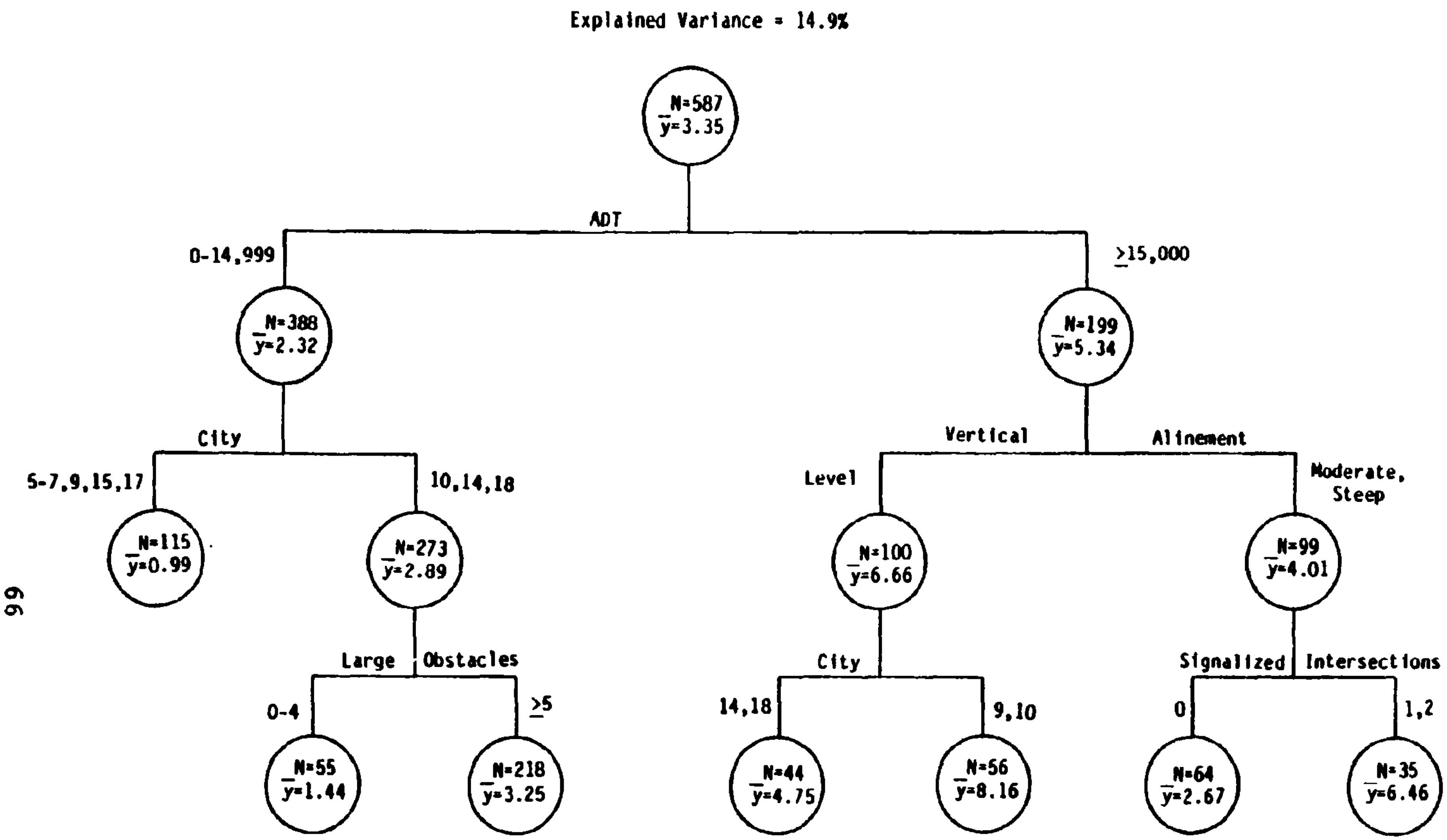


Figure 57. Branching diagram for head-on accident frequency using two-lane, two-way segments.

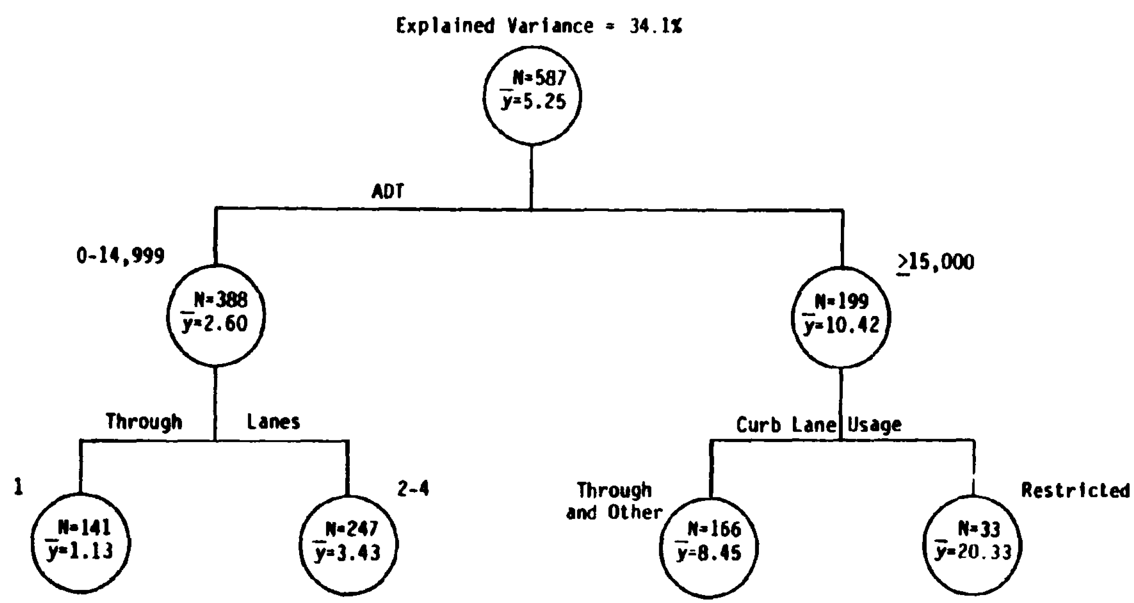


Legend

N = Number of 0.1-mile roadway segments

$\overline{y}$ = Angle accident frequency for a three-year period

Figure 58. Branching diagram for angle accident frequency using one-way segments.



Legend

N = Number of 0.1-mile roadway segments

$\bar{y}$ = Rear-end accident frequency for a three-year period

Figure 59. Branching diagram for rear-end accident frequency using one-way segments.

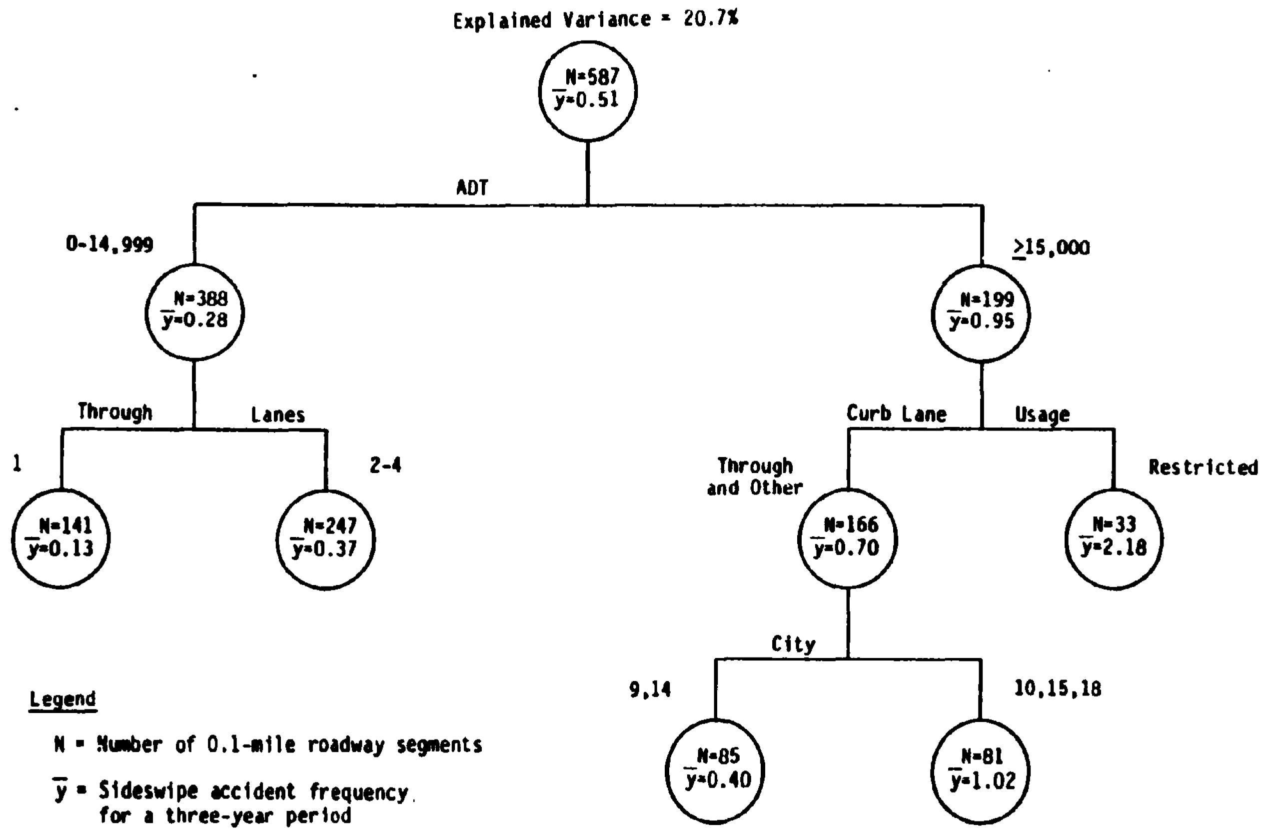


Figure 60. Branching diagram for sideswipe accident frequency using one-way segments.

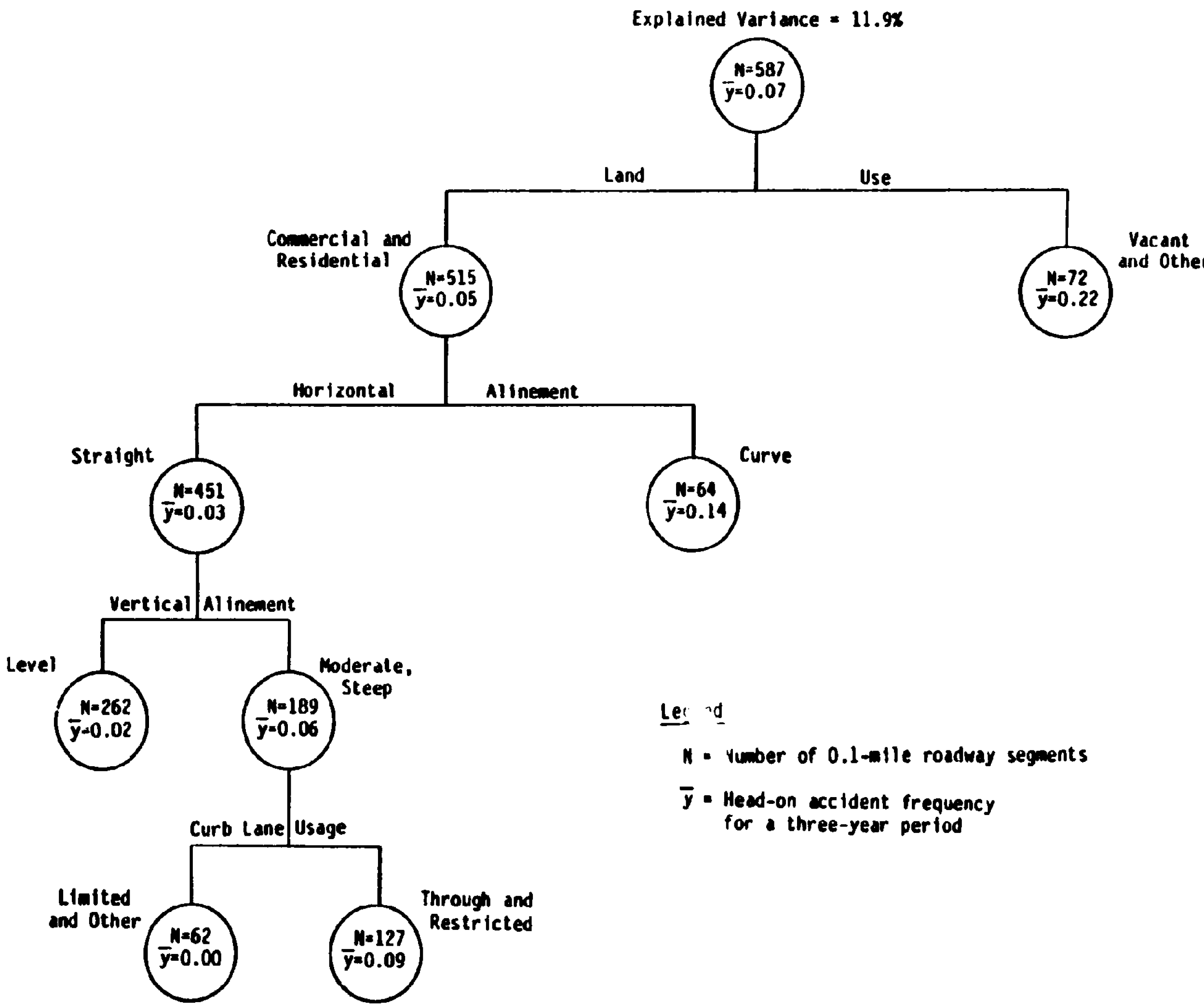
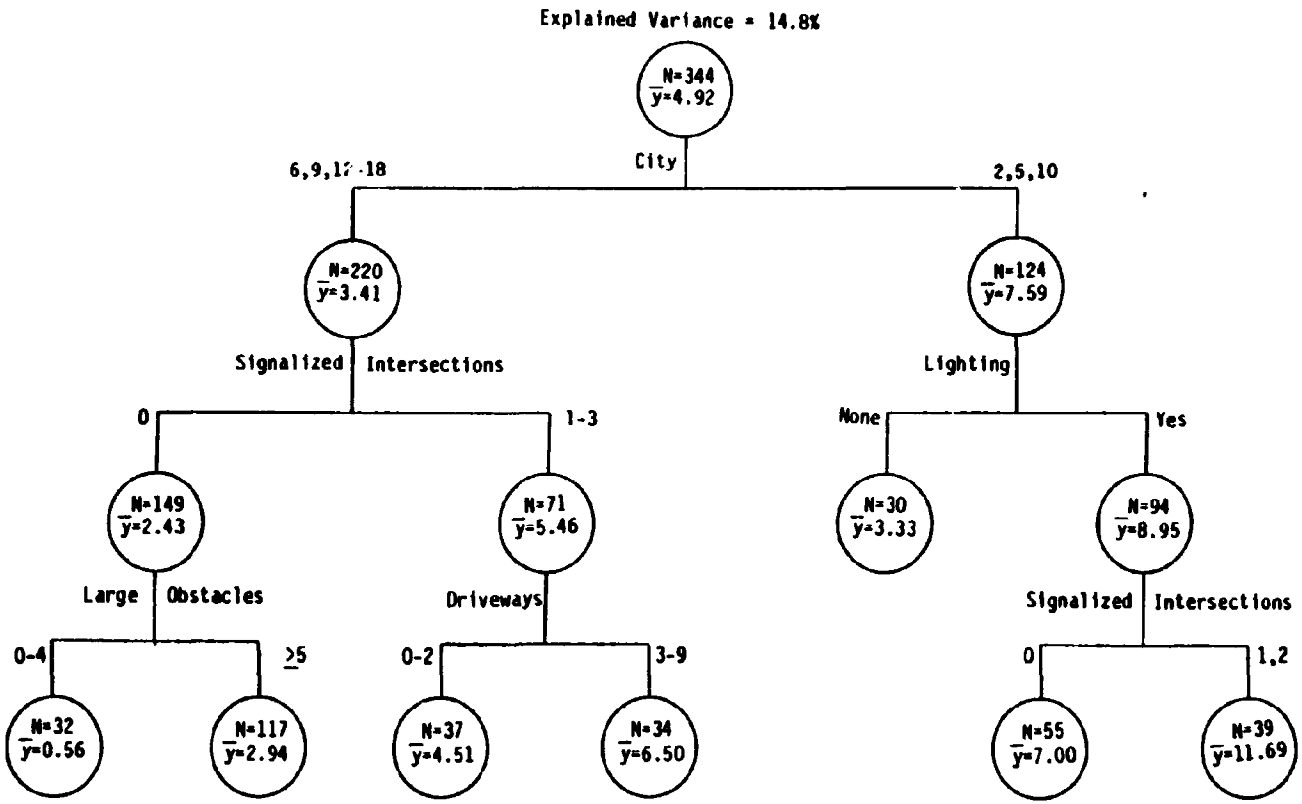


Figure 61. Branching diagram for head-on accident frequency using one-way segments.



<u>Legend</u>

N = Number of 0.1-mile roadway segments

$\bar{y}$ = Angle accident frequency for a three-year period

Figure 62. Branching diagram for angle accident frequency using multilane divided segments.

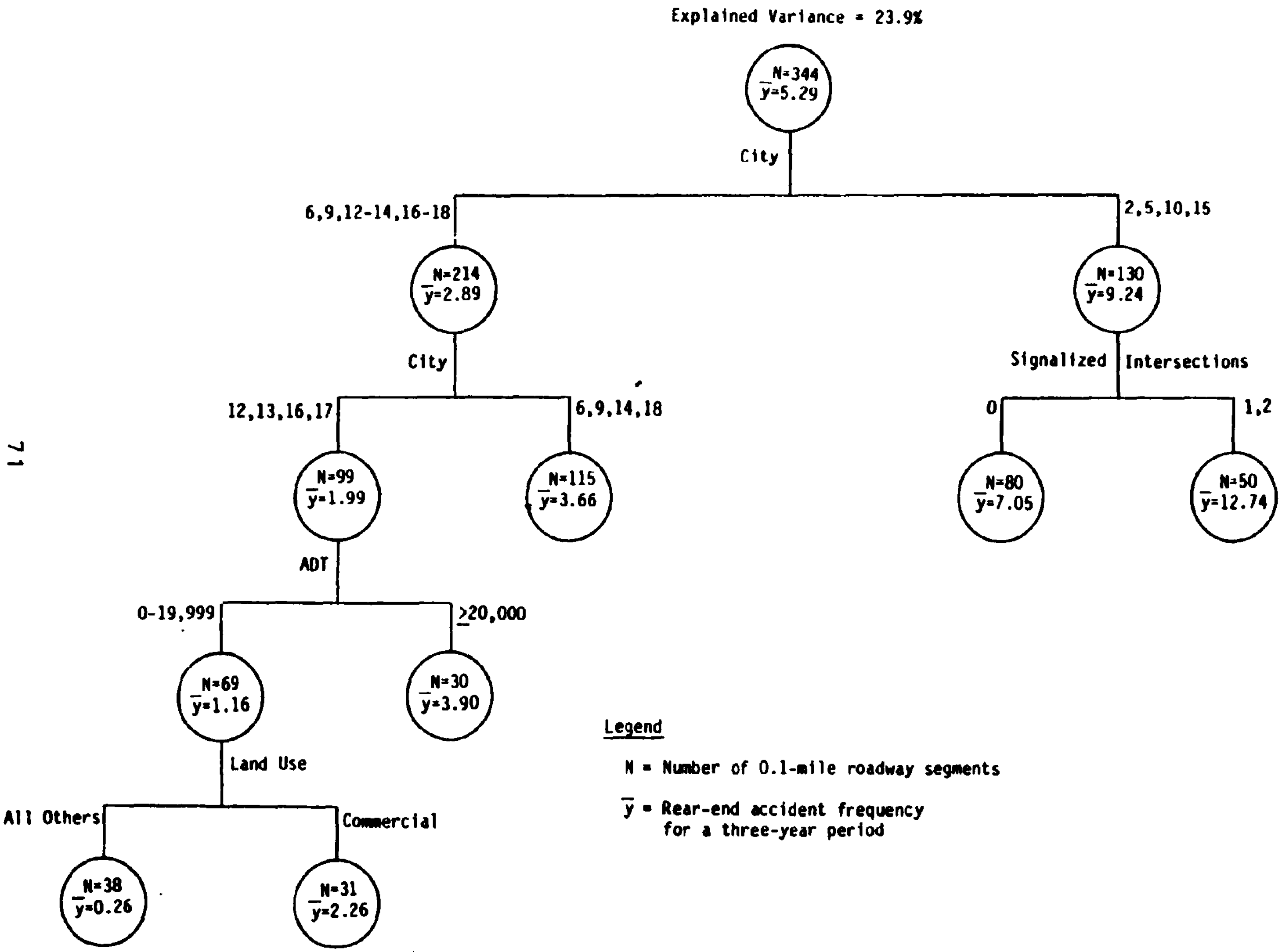


Figure 63. Branching diagram for rear-end accident frequency using multilane divided segments.

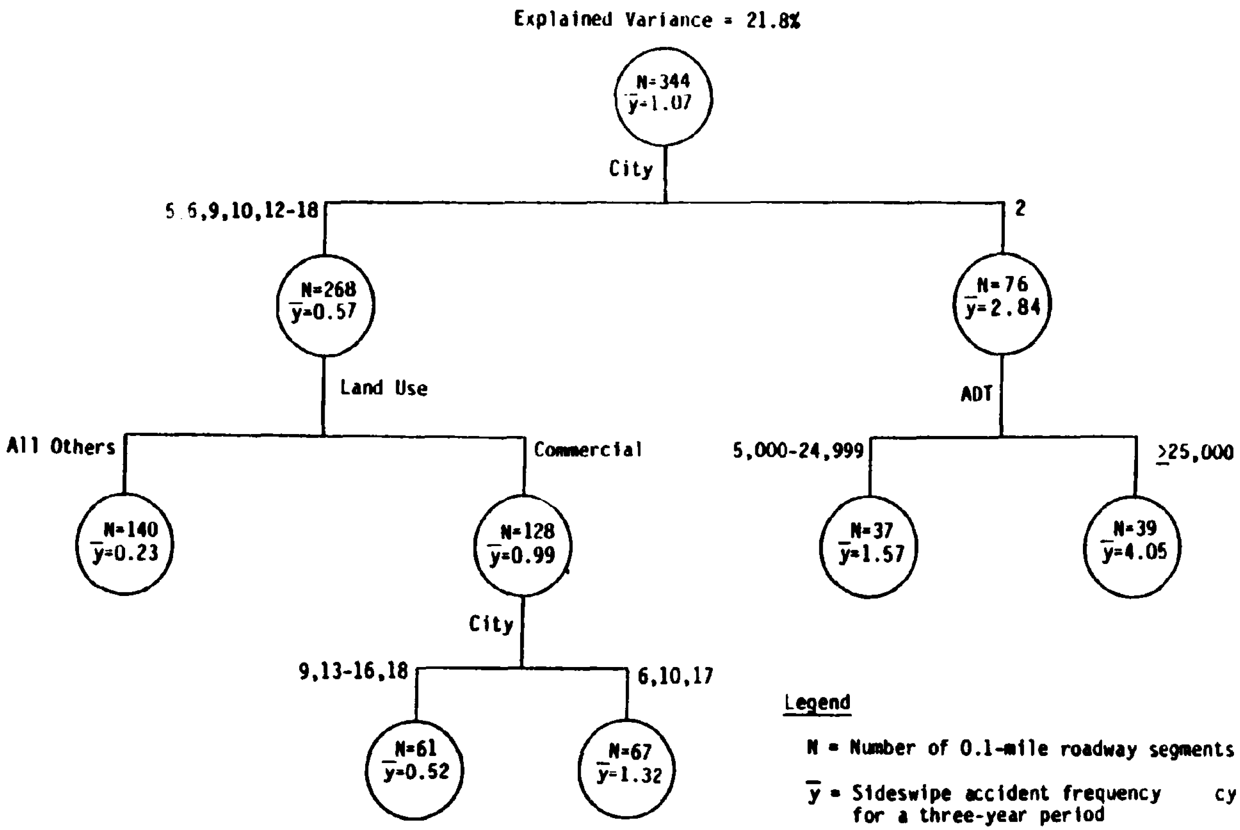


Figure 64. Branching diagram for sideswipe accident frequency using multilane divided segments.

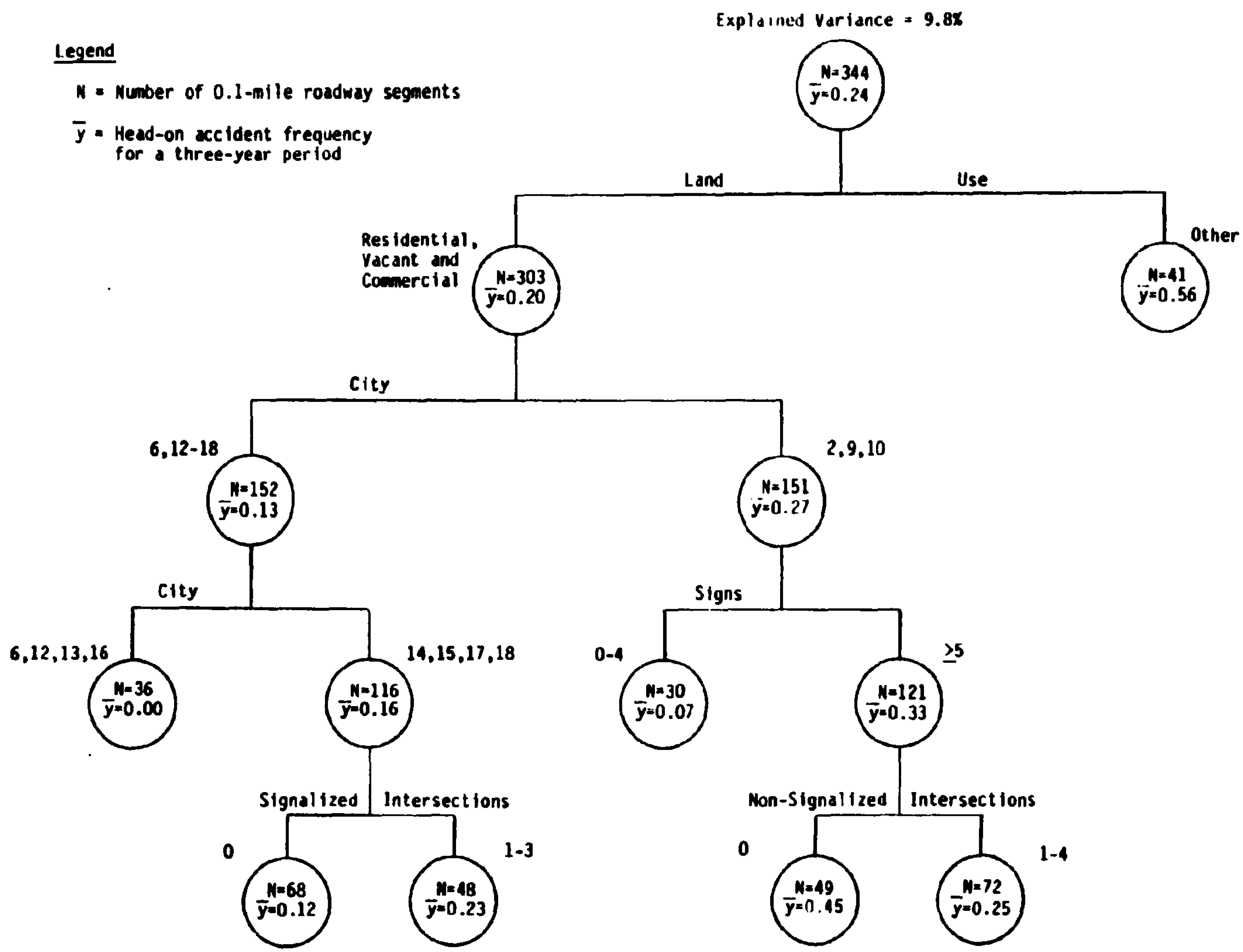


Figure 65. Branching diagram for head-on accident frequency using multilane divided segments.

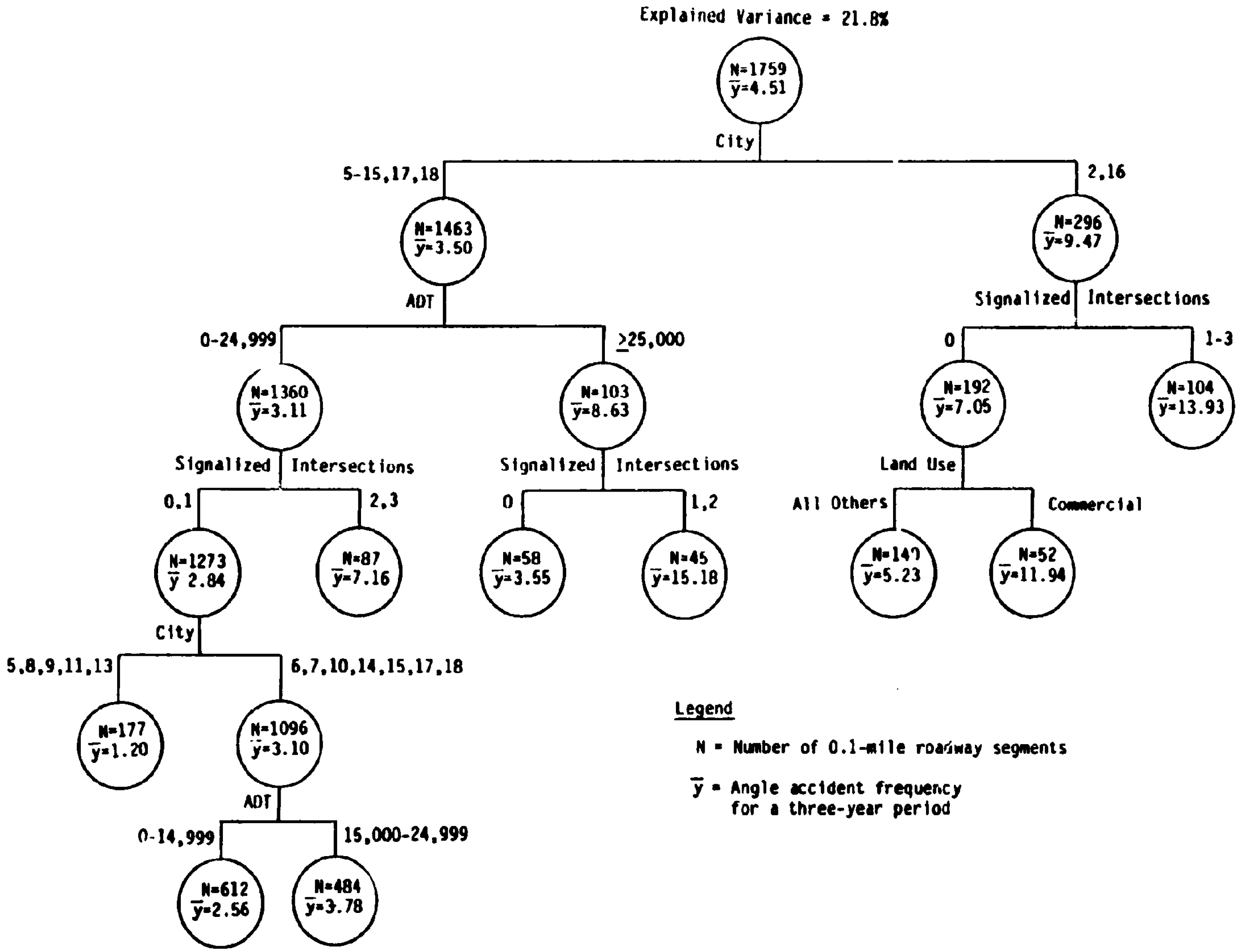


Figure 66. Branching diagram for angle accident frequency using multilane undivided segments.

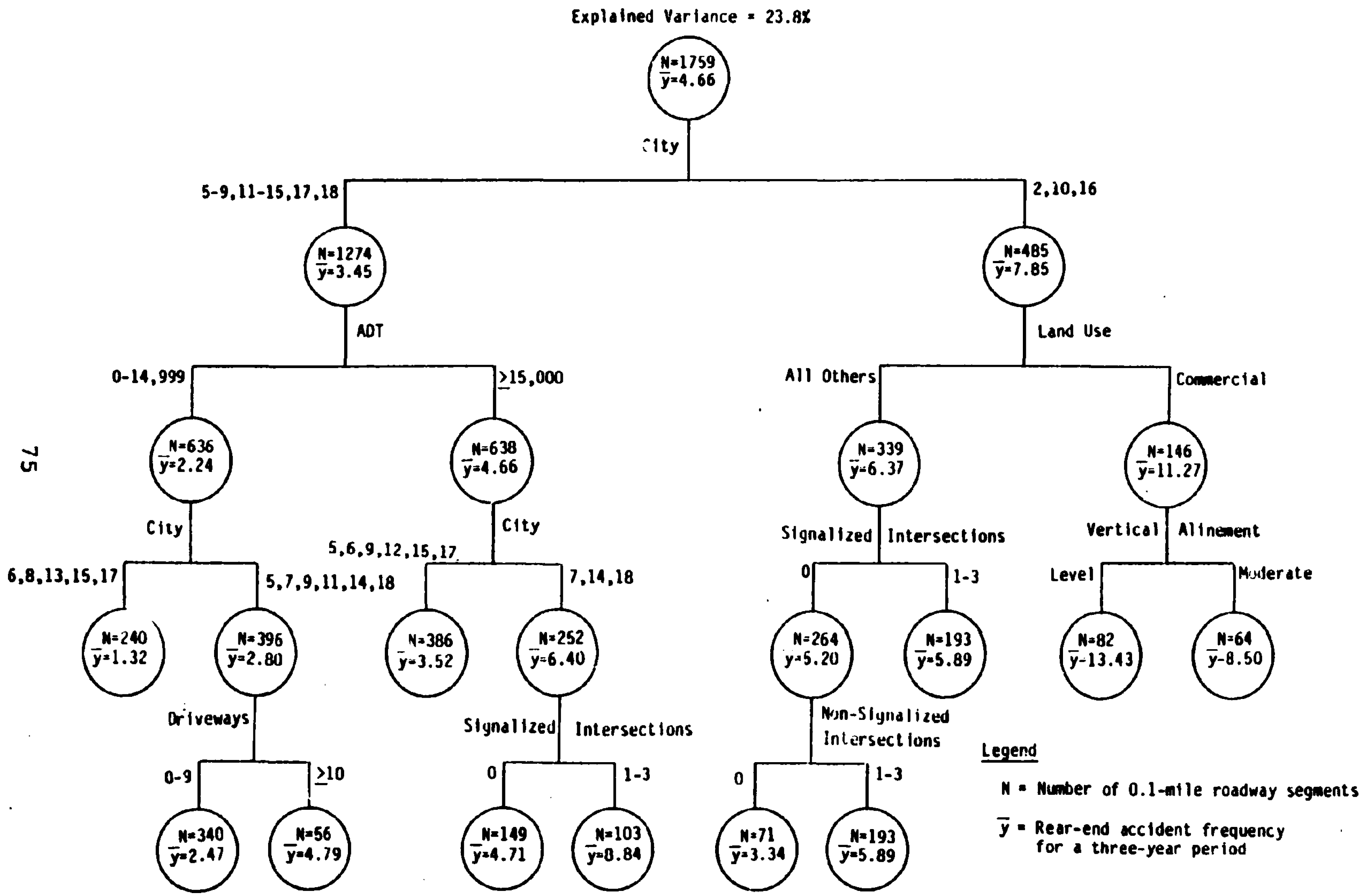


Figure 67. Branching diagram for rear-end accident frequency using multilane undivided segments.

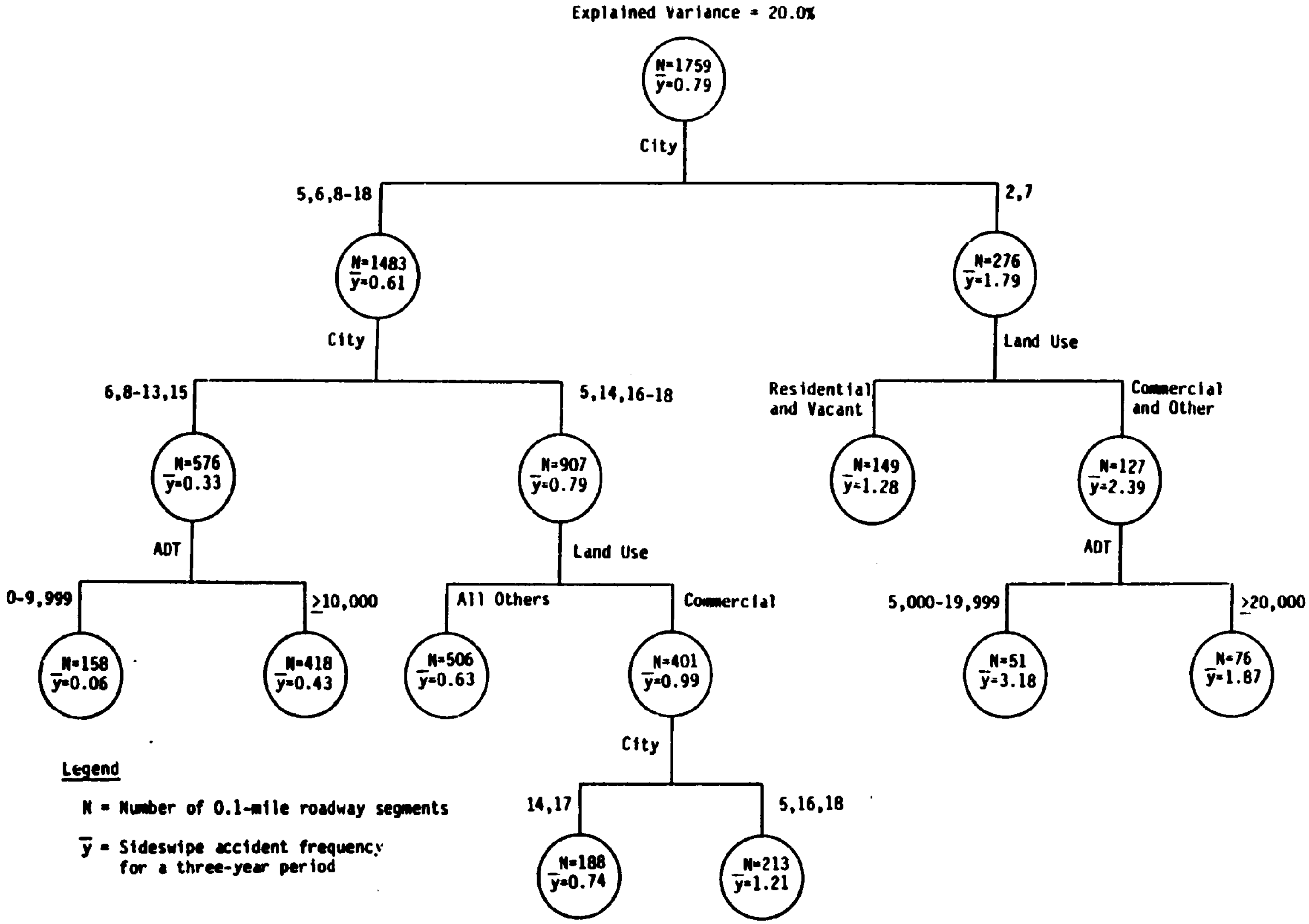


Figure 68. Branching diagram for sideswipe accident frequency using multilane undivided segments.

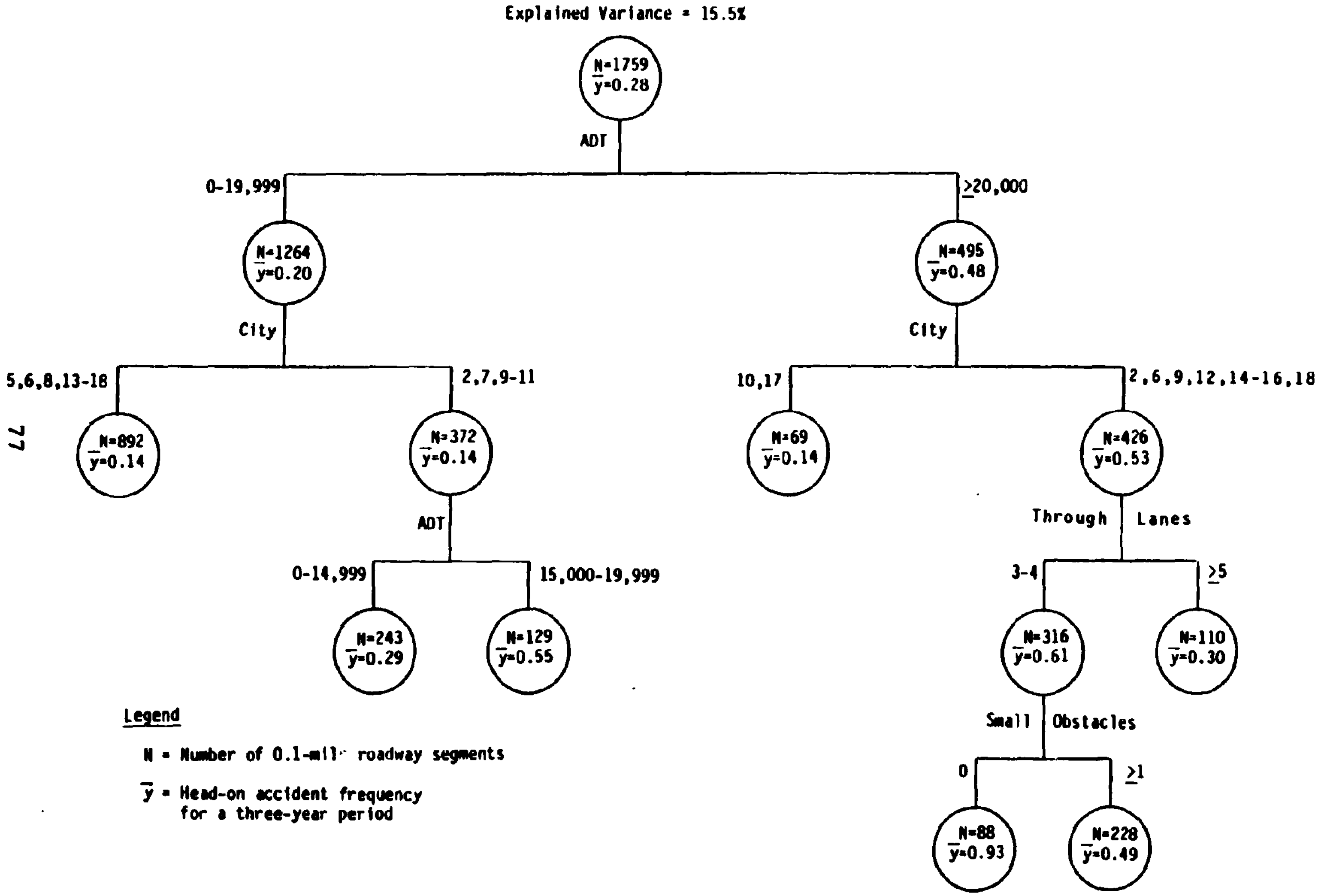


Figure 69. Branching diagram for head-on accident frequency using multilane undivided segments.

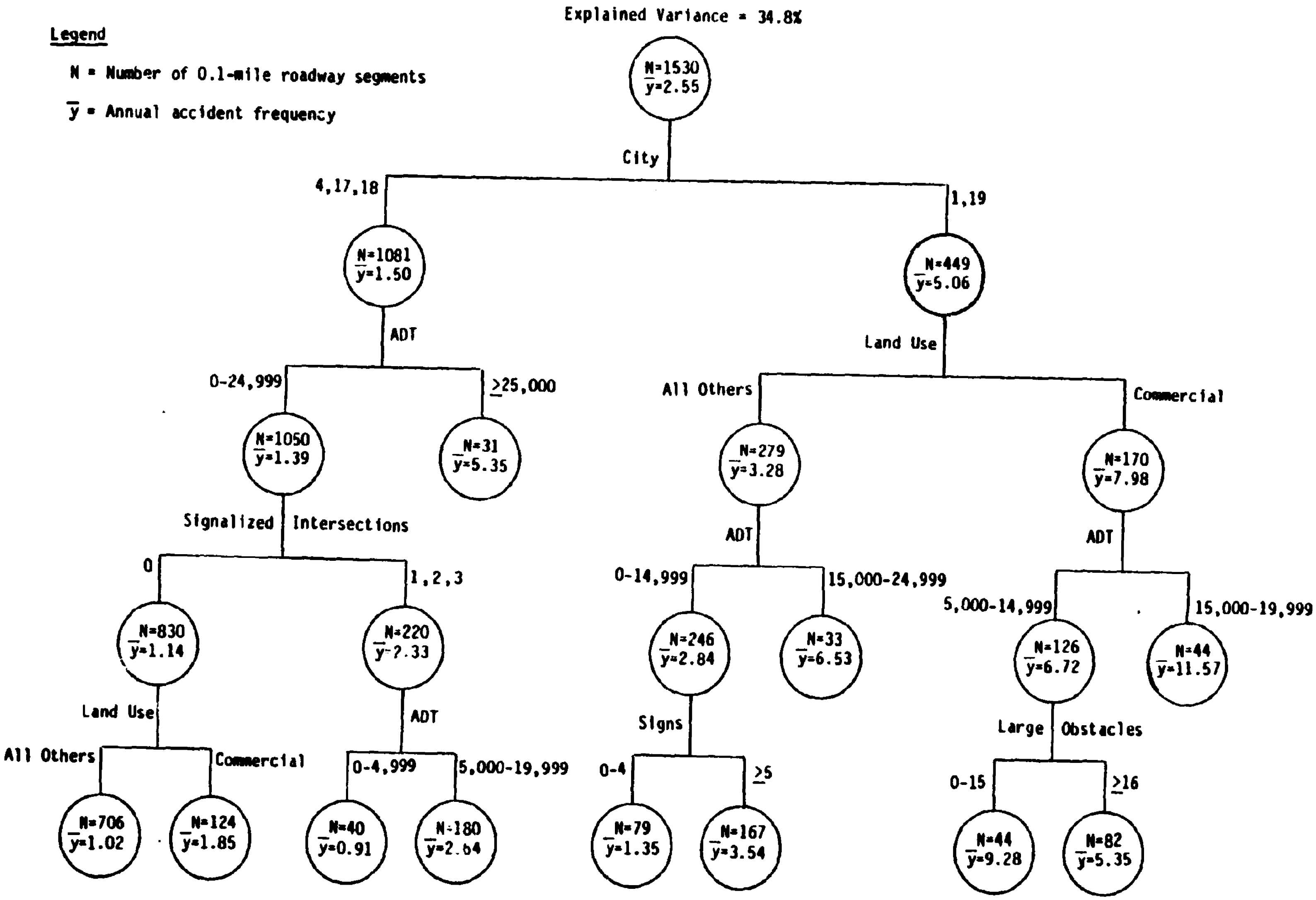


Figure 70. Branching diagram for annual accident frequency using two-lane, two-way segments in large cities.

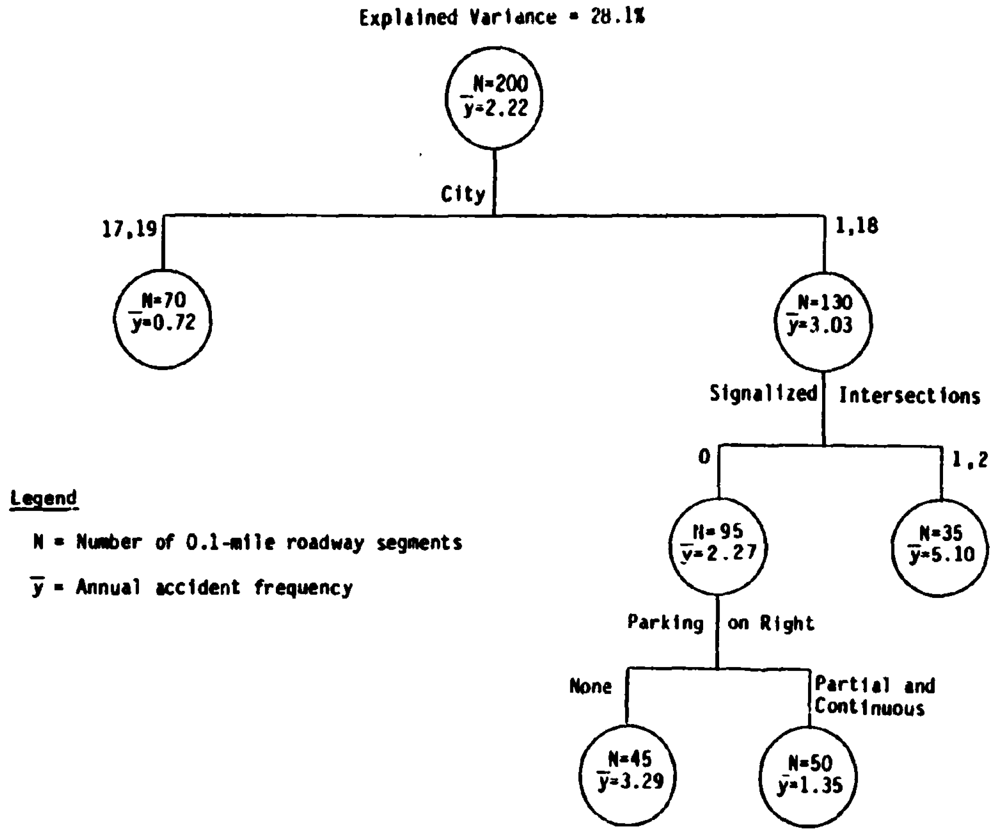


Figure 71. Branching diagram for annual accident frequency using one-way segments in large cities.

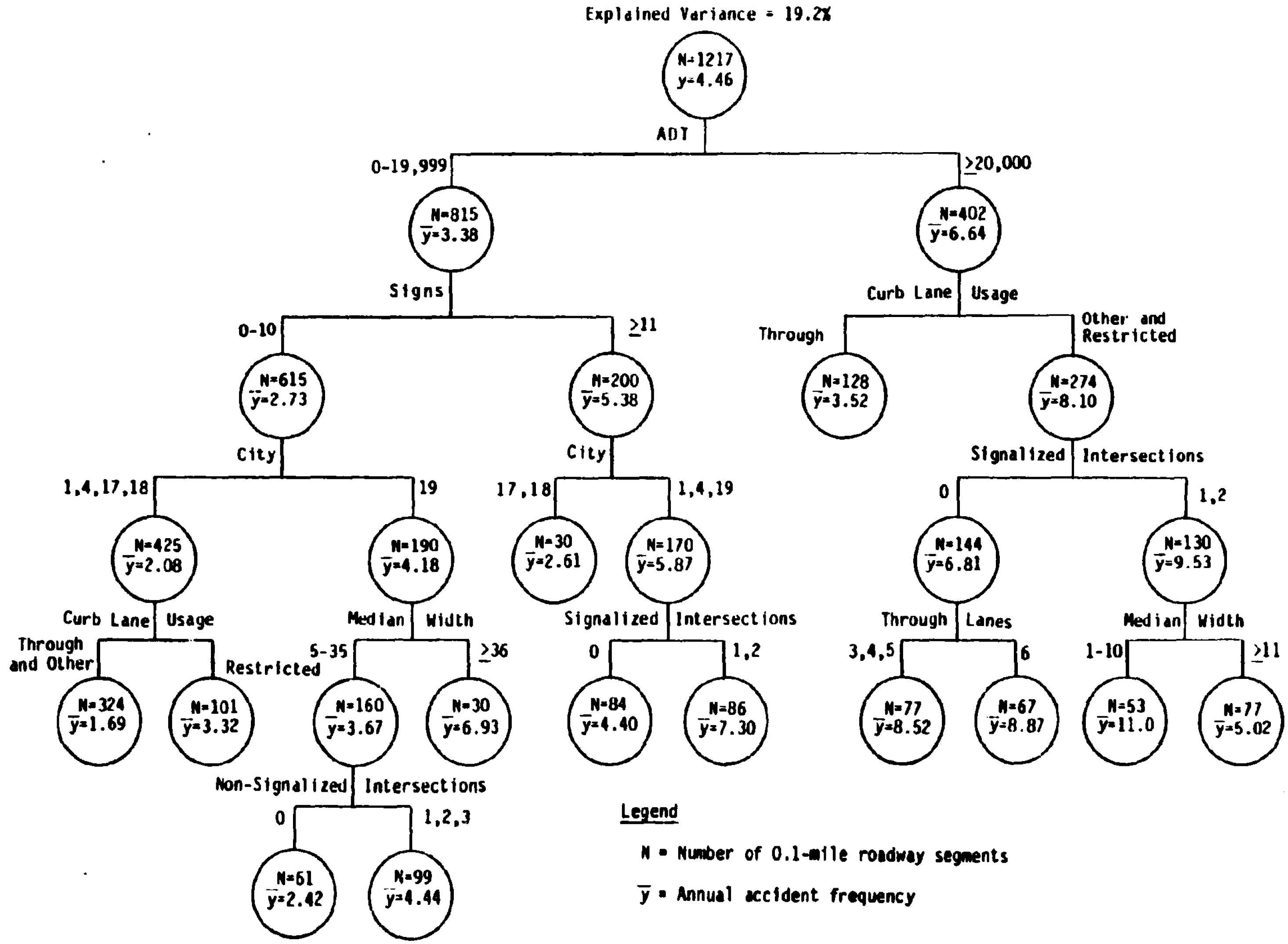


Figure 72. Branching diagram for annual accident frequency using multilane divided segments in large cities.

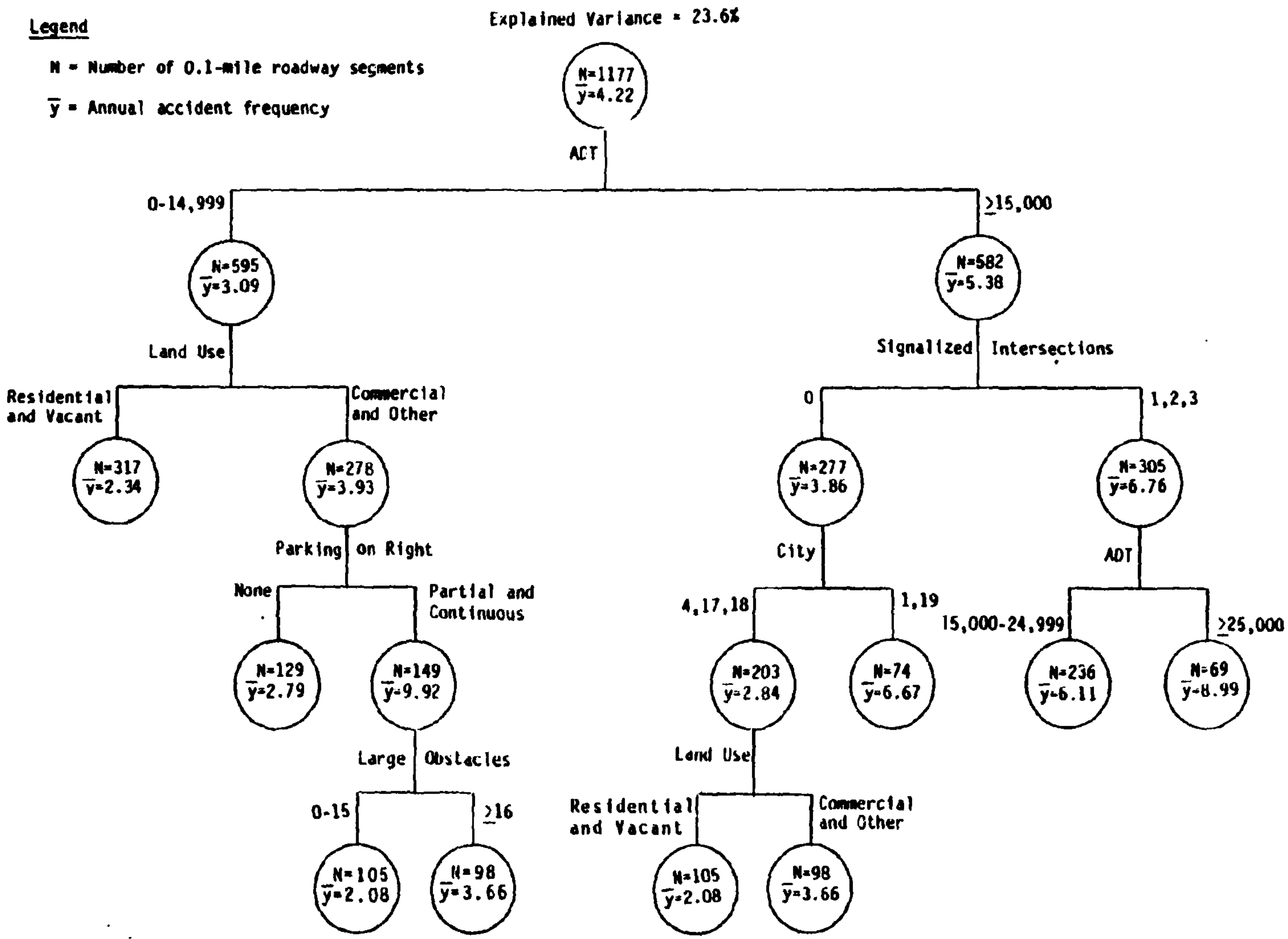


Figure 73. Branching diagram for annual accident frequency using multilane undivided segments in large cities.

References

1. Institute for Social Research, "OSIRIS IV User's Manual", Sixth Edition, University of Michigan, Ann Arbor, Michigan, February 1980, (updated June 1980).

2. Sonquist, John A., Elizabeth L. Bake, and James N. Morgan, "Searching for Structure", University of Michigan, Ann Arbor, Michigan, 1973.

3. Vaughan, R.G., T. Sowerbutts, J. Hennessy, and A. Lee, "Detection of Important Interactions Among Factors - A Useful Technique for Traffic Safety Research", Australian Road Research Board Proceedings, Volume 8, Session 27, Victoria, Australia, 1976.

4. Golomb, D. Henry and James O'Day, "An Aid Analysis of Texas Traffic Accident Data Before and During the Energy Crisis", HIT LAB reports, Volume 5, Number 7, University of Michigan, Highway Safety Research Institute, Ann Arbor, Michigan, March 1975.

5. Cleveland, Donald E., and Ryuichi Kitamura, "Macroscopic Modeling of Two-Lane Rural Roadside Accidents", Transportation Research Record No. 681, Transportation Research Board, Washington, D.C., 1978.

6. Parker, Martin R., et al., "Geometric Treatments for Reducing Passing Accidents at Rural Intersections on Two-Lane Highways", draft final report prepared for the Federal Highway Administration, Washington, D.C., June, 1982.

APPENDIX G - MULTIPLE REGRESSION RESULTS

Introduction

Multiple linear regression analysis was utilized to identify relationships between variables that explained the greatest amount of accident variation in the accident frequency and rate for each functional roadway class. The selection of independent variables used for analysis input was based upon the literature review, the identification work performed in the macroscopic and branching analyses, and the experience of the research team members. From ten to twenty independent variables were included in each stepwise multiple regression test. A final selection of the most meaningful independent variables was made based upon the explained variance, i.e., R^2, the overall F statistic, the magnitude of the standard error, and the calculated t value for each regression coefficient.

Background

Regression analysis is a technique for determining the best fit equation to a set of observed data. The equation developed using the method of least squares can then be used to predict future outcomes given estimates of the independent variables.

In developing regression equations, it is important to remove independent variables with a high degree of correlation, as these variables decrease the validity of predictions. Research in the area of error propagation has shown that errors committed in the estimation of the independent variables are propagated in the prediction and, further, the effect is significantly more adverse when the independent variables are highly correlated. In addition to the problem of collinearity, precautions were taken to avoid typical misuses of regression techniques. For example, a complete analysis of the residuals was performed for each equation examined.

Regression analysis was conducted utilizing the Statistical Package for the Social Sciences (SPSS) subprogram NEW REGRESSION. NEW REGRESSION allows the options of simple multiple regression, regression with hierarchical inclusion of independent variables, stepwise inclusion of the independent variable using forward inclusion, backward elimination of variables, forced entry, and forced removal of variables. In addition, residuals and predicted values can be calculated as well as special treatments applied in the cases where there are missing data. Through the use of data transformation statements, nonlinear models can also be developed with the subprogram.

Results Using Accident Frequency For Each Roadway Classification

For each of the four urban arterial roadway groups included in the data base, i.e., two-lane, two-way; one-way; multilane divided; and multilane undivided regression equations were developed using annual accident frequency as a dependent variable. The regression results, including the mean values for the dependent and independent variables, the correlation coefficients, and the statistics for the stepwise development of the regression equations are shown in Tables 54 through 57.

Results Using Accident Rate For Each Roadway Classification

The details of the regression equations developed with accident rate as a dependent variable is presented in Tables 58 through 61.

Table 54. Regression results for two-lane, two-way segments using annual accident frequency.

* * * * M U L T I P L E   R E G R E S S I O N * * * *

VARIABLE LIST NUMBER 1. LISTWISE DELETION OF MISSING DATA.

	MEAN	STD DEV	LABEL
VAD10	2.503	3.980	AVG ACCIDENT FREQ
VACO1	9064.059	5323.670	ADT
VATO4	6.304	4.825	NO. OF TRAFFIC SIGNS
VAT18	0.186	0.457	NO. OF INTER SIG
VAT17	4.983	3.627	NO. OF DRIVEWAYS
VAT38	4.320	3.095	UTILITY POLES

N OF CASES = 3459

CORRELATION

	VAD10	VACO1	VATO4	VAT18	VAT17	VAT38
VAD10	1.000	0.327	0.317	0.178	0.080	0.254
VACO1	0.327	1.000	0.165	0.070	0.052	0.121
VATO4	0.317	0.165	1.000	0.266	0.184	0.447
VAT18	0.178	0.070	0.266	1.000	0.024	0.257
VAT17	0.080	0.052	0.184	0.024	1.000	0.249
VAT38	0.254	0.121	0.447	0.257	0.249	1.000

Table 54. Regression results for two-lane, two-way segments using annual accident frequency (Continued).

* * * * M U L T I P L E   R E G R E S S I O N * * * *

EQUATION NUMBER 1.

DEPENDENT VARIABLE.. VAD10 AVG ACCIDENT FREQ

BEGINNING BLOCK NUMBER 1. METHOD: STEPWISE

VARIABLE(S) ENTERED ON STEP NUMBER 1.. VACO1 ADT

MULTIPLE R	0.32696		
R SQUARE	0.10690	R SQUARE CHANGE	0.10690
ADJUSTED R SQUARE	0.10665	F CHANGE	413.80547
STANDARD ERROR	3.76185	SIGNIF F CHANGE	0.0000

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	1	5855.98096	5855.98096
RESIDUAL	3457	48921.84272	14.15153

F = 413.80547 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
VACO1	0.24444E-03	0.1202E-04	0.22088E-03	0.26800E-03	0.32696	20.342	0.0000
(CONSTANT)	0.28691	0.12631	0.03926	0.53457		2.271	0.0232

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
VAT04	0.26998	0.28178	0.97289	17.265	0.0000
VAT18	0.15569	0.16434	0.99510	9.795	0.0000
VAT17	0.06360	0.06721	0.99734	3.960	0.0001
VAT38	0.21781	0.22878	0.98532	13.816	0.0000

Table 54. Regression results for two-lane, two-way segments using annual accident frequency (Continued).

* * * * M U L T I P L E   R E G R E S S I O N * * * *

DEPENDENT VARIABLE.. VAD10 AVG ACCIDENT FREQ

VARIABLE(S) ENTERED ON STEP NUMBER 2.. VAT04 NO. OF TRAFFIC SIGNS

MULTIPLE R	0.42168		
R SQUARE	0.17782	R SQUARE CHANGE	0.07091
ADJUSTED R SQUARE	0.17734	F CHANGE	298.08160
STANDARD ERROR	3.60994	SIGNIF F CHANGE	0.0000

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	2	9740.47326	4870.23663
RESIDUAL	3456	45037.35043	13.03164

F = 373.72398 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
VAC01	0.21121E-03	0.1159E-04	0.18828E-03	0.23413E-03	0.28251	18.066	0.0000
VAT04	0.22272	0.01290	0.19743	0.24802	0.26998	17.265	0.0000
(CONSTANT)	-0.81584	0.13701	-1.[illegible]47	-0.54722		-5.955	0.0000

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
VAT18	0.09279	0.09861	0.90766	5.824	0.0000
VAT17	0.01666	0.01806	0.94206	1.061	0.2885
VAT38	0.12457	0.12274	0.788[illegible]	7.270	0.0000

Table 54. Regression results for two-lane, two-way segments using annual accident frequency (Continued).

* * * * MULTIPLE REGRESSION * * * *

DEPENDENT VARIABLE.. VAD10 AVG ACCIDENT FREQ

VARIABLE(S) ENTERED ON STEP NUMBER 3.. VAT38 UTILITY POLES

MULTIPLE R	0.43613		
R SQUARE	0.19021	R SQUARE CHANGE	0.01239
ADJUSTED R SQUARE	0.18950	F CHANGE	52.85038
STANDARD ERROR	3.58316	SIGNIF F CHANGE	0.0000

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	3	10419.02016	3473.00672
RESIDUAL	3455	44358.80352	12.83902

F = 270.50410 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
VAC01	0.20665E-03	0.1162E-04	0.18386E-03	0.22943E-03	0.27641	17.782	0.0000
VAT04	0.17766	0.01423	0.14977	0.20555	0.21536	12.488	0.0000
VAT38	0.16018	0.02203	0.11698	0.20338	0.12457	7.270	0.0000
(CONSTANT)	-1.18240	0.14504	-1.46677	-0.89802		-8.152	0.0000

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
VAT18	0.07634	0.08070	0.76498	4.758	0.0000
VAT17	-0.00491	-0.00527	0.76976	-0.310	0.7568

Table 54. Regression results for two-lane, two-way segments using annual accident frequency (Continued).

* * * * M U L T I P L E   R E G R E S S I O N * * * *

DEPENDENT VARIABLE.. VAD10   AVG ACCIDENT FREQ

VARIABLE(S) ENTERED ON STEP NUMBER 4..   VAT18   NO. OF INTER SIG

MULTIPLE R	0.44213			ANALYSIS OF VARIANCE			
R SQUARE	0.19548	R SQUARE CHANGE	0.00527		DF	SUM OF SQUARES	MEAN SQUARE
ADJUSTED R SQUARE	0.19455	F CHANGE	22.63970	REGRESSION	4	10707.88241	2676.97060
STANDARD ERROR	3.57199	SIGNIF F CHANGE	0.0000	RESIDUAL	3454	44069.94128	12.75910

F = 209.80869   SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
VACO1	0.20559E-03	0.1159E-04	0.18287E-03	0.22831E-03	0.27500	17.744	0.0000
VATO4	0.16591	0.01440	0.13769	0.19413	0.20111	11.526	0.0000
VAT38	0.14333	0.02225	0.09970	0.18695	0.11146	6.442	0.0000
VAT18	0.66461	0.13968	0.39075	0.93848	0.07634	4.758	0.0000
(CONSTANT)	-1.14989	0.14475	-1.43369	-0.86609		-7.944	0.0000

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
VAT17	-0.523E-03	-0.00056	0.74822	-0.033	0.9737

FOR BLOCK NUMBER 1   PIN = 0.050 LIMITS REACHED.

Table 55. Regression results for one-way segments using annual accident frequency.

* * * * M U L T I P L E R E G R E S S I O N * * * *

VARIABLE LIST NUMBER 1. LISTWISE DELETION OF MISSING DATA.

	MEAN	STD DEV	LABEL
VAD10	3.724	5.109	AVG ACCIDENT FREQ
VAC01	10707.617	6677.550	ADT
VAT07	2.133	0.922	NO. OF THRU LANES
VAT18	0.435	0.766	NO. OF INTER SIG
VAT04	10.050	6.664	NO. OF TRAFFIC SIGNS
VAT19	1.163	1.112	NO. OF INTER NSIG
VAT38	4.895	2.890	UTILITY POLES
VAT17	4.318	3.426	NO. OF DRIVEWAYS
VAT21	30.380	4.300	POSTED SPEED

N OF CASES = 724

CORRELATION

	VAD10	VAC01	VAT07	VAT18	VAT04	VAT19	VAT38	VAT17	VAT21
VAD10	1.000	0.422	0.351	0.170	0.149	-0.060	0.254	0.004	0.050
VAC01	0.422	1.000	0.581	0.113	0.109	-0.048	0.239	0.021	0.356
VAT07	0.351	0.581	1.000	0.245	0.444	0.049	0.210	0.149	0.191
VAT18	0.170	0.113	0.245	1.000	0.313	-0.330	0.129	0.145	-0.113
VAT04	0.149	0.109	0.444	0.313	1.000	0.223	0.263	0.330	-0.154
VAT19	-0.060	-0.048	0.049	-0.330	0.223	1.000	0.031	0.210	-0.035
VAT38	0.254	0.239	0.210	0.129	0.263	0.031	1.000	0.242	-0.202
VAT17	0.004	0.021	0.149	0.145	0.330	0.210	0.242	1.000	-0.155
VAT21	0.050	0.356	0.191	-0.113	-0.154	-0.035	-0.202	-0.155	1.000

Table 55. Regression results for one-way segments using annual accident frequency (Continued).

* * * * M U L T I P L E   R E G R E S S I O N * * * *

EQUATION NUMBER 1.

DEPENDENT VARIABLE.. VAD10 AVG ACCIDENT FREQ

BEGINNING BLOCK NUMBER 1. METHOD: STEPWISE

VARIABLE(S) ENTERED ON STEP NUMBER 1.. VAC01 ADT

MULTIPLE R	0.42237		
R SQUARE	0.17840	R SQUARE CHANGE	0.17840
ADJUSTED R SQUARE	0.17726	F CHANGE	156.77369
STANDARD ERROR	4.63425	SIGNIF F CHANGE	0.0000

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	1	3366.92070	3366.92070
RESIDUAL	722	15505.89773	21.47631

F = 156.77369 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
VAC01	0.32317E-03	0.2581E-04	0.27250E-03	0.37384E-03	0.42237	12.521	0.0000
(CONSTANT)	0.26384	0.32564	-0.37547	0.90316		0.810	0.4181

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
VAT07	0.16003	0.14375	0.66292	3.900	0.0001
VAT18	0.12389	0.13580	0.98718	3.680	0.0003
VAT04	0.10394	0.11398	0.98803	3.081	0.0021
VAT19	-0.03965	-0.04369	0.99768	-1.174	0.2407
VAT38	0.16265	0.17423	0.94271	4.751	0.0000
VAT17	-0.00434	-0.00479	0.99956	-0.129	0.8977
VAT21	-0.11527	-0.11884	0.87330	-3.214	0.0014

Table 55. Regression results for one-way segments using annual accident frequency (Continued).

* * * * M U L T I P L E R E G R E S S I O N * * * *

DEPENDENT VARIABLE.. VAD10 AVG ACCIDENT FREQ

VARIABLE(S) ENTERED ON STEP NUMBER 2.. VAT38 UTILITY POLES

MULTIPLE R	0.45093		
R SQUARE	0.20334	R SQUARE CHANGE	0.02494
ADJUSTED R SQUARE	0.20113	F CHANGE	22.57164
STANDARD ERROR	4.56654	SIGNIF F CHANGE	0.0000

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	2	3837.61317	1918.80658
RESIDUAL	721	15035.20526	20.85327

F = 92.01468 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
VAC01	0.29338E-03	0.2619E-04	0.24196E-03	0.34481E-03	0.38344	11.200	0.0000
VAT38	0.28756	0.06053	0.16873	0.40639	0.16265	4.751	0.0000
(CONSTANT)	-0.82483	0.39430	-1.59895	-0.05071		-2.092	0.0368

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
VAT07	0.14384	0.13069	0.64844	3.537	0.0004
VAT18	0.10834	0.11992	0.93223	3.241	0.0012
VAT04	0.06905	0.07454	0.88574	2.006	0.0453
VAT19	-0.04669	-0.05220	0.93961	-1.403	0.1612
VAT17	-0.04562	-0.04956	0.88653	-1.331	0.1835
VAT21	-0.06873	-0.06827	0.77241	-1.836	0.0668

Table 55. Regression results for one-way segments using annual accident frequency (Continued).

* * * * M U L T I P L E   R E G R E S S I O N * * * *

DEPENDENT VARIABLE.. VA010   AVG ACCIDENT FREQ

VARIABLE(S) ENTERED ON STEP NUMBER 3.. VAT07   NO. OF THRU LANES

MULTIPLE R	0.46578			ANALYSIS OF VARIANCE			
R SQUARE	0.21695	R SQUARE CHANGE	0.01361		DF	SUM OF SQUARES	MEAN SQUARE
ADJUSTED R SQUARE	0.21368	F CHANGE	12.51024	REGRESSION	3	4094.39326	1364.79775
STANDARD ERROR	4.53052	SIGNIF F CHANGE	0.0004	RESIDUAL	720	14778.42517	20.52559

F = 66.49250   SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
VAC01	0.23146E-03	0.31133E-04	0.16994E-03	0.29298E-03	0.30251	7.387	0.0000
VAT38	0.26850	0.06029	0.15013	0.38686	0.15187	4.453	0.0000
VAT07	0.79664	0.22523	0.35445	1.23882	0.14384	3.537	0.0004
(CONSTANT)	-1.76738	0.47333	-2.69666	-0.83810		-3.734	0.0002

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
VAT18	0.08702	0.09490	0.62737	2.556	0.0108
VAT04	0.01643	0.01585	0.51611	0.425	0.6709
VAT19	-0.05783	-0.06494	0.64216	-1.745	0.0814
VAT17	-0.06527	-0.07069	0.63949	-1.900	0.0578
VAT21	-0.06984	-0.06998	0.56484	-1.881	0.0604

Table 55. Regression results for one-way segments using annual accident frequency (Continued).

* * * M U L T I P L E R E G R E S S I O N * * * *

DEPENDENT VARIABLE.. VAD10 AVG ACCIDENT FREQ

VARIABLE(S) ENTERED ON STEP NUMBER 4.. VAT16 NO. OF INTER SIG

MULTIPLE R	0.47328		
R SQUARE	0.22400	R SQUARE CHANGE	0.00705
ADJUSTED R SQUARE	0.21968	F CHANGE	6.53395
STANDARD ERROR	4.51321	SIGNIF F CHANGE	0.0108

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	4	4227.48357	1056.87089
RESIDUAL	719	14645.33485	20.36903

F = 51.88616 SIGNIF F = 0.0000

VARIABLES IN THE EQUATION

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
VAC01	0.23543E-03	0.3125E-04	0.17407E-03	0.29679E-03	0.30770	7.533	0.0000
VAT38	0.25491	0.06030	0.13654	0.37329	0.14419	4.228	0.0000
VAT07	0.67070	0.22972	0.21971	1.12169	0.12110	2.920	0.0036
VAT18	0.58059	0.22713	0.13467	1.02652	0.08702	2.556	0.0108
(CONSTANT)	-1.72743	0.47178	-2.65367	-0.80119		-3.661	0.0003

VARIABLES NOT IN THE EQUATION

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
VAT04	-0.00535	-0.00505	0.51146	-0.135	0.8923
VAT19	-0.03124	-0.03283	0.60775	-0.880	0.3791
VAT17	-0.07405	-0.08022	0.61698	-2.157	0.0314
VAT21	-0.05730	-0.05706	0.56483	-1.531	0.1261

Table 55. Regression results for one-way segments using annual accident frequency (Continued).

* * * * M U L T I P L E   R E G R E S S I O N * * * *

DEPENDENT VARIABLE.. VA010 AVG ACCIDENT FREQ

VARIABLE(S) ENTERED ON STEP NUMBER 5.. VAT17 NO. OF DRIVEWAYS

MULTIPLE R	0.47853		
R SQUARE	0.22899	R SQUARE CHANGE	0.00499
ADJUSTED R SQUARE	0.22362	F CHANGE	4.65069
STANDARD ERROR	4.50179	SIGNIF F CHANGE	0.0314

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	5	4321.73506	864.34701
RESIDUAL	718	14551.08336	20.26613

F = 42.64982 SIGNIF F = 0.0000

------------------ VARIABLES IN THE EQUATION ------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
VAC01	0.22776E-03	0.3138E-04	0.16616E-03	0.28937E-03	0.29768	7.259	0.0000
VAT38	0.28499	0.06174	0.16378	0.40620	0.16120	4.616	0.0000
VAT07	0.73482	0.23106	0.28119	1.18844	0.13268	3.180	0.0015
VAT18	0.62622	0.22755	0.17948	1.07295	0.09386	2.752	0.0061
VAT17	-0.11043	0.05121	-0.21097	-0.00990	-0.07405	-2.157	0.0314
(CONSTANT)	-1.47233	0.48523	-2.42497	-0.51969		-3.034	0.0025

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
VAT04	0.01539	0.01419	0.51132	0.380	0.7041
VAT19	-0.01308	-0.01336	0.60324	-0.358	0.7206
VAT21	-0.06556	-0.06519	0.56183	-1.749	0.0807

FOR BLOCK NUMBER 1 PIN = 0.050 LIMITS REACHED.

Table 56. Regression results for multilane divided segments using annual accident frequency.

* * * * M U L T I P L E   R E G R E S S I O N * * * *

VARIABLE LIST NUMBER 1. LISTWISE DELETION OF MISSING DATA.

	MEAN	STD DEV	LABEL
VAD10	4.732	6.213	AVG ACCIDENT FREQ
VACO1	17912.078	9227.664	ADT
VAT18	0.382	0.587	NO. OF INTER SIG
VAT19	0.852	0.801	NO. OF INTER NSIG
VATO4	8.536	5.261	NO. OF TRAFFIC SIGNS
VAT38	7.392	4.939	UTILITY POLES
VAT17	5.335	3.920	NO. OF DRIVEWAYS
VATO5	14.670	10.369	LARGE OBSTACLES

N OF CASES = 1997

CORRELATION

	VAD10	VACO1	VAT18	VAT19	VATO4	VAT38	VAT17	VATO5
VAD10	1.000	0.254	0.198	-0.034	0.235	0.128	0.061	0.105
VACO1	0.254	1.000	0.093	-0.004	0.130	0.176	0.087	0.063
VAT18	0.198	0.093	1.000	-0.259	0.288	0.171	-0.012	0.224
VAT19	-0.034	-0.004	-0.259	1.000	0.091	0.060	0.213	0.127
VATO4	0.235	0.130	0.288	0.091	1.000	0.234	0.071	0.294
VAT38	0.128	0.176	0.171	0.060	0.234	1.000	0.264	0.770
VAT17	0.061	0.087	-0.012	0.213	0.071	0.264	1.000	0.263
VATO5	0.105	0.063	0.224	0.127	0.294	0.770	0.263	1.000

Table 56. Regression results for multilane divided segments using annual accident frequency (Continued).

* * * * M U L T I P L E   R E G R E S S I O N * * * *

EQUATION NUMBER 1.

DEPENDENT VARIABLE.. VAD10 AVG ACCIDENT FREQ

BEGINNING BLOCK NUMBER 1. METHOD: STEPWISE

VARIABLE(S) ENTERED ON STEP NUMBER 1.. VACO1 ADT

MULTIPLE R	0.25426		
R SQUARE	0.06465	R SQUARE CHANGE	0.06465
ADJUSTED R SQUARE	0.06418	F CHANGE	137.88196
STANDARD ERROR	6.01055	SIGNIF F CHANGE	0.0000

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	1	4981.22809	4981.22809
RESIDUAL	1995	72072.88007	36.12676

F = 137.88196 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
VACO1	0.17120E-03	0.1458E-04	0.14260E-03	0.19[illegible]E-03	0.25426	11.742	0.0000
(CONSTANT)	1.66510	0.29375	1.08901	2.24119		5.668	0.0000

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
VAT18	0.17573	0.18091	0.99127	8.214	0.0000
VAT19	-0.03338	-0.03451	0.99998	-1.542	0.1232
VAT04	0.20570	0.21090	0.98320	9.634	0.0000
VAT38	0.08567	0.08719	0.96886	3.908	0.0001
VAT17	0.03874	0.03991	0.99244	1.783	0.0747
VAT05	0.08951	0.09237	0.99603	4.142	0.0000

Table 56. Regression results for multilane divided segments using annual accident frequency (Continued).

* * * * MULTIPLE REGRESSION * * * *

DEPENDENT VARIABLE.. VAD10 AVG ACCIDENT FREQ

VARIABLE(S) ENTERED ON STEP NUMBER 3.. VAT18 NO. OF INTER SIG

MULTIPLE R	0.34837			ANALYSIS OF VARIANCE			
R SQUARE	0.12136	R SQUARE CHANGE	0.01511		DF	SUM OF SQUARES	MEAN SQUARE
ADJUSTED R SQUARE	0.12004	F CHANGE	34.28351	REGRESSION	3	9351.52793	3117.17598
STANDARD ERROR	5.82839	SIGNIF F CHANGE	0.0000	RESIDUAL	1993	67702.58022	33.97019

F = 91.76211 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE	INTRVL B	BETA	T	SIG T
VAC01	0.14830E-03	0.1428E-04	0.12029E-03	0.17631E-03	0.22025	10.383	0.0000
VAT04	0.20040	0.02604	0.14932	0.25147	0.16968	7.695	0.0000
VAT18	1.36156	0.23254	0.90552	1.81760	0.12859	5.855	0.0000
(CONSTANT)	-0.15483	0.33735	-0.81642	0.50676		-0.459	0.6463

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
VAT19	-0.01748	-0.01772	0.83279	-0.791	0.4289
VAT38	0.03001	0.03060	0.87684	1.366	0.1720
VAT17	0.03122	0.03310	0.90235	1.478	0.1396
VAT05	0.01408	0.01418	0.85295	0.633	0.5268

FOR BLOCK NUMBER 1 PIN = 0.050 LIMITS REACHED.

Table 56. Regression results for multilane divided segments using annual accident frequency (Continued).

* * * * M U L T I P L E   R E G R E S S I O N * * * *

DEPENDENT VARIABLE.. VAD10 AVG ACCIDENT FREQ

VARIABLE(S) ENTERED ON STEP NUMBER 3.. VAT18 NO. OF INTER SIG

MULTIPLE R	0.34837		
R SQUARE	0.12136	R SQUARE CHANGE	0.01511
ADJUSTED R SQUARE	0.12004	F CHANGE	34.28351
STANDARD ERROR	5.82839	SIGNIF F CHANGE	0.0000

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	3	9351.52793	3117.17598
RESIDUAL	1993	67702.58022	33.97019

F = 91.76211 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
VACO1	0.14830E-03	0.1428E-04	0.12029E-03	0.17631E-03	0.22025	10.383	0.0000
VATO4	0.20040	0.02604	0.14932	0.25147	0.16960	7.695	0.0000
VAT18	1.36156	0.23254	0.90552	1.81760	0.12859	5.855	0.0000
(CONSTANT)	-0.15483	0.33735	-0.81642	0.50676		-0.459	0.6463

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
VAT19	-0.01748	-0.01772	0.83279	-0.791	0.4289
VAT38	0.03001	0.03060	0.87684	1.366	0.1720
VAT17	0.03122	0.03310	0.90235	1.478	0.1396
VATO5	0.01408	0.01418	0.85295	0.633	0.5268

FOR BLOCK NUMBER 1 PIN = 0.050 LIMITS REACHED.

Table 57. Regression results for multilane undivided segments using annual accident frequency (Continued).

**** MULTIPLE REGRESSION ****

EQUATION NUMBER 1.

DEPENDENT VARIABLE.. VAD10 AVG ACCIDENT FREQ

BEGINNING BLOCK NUMBER 1. METHOD: STEPWISE

VARIABLE(S) ENTERED ON STEP NUMBER 1.. VACO1 ADT

MULTIPLE R	0.24199		
R SQUARE	0.05856	R SQUARE CHANGE	0.05856
ADJUSTED R SQUARE	0.05818	F CHANGE	155.12478
STANDARD ERROR	5.45507	SIGNIF F CHANGE	0.0000

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	1	4616.16840	4616.16840
RESIDUAL	2494	74215.89048	29.75777

F = 155.12478 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
VACO1	0.19339E-03	0.1553E-04	0.16294E-03	0.22383E-03	0.24199	12.455	0.0000
(CONSTANT)	1.51174	0.25455	1.01259	2.01089		5.939	0.0000

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
VAT18	0.19997	0.20478	0.98730	10.446	0.0000
VAT38	0.18600	0.19088	0.99147	9.709	0.0000
VAT19	-0.04122	-0.04239	0.99578	-2.118	0.0342
VAT17	0.04406	0.04527	0.99387	2.263	0.0237

Table 57. Regression results for multilane undivided segments using annual accident frequency (Continued).

* * * * M U L T I P L E   R E G R E S S I O N * * * *

DEPENDENT VARIABLE.. VAD10 AVG ACCIDENT FREQ

VARIABLE(S) ENTERED ON STEP NUMBER 2.. VAT18 NO. OF INTER SIG

MULTIPLE R	0.31311		
R SQUARE	0.09804	R SQUARE CHANGE	0.03948
ADJUSTED R SQUARE	0.09731	F CHANGE	109.11824
STANDARD ERROR	5.34054	SIGNIF F CHANGE	0.0000

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	2	7728.36659	3864.18329
RESIDUAL	2493	71103.69229	28.52134

F = 135.48395 SIGNIF F = 0.0000

------------------------------- VARIABLES IN THE EQUATION -------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
VAC01	0.17538E-03	0.1530E-04	0.14538E-03	0.20538E-03	0.21945	11.464	0.0000
VAT18	1.86735	0.17876	1.51681	2.21789	0.19997	10.446	0.0000
(CONSTANT)	1.00333	0.25391	0.50542	1.50123		3.951	0.0001

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
VAT38	0.13782	0.13755	0.89473	6.932	0.0000
VAT19	0.02553	0.02540	0.88498	1.268	0.2049
VAT17	0.04319	0.04534	0.98126	2.266	0.0236

Table 57. Regression results for multilane undivided segments using annual accident frequency (Continued).

* * * * M U L T I P L E   R E G R E S S I O N * * * *

DEPENDENT VARIABLE.. VAD10 AVG ACCIDENT FREQ

VARIABLE(S) ENTERED ON STEP NUMBER 3.. VAT38 UTILITY POLES

MULTIPLE R	0.33927		
R SQUARE	0.11510	R SQUARE CHANGE	0.01707
ADJUSTED R SQUARE	0.11404	F CHANGE	48.05948
STANDARD ERROR	5.29083	SIGNIF F CHANGE	0.0000

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	3	9073.69194	3024.56398
RESIDUAL	2492	69758.36694	27.99292

F = 108.04745 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE	INTRVL B	BETA	T	SIG T
VAC01	0.16902E-03	0.1518E-04	0.13924E-03	0.19879E-03	0.21149	11.131	0.0000
VAT18	1.47243	0.18604	1.10763	1.83723	0.15768	7.915	0.0000
VAT38	0.24177	0.03487	0.17338	0.31015	0.13782	6.932	0.0000
(CONSTANT)	-0.16226	0.30257	-0.75557	0.43105		-0.536	0.5918

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
VAT19	0.00514	0.00510	0.78533	0.255	0.7990
VAT17	0.02721	0.02861	0.88443	1.429	0.1532

FOR BLOCK NUMBER 1 PIN = 0.050 LIMITS REACHED.

Table 58. Regression results for two-lane, two-way segments. using accident rate.

* * * * M U L T I P L E   R E G R E S S I O N * * * *

VARIABLE LIST NUMBER 1. LISTWISE DELETION OF MISSING DATA.

	MEAN	STD DEV	LABEL
VAC17	8 064	10.929	TOT ACCIDENT RATE
VAC01	9064.059	5323.670	ADT
VAT04	6.304	4.825	NO. OF TRAFFIC SIGNS
VAT38	4.320	3.095	UTILITY POLES
VAT05	10.346	7.586	LARGE OBSTACLES

N OF CASES = 3459

CORRELATION

	VAC17	VAC01	VAT04	VAT38	VAT05
VAC17	1.000	-0.078	0.258	0.214	0.178
VAC01	-0.078	1.000	0.165	0.121	0.109
VAT04	0.258	0.165	1.000	0.447	0.469
VAT38	0.214	0.121	0.447	1.000	0.646
VAT05	0.178	0.109	0.469	0.646	1.000

Table 58. Regression results for two-lane, two-way segments. using accident rate (Continued).

*** * * * M U L T I P L E   R E G R E S S I O N * * * ***

EQUATION NUMBER 1.

DEPENDENT VARIABLE.. VAC17 TOT ACCIDENT RATE

BEGINNING BLOCK NUMBER 1. METHOD: STEPWISE

VARIABLE(S) ENTERED ON STEP NUMBER 1.. VAT04 NO. OF TRAFFIC SIGNS

MULTIPLE R	0.25794		
R SQUARE	0.06653	R SQUARE CHANGE	0.06653
ADJUSTED R SQUARE	0.06626	F CHANGE	246.39508
STANDARD ERROR	10.56032	SIGNIF F CHANGE	0.0

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	1	27478.07212	27478.07212
RESIDUAL	3457	385525.94415	111.52038

F = 246.39508 SIGNIF F = 0.0

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
VAT04	0.58428	0.03722	0.51130	0.65726	0.25794	15.697	0.0000
(CONSTANT)	4.38038	0.29546	3.80108	4.95968		14.825	0.0000

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
VAC01	-0.12364	-0.12623	0.97289	-7.480	0.0000
VAT38	0.12300	0.11391	0.80059	6.740	0.0000
VAT05	0.07340	0.06709	0.77978	3.953	0.0001

Table 58. Regression results for two-lane, two-way segments. using accident rate (Continued).

* * * * M U L T I P L E R E G R E S S I O N * * * *

DEPENDENT VARIABLE.. VAC17 TOT ACCIDENT RATE

VARIABLE(S) ENTERED ON STEP NUMBER 2.. VACO1 ADT

MULTIPLE R	0.28532			ANALYSIS OF VARIANCE			
R SQUARE	0.08141	R SQUARE CHANGE	0.01437		DF	SUM OF SQUARES	MEAN SQUARE
ADJUSTED R SQUARE	0.08087	F CHANGE	55.95611	REGRESSION	2	33620.70234	16810.35117
STANDARD ERROR	10.47737	SIGNIF F CHANGE	0.0	RESIDUAL	3456	379383.31392	109.77526

F = 153.13424 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
VATO4	0.63040	0.03744	0.55699	0.70381	0.27830	16.837	0.0000
VACO1	-0.25382E-03	0.3393E-04	-0.32035E-03	-0.18729E-03	-0.12364	-7.480	0.0000
(CONSTANT)	6.39028	0.39765	5.61062	7.16993		16.070	0.0000

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
VAT38	0.13073	0.12187	0.78818	7.217	0.0000
VATO5	0.07847	0.07225	0.76669	4.258	0.0000

Table 58. Regression results for two-lane, two-way segments. using accident rate (Continued).

* * * * M U L T I P L E   R E G R E S S I O N * * * *

DEPENDENT VARIABLE.. VAC17 TOT ACCIDENT RATE

VARIABLE(S) ENTERED ON STEP NUMBER 3.. VAT38 UTILITY POLES

MULTIPLE R	0.30830		
R SQUARE	0.09505	R SQUARE CHANGE	0.01364
ADJUSTED R SQUARE	0.09426	F CHANGE	52.08907
STANDARD ERROR	10.40078	SIGNIF F CHANGE	0.0000

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	3	39255.49664	13085.16555
RESIDUAL	3455	373748.51963	108.17613

F = 120.96167 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE	INTRVL B	BETA	T	SIG T
VAT04	0.50055	0.04129	0.41958	0.58151	0.22097	12.122	0.0000
VAC01	-0.26695E-03	0.3373E-04	-0.33309E-03	-0.20082E-03	-0.13004	-7.914	0.0000
VAT38	0.46159	0.06396	0.33619	0.58698	0.13073	7.217	0.0000
(CONSTANT)	5.33399	0.42100	4.50855	6.15943		12.670	0.0000

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
VAT05	0.00787	0.00609	0.54194	0.358	0.7204

FOR BLOCK NUMBER 1 PIN = 0.050 LIMITS REACHED.

Table 59. Regression results for one-way segments using accident rate.

* * * * MULTIPLE REGRESSION * * * *

VARIABLE LIST NUMBER 1. LISTWISE DELETION OF MISSING DATA.

	MEAN	STD DEV	LABEL
VAC17	10.028	11.511	TOT ACCIDENT RATE
VAC01	10583.189	6672.905	ADT
VAT25	1.689	1.654	CURB LANE USAGE
VAT05	9.987	6.260	LANGF OBSTACLES
VAT24	1.892	0.799	LAND USE
VAT18	0.447	0.774	NO. OF INTER SIG
VAT19	1.194	1.113	NO. OF INTER NSIG
VAT38	4.909	2.918	UTILITY POLES
VAT17	4.390	3.407	NO. OF DRIVEWAYS
VAT21	30.477	4.267	POSTED SPEED

N OF CASES = 702

CORRELATION

	VAC17	VAC01	VAT25	VAT05	VAT24	VAT18	VAT19	VAT38	VAT17	VAT21
VAC17	1.000	-0.093	0.109	0.048	-0.116	0.104	0.029	0.130	0.017	-0.071
VAC01	-0.093	1.000	0.013	0.058	-0.094	0.125	-0.034	0.252	0.032	0.381
VAT25	0.109	0.013	1.000	0.149	-0.025	0.138	-0.104	0.249	0.018	-0.320
VAT05	0.048	0.058	0.149	1.000	-0.080	0.069	0.049	0.601	0.212	-0.283
VAT24	-0.116	-0.094	-0.025	-0.080	1.000	-0.233	0.077	-0.144	-0.132	0.157
VAT18	0.104	0.125	0.138	0.069	-0.233	1.000	-0.351	0.129	0.139	-0.127
VAT19	0.029	-0.034	-0.104	0.049	0.077	-0.351	1.000	0.023	0.189	-0.059
VAT38	0.130	0.252	0.249	0.601	-0.144	0.129	0.023	1.000	0.237	-0.211
VAT17	0.017	0.032	0.018	0.212	-0.132	0.139	0.189	0.237	1.000	-0.182
VAT21	-0.071	0.381	-0.320	-0.283	0.157	-0.127	-0.059	-0.211	-0.182	1.000

Table 59. Regression results for one-way segments using accident rate (Continued).

**** M U L T I P L E   R E G R E S S I O N ****

EQUATION NUMBER 1.

DEPENDENT VARIABLE.. VAC17   TOT ACCIDENT RATE

BEGINNING BLOCK NUMBER 1. METHOD: STEPWISE

VARIABLE(S) ENTERED ON STEP NUMBER 1.. VAT38   UTILITY POLES

MULTIPLE R	0.12999		
R SQUARE	0.01690	R SQUARE CHANGE	0.01690
ADJUSTED R SQUARE	0.01549	F CHANGE	12.03125
STANDARD ERROR	11.42099	SIGNIF F CHANGE	0.0006

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	1	1569.34506	1569.34506
RESIDUAL	700	91307.34759	130.43907

F = 12.03125   SIGNIF F = 0.0006

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
VAT38	0.51279	0.14784	0.22253	0.80305	0.12999	3.469	0.0006
(CONSTANT)	7.51102	0.84407	5.85380	9.16824		8.899	0.0000

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
VAC01	-0.13414	-0.13091	0.93634	-3.491	0.0005
VAT25	0.08138	0.07950	0.93820	2.109	0.0353
VAT05	-0.04747	-0.03825	0.63820	-1.012	0.3119
VAT24	-0.09952	-0.09933	0.97917	-2.639	0.0085
VAT18	0.08905	0.08905	0.98328	2.364	0.0184
VAT19	0.02566	0.02587	0.99945	0.684	0.4941
VAT17	-0.01469	-0.01439	0.94387	-0.381	0.7036
VAT21	-0.04596	-0.04530	0.95534	-1.199	0.2310

Table 59. Regression results for one-way segments using accident rate (Continued).

* * * * M U L T I P L E   R E G R E S S I O N * * * *

DEPENDENT VARIABLE.. VAC17   TOT ACCIDENT RATE

VARIABLE(S) ENTERED ON STEP NUMBER 2.. VAC01   ADT

MULTIPLE R	0.18370		
R SQUARE	0.03375	R SQUARE CHANGE	0.01685
ADJUSTED R SQUARE	0.03098	F CHANGE	12.18870
STANDARD ERROR	11.33080	SIGNIF F CHANGE	0.0005

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	2	3134.21497	1567.10749
RESIDUAL	699	89742.47767	128.38695

F = 12.20613   SIGNIF F = 0.0000

------------------ VARIABLES IN THE EQUATION ------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
VAT38	0.64631	0.15157	0.34871	0.94390	0.16383	4.264	0.0000
VAC01	-0.23139E-03	0.6628E-04	-0.36152E-03	-0.10126E-03	-0.13414	-3.491	0.0005
(CONSTANT)	9.30946	0.98242	7.37563	11.23330		9.471	0.0000

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
VAT25	0.07443	0.07323	0.87610	1.940	0.0528
VAT05	-0.06822	-0.05503	0.59074	-1.456	0.1458
VAT24	-0.10782	-0.10834	0.92167	-2.879	0.0041
VAT18	0.10256	0.10298	0.92662	2.735	0.0064
VAT19	0.02036	0.02069	0.93476	0.547	0.5848
VAT17	-0.01864	-0.01841	0.88393	-0.487	0.6267
VAT21	0.01704	0.01682	0.73890	0.444	0.6568

Table 59. Regression results for one-way segments using accident rate (Continued).

* * * * M U L T I P L E   R E G R E S S I O N * * * *

DEPENDENT VARIABLE.. VAC17   TOT ACCIDENT RATE

VARIABLE(S) ENTERED ON STEP NUMBER 3..   VAT24   LAND USE

MULTIPLE R	0.21234		
R SQUARE	0.04509	R SQUARE CHANGE	0.01134
ADJUSTED R SQUARE	0.04098	F CHANGE	8.29017
STANDARD ERROR	11.27217	SIGNIF F CHANGE	0.0041

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	3	4187.57878	1395.85959
RESIDUAL	698	88689.11387	127.06177

F = 10.98568   SIGNIF F = 0.0000

------------------ VARIABLES IN THE EQUATION ------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
VAT38	0.59153	0.15198	0.29313	0.88994	0.14995	3.892	0.0001
VAC01	-0.24285E-03	0.6606E-04	-0.37254E-03	-0.11316E-03	-0.14079	-3.676	0.0003
VAT24	-1.55282	0.53931	-2.61168	-0.49395	-0.10782	-2.879	0.0041
(CONSTANT)	12.63213	1.51357	9.66043	15.60383		8.346	0.0000

------------ VARIABLES NOT IN THE EQUATION ------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
VAT25	0.07528	0.07451	0.86284	1.972	0.0489
VAT05	-0.06806	-0.05523	0.58478	-1.460	0.1447
VAT18	0.08328	0.08217	0.91629	2.177	0.0298
VAT19	0.02891	0.02946	0.91998	0.778	0.4367
VAT17	-0.03030	-0.02995	0.87541	-0.791	0.4291
VAT21	0.04238	0.03704	0.72507	0.979	0.3281

Table 59. Regression results for one-way segments using accident rate (Continued).

* * * * M U L T I P L E   R E G R E S S I O N * * * *

DEPENDENT VARIABLE.. VAC17   TOT ACCIDENT RATE

VARIABLE(S) ENTERED ON STEP NUMBER 4.. VAT18   NO. OF INTER SIG

MULTIPLE R	0.22701		
R SQUARE	0.05153	R SQUARE CHANGE	0.00645
ADJUSTED R SQUARE	0.04609	F CHANGE	4.73796
STANDARD ERROR	11.24211	SIGNIF F CHANGE	0.0298

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	4	4786.38517	1196.59629
RESIDUAL	697	88090.30747	126.38495

F = 9.46787   SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE	INTRVL B	BETA	T	SIG T
VAT38	0.56626	0.15202	0.26778	0.86474	0.14354	3.725	0.0002
VAC01	-0.25509E-03	0.6612E-04	-0.38491E-03	-0.12528E-03	-0.14788	-3.858	0.0001
VAT24	-1.29625	0.55064	-2.37735	-0.21514	-0.09000	-2.354	0.0188
VAT18	1.23911	0.56927	0.12143	2.35680	0.08328	2.177	0.0298
(CONSTANT)	11.84618	1.55212	8.79879	14.89356		7.632	0.0000

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
VAT25	0.06626	0.06533	0.86117	1.727	0.0846
VAT05	-0.06814	-0.05548	0.58265	-1.466	0.1431
VAT19	0.06475	0.06208	0.81731	1.641	0.1012
VAT17	-0.03866	-0.03817	0.87293	-1.008	0.3139
VAT21	0.05592	0.04861	0.71122	1.284	0.1996

FOR BLOCK NUMBER 1 PIN = 0.050 LIMITS REACHED.

Table 60. Regression results for multilane divided segments using accident rate.

* * * * M U L T I P L E   R E G R E S S I O N * * * *

VARIABLE LIST NUMBER 1. LISTWISE DELETION OF MISSING DATA.

	MEAN	STD DEV	LABEL
VAC17	7.827	10.700	TOT ACCIDENT RATE
VACO1	17675.478	9848.004	ADT
VAT18	0.401	0.594	NO. OF INTER SIG
VAT19	0.887	0.811	NO. OF INTER NSIG
VATO4	8.465	5.482	NO. OF TRAFFIC SIGNS
VATO8	29.478	29.784	MEDIAN WIDTH
VAT38	8.044	5.172	UTILITY POLES
VAT17	5.102	3.995	NO. OF DRIVEWAYS
VATO5	16.444	10.547	LARGE OBSTACLES

N OF CASES = 1555

CORRELATION

	VAC17	VACO1	VAT18	VAT19	VATO4	VATO8	VAT38	VAT17	VATO5
VAC17	1.000	-0.102	0.183	-0.042	0.165	-0.046	0.051	0.016	0.058
VACO1	-0.102	1.000	0.119	-0.002	0.156	0.249	0.228	0.079	0.103
VAT18	0.183	0.119	1.000	-0.272	0.310	-0.144	0.158	-0.016	0.222
VAT19	-0.042	-0.002	-0.272	1.000	0.084	0.039	0.055	0.241	0.125
VATO4	0.165	0.156	0.310	0.084	1.000	0.035	0.249	0.059	0.328
VATO8	-0.046	0.249	-0.144	0.039	0.035	1.000	0.332	0.160	0.186
VAT38	0.051	0.228	0.158	0.055	0.249	0.332	1.000	0.308	0.756
VAT17	0.016	0.079	-0.016	0.241	0.059	0.160	0.308	1.000	0.323
VATO5	0.058	0.103	0.222	0.125	0.328	0.186	0.756	0.323	1.000

Table 60. Regression results for multilane divided segments using accident rate (Continued).

*** * * * M U L T I P L E   R E G R E S S I O N * * * ***

EQUATION NUMBER 1.

DEPENDENT VARIABLE.. VAC17 TOT ACCIDENT RATE

BEGINNING BLOCK NUMBER 1. METHOD: STEPWISE

VARIABLE(S) ENTERED ON STEP NUMBER 1.. VAT18 NO. OF INTER SIG

MULTIPLE R	0.18302		
R SQUARE	0.03349	R SQUARE CHANGE	0.03349
ADJUSTED R SQUARE	0.03287	F CHANGE	53.81995
STANDARD ERROR	10.52231	SIGNIF F CHANGE	0.0000

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	1	5958.88788	5958.88788
RESIDUAL	1553	171946.52132	110.71894

F = 53.81995 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
VAT18	3.29877	0.44966	2.41677	4.18077	0.18302	7.336	0.0000
(CONSTANT)	6.50298	0.32212	5.87114	7.13481		20.188	0.0000

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
VAC01	-0.12584	-0.12710	0.98589	-5.048	0.0000
VAT19	0.00831	0.00814	0.92590	0.321	0.7486
VAT04	0.11975	0.11581	0.90388	4.593	0.0000
VAT08	-0.01962	-0.01975	0.97917	-0.778	0.4366
VAT38	0.02287	0.02297	0.97507	0.905	0.3656
VAT17	0.01897	0.01830	0.99974	0.760	0.4472
VAT05	0.01799	0.01785	0.95093	0.703	0.4821

Table 60. Regression results for multilane divided segments using accident rate (Continued).

* * * * M U L T I P L E   R E G R E S S I O N * * * *

DEPENDENT VARIABLE.. VAC17 TOT ACCIDENT RATE

VARIABLE(S) ENTERED ON STEP NUMBER 2.. VAC01 ADT

MULTIPLE R	0.22160			ANALYSIS OF VARIANCE			
R SQUARE	0.04911	R SQUARE CHANGE	0.01561		DF	SUM OF SQUARES	MEAN SQUARE
ADJUSTED R SQUARE	0.04788	F CHANGE	25.48287	REGRESSION	2	8736.53517	4368.26758
STANDARD ERROR	10.44033	SIGNIF F CHANGE	0.0000	RESIDUAL	1552	169168.87403	109.00056

F = 40.07564 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
VAT18	3.56824	0.44933	2.68687	4.44960	0.19797	7.941	0.0000
VAC01	-0.13673E-03	0.2708E-04	-0.18985E-03	-0.83599E-04	-0.12584	-5.048	0.0000
(CONSTANT)	8.81154	0.55793	7.71716	9.90592		15.793	0.0000

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
VAT19	0.01244	0.01227	0.91192	0.483	0.6290
VAT04	0.13850	0.13395	0.88955	5.323	0.0000
VAT08	0.01568	0.01532	0.90752	0.603	0.5463
VAT38	0.05224	0.05168	0.93070	2.038	0.0417
VAT17	0.02940	0.03005	0.97928	1.184	0.2367
VAT05	0.02838	0.02829	0.94164	1.115	0.2651

Table 60. Regression results for multilane divided segments using accident rate (Continued).

* * * * M U L T I P L E   R E G R E S S I O N * * * *

DEPENDENT VARIABLE.. VAC17 TOT ACCIDENT RATE

VARIABLE(S) ENTERED ON STEP NUMBER 3.. VAT04 NO. OF TRAFFIC SIGNS

MULTIPLE R	0.25724			ANALYSIS OF VARIANCE			
R SQUARE	0.06617	R SQUARE CHANGE	0.01706		DF	SUM OF SQUARES	MEAN SQUARE
ADJUSTED R SQUARE	0.06436	F CHANGE	28.33905	REGRESSION	3	11772.03576	3924.01192
STANDARD ERROR	10.34958	SIGNIF F CHANGE	0.0000	RESIDUAL	1551	166133.37344	107.11372

F = 36.63408 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
VAT18	2.83003	0.46652	1.91496	3.74510	0.15701	6.066	0.0000
VACO1	-0.15487E-03	0.2706E-04	-0.20795E-03	-0.10178E-03	-0.14254	-5.722	0.0000
VAT04	0.27031	0.05078	0.17071	0.36991	0.13850	5.323	0.0000
(CONSTANT)	7.14023	0.63598	5.89276	8.38769		11.227	0.0000

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
VAT19	-0.01268	-0.01241	0.80977	-0.489	0.6251
VAT08	0.00838	0.00825	0.86693	0.325	0.7453
VAT38	0.02716	0.02661	0.85654	1.048	0.2948
VAT17	0.02188	0.02253	0.88656	0.887	0.3751
VAT05	-0.00885	-0.00856	0.82365	-0.337	0.7361

FOR BLOCK NUMBER 1 PIN = 0.050 LIMITS REACHED.

Table 61. Regression results for multilane undivided segments using accident rate.

* * * * M U L T I P L E   R E G R E S S I O N * * * *

VARIABLE LIST NUMBER 1. LISTWISE DELETION OF MISSING DATA.

	MEAN	STD DEV	LABEL
VAC17	8.627	10.812	TOT ACCIDENT RATE
VAC01	14812.286	7063.815	ADT
VAT18	0.419	0.605	NO. OF INTER SIG
VAT38	5.887	3.214	UTILITY POLES
VAT24	1.896	0.893	LAND USE
VAT19	0.919	0.805	NO. OF INTER NSIG
VAT17	5.216	3.609	NO. OF DRIVEWAYS

N OF CASES = 2446

CORRELATION

	VAC17	VAC01	VAT18	VAT38	VAT24	VAT19	VAT17
VAC17	1.000	-0.098	0.183	0.189	-0.091	-0.016	0.062
VAC01	-0.098	1.000	0.111	0.091	-0.051	-0.062	-0.079
VAT18	0.183	0.111	1.000	0.313	-0.208	-0.331	-0.011
VAT38	0.189	0.091	0.313	1.000	-0.227	0.028	0.108
VAT24	-0.091	-0.051	-0.208	-0.227	1.000	0.004	-0.198
VAT19	-0.016	-0.062	-0.331	0.028	0.004	1.000	0.132
VAT17	0.062	-0.079	-0.011	0.108	-0.198	0.132	1.000

Table 61. Regression results for multilane undivided segments using accident rate (Continued).

* * * * M U L T I P L E   R E G R E S S I O N * * * *

EQUATION NUMBER 1.

DEPENDENT VARIABLE.. VAC17 TOT ACCIDENT RATE

BEGINNING BLOCK NUMBER 1. METHOD: STEPWISE

VARIABLE(S) ENTERED ON STEP NUMBER 1.. VAT38 UTILITY POLES

MULTIPLE R	0.18892		
R SQUARE	0.03569	R SQUARE CHANGE	0.03569
ADJUSTED R SQUARE	0.03530	F CHANGE	90.46155
STANDARD ERROR	10.61966	SIGNIF F CHANGE	0.0

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	1	10202.00366	10202.00366
RESIDUAL	2444	275627.56713	112 77724

F = 90.46155 SIGNIF F = 0.0

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
VAT38	0.63562	0.06683	0.50457	0.76667	0.18892	9.511	0.0000
(CONSTANT)	4.88495	0.44819	4.00607	5.76382		10.899	0.0000

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
VAC01	-0.11657	-0.11821	0.99173	-5.884	0.0000
VAT18	0.13687	0.13236	0.90172	6.600	0.0000
VAT24	-0.05109	-0.05067	0.94855	-2.508	0.0122
VAT19	-0.02113	-0.02151	0.99920	-1.063	0.2878
VAT17	0.04164	0.04216	0.98824	2.085	0.0371

Table 61. Regression results for multilane undivided segments using accident rate (Continued).

* * * * M U L T I P L E   R E G R E S S I O N * * * *

DEPENDENT VARIABLE.. VAC17 TOT ACCIDENT RATE

VARIABLE(S) ENTERED ON STEP NUMBER 2.. VAT18 NO. OF INTER SIG

MULTIPLE R	0.22931		
R SQUARE	0.05259	R SQUARE CHANGE	0.01689
ADJUSTED R SQUARE	0.05181	F CHANGE	43.55951
STANDARD ERROR	10.52839	SIGNIF F CHANGE	0.0000

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	2	15030.44351	7515.22175
RESIDUAL	2443	270799.12728	110.84696

F = 67.79818 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
VAT38	0.49126	0.06977	0.35444	0.62808	0.14602	7.041	0.0000
VAT18	2.44786	0.37089	1.72057	3.17515	0.13687	6.600	0.0000
(CONSTANT)	4.70798	0.44515	3.83506	5.58089		10.576	0.0000

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
VAC01	-0.12895	-0.13142	0.89485	-6.551	0.0000
VAT24	-0.03210	-0.03176	0.87438	-1.570	0.1164
VAT19	0.02914	0.02795	0.78621	1.382	0.1672
VAT17	0.04796	0.04893	0.88921	2.421	0.0156

Table 61. Regression results for multilane undivided segments using accident rate (Continued).

**** M U L T I P L E   R E G R E S S I O N ****

DEPENDENT VARIABLE.. VAC17   TOT ACCIDENT RATE

VARIABLE(S) ENTERED ON STEP NUMBER 3.. VAC01   ADT

MULTIPLE R	0.26258		
R SQUARE	0.06895	R SQUARE CHANGE	0.01636
ADJUSTED R SQUARE	0.06781	F CHANGE	42.92038
STANDARD ERROR	10.43920	SIGNIF F CHANGE	0.0000

ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	3	19707.77653	6569.25884
RESIDUAL	2442	266121.79426	108.97698

F = 60.28116   SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
VAT38	0.51825	0.06930	0.38235	0.65415	0.15404	7.478	0.0000
VAT18	2.65908	0.36916	1.93518	3.38298	0.14868	7.203	0.0000
VAC01	-0.19737E-03	0.30013E-04	-0.25645E-03	-0.13830E-03	-0.12895	-6.551	0.0000
(CONSTANT)	7.38401	0.60138	6.20474	8.56328		12.278	0.0000

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
VAT24	-0.03459	-0.03453	0.87170	-1.707	0.0880
VAT19	0.02423	0.02342	0.78249	1.157	0.2472
VAT17	0.03711	0.03804	0.88492	1.881	0.0601

FOR BLOCK NUMBER 1 PIN = 0.050 LIMITS REACHED.

APPENDIX H - ANALYSIS OF VARIANCE AND COVARIANCE RESULTS

Introduction

These tests were used to identify differences in mean accident rates and frequencies for various independent variable groupings. In addition, the analysis was used to account for influencing factors, i.e., traffic volume, land use, etc. Factors tested as influencing factors were selected from the branching analysis results, the literature review, and experience of the research team. While an attempt was made to account for the influencing factors that can reasonably be expected to affect the accident rate and frequency, it must be recognized that an almost infinite number of influencing factor combinations are possible. This analysis includes the results of only a small number of combinations, but the data base developed in this study can be used for further research for any other combinations of variables and covariates.

Background

Analysis of variance is a statistical technique used to identify sources of variation in dependent variables. It is also used to test if a significant fraction of the total variance can be explained by the relationship with the identified sources of variation. Typically, the technique lends itself to use in experiments under controlled conditions. However, by utilizing an appropriate experimental design and sampling strategy, it is possible to use this technique in situations where the experiment cannot be performed under controlled conditions, e.g., traffic accident analysis.

A factorial design was selected for the accident data analysis using the analysis of variance technique. The selection of the factors along with their associated levels was based in part upon the findings of the literature review, with additional factors based on the judgement and experience of the research team members. Although it is theoretically possible to identify an unlimited number of factors and levels for analysis purposes, the results become difficult to comprehend and interpret when the experiment exceeds a particular size. In most experimental studies, a 3^n factorial design is considered as the maximum; i.e., no factor is generally considered in more than three levels. In the accident data analyses conducted for this study, the factors could be broadly classified into traffic and geometric characteristics.

The advantages of the factorial approach in traffic accident analysis is that a number of factors can be considered in the same experiment. This makes it possible for the analyst to examine not only the significance of the individual factors, but also the possible interactions among the factors being tested. Such a design approach would appear to be quite appropriate when one considers the multitude of independent variables that need to be accounted for in accident data analyses.

The F-statistic was used to determine whether statistically significant differences exist between the calculated means in each category. The null hypothesis for these tests was that there are no differences between the means for each level.

For this phase of the analysis, the ANOVA subprogram contained in the Statistical Package for the Social Sciences (SPSS) was used. This subprogram allows the use of up to five factors per design for factorial designs. In addition, a table for multiple classification analysis was produced. Multiple classification analysis is a method that can be used to display the results of the analysis of variance when there are no significant interaction effects. In particular the multiple classification analysis is used to illustrate the individual effects of each factor on the dependent variables.

Analysis of covariance was used to test for differences in means for each category while the effects of other influencing variables are experimentally controlled. For example in examining the relationship between urban arterial accidents and roadway classification, it is necessary to control for the effects of traffic volume as volume can be expected to have an affect on the number of urban arterial accidents. Regression procedures are used to remove extraneous variation from the dependent variable due to one or more covariates, then an analysis of variance is conducted for the adjusted values. The analysis of covariance was conducted using the SPSS Subprogram ANOVA.

One-Way Analysis Of Variance Results For Land Use

One-way analysis of variance is a statistical technique used to identify sources of variation in a dependent variable resulting from variations in the value of one independent variable. One-way analysis of variance was used to test for statistically significant differences between the mean accident rates and frequencies for categories of each independent variable.

The Statistical Package for the Social Sciences (SPSS) ONE-WAY subprogram permits testing pairs of group means with several different test procedures. The a posteriori test that was selected to compare all possible pairs of group means was the least significant difference (LSD) test. The LSD test is basically a student's t-test which is used to determine the significance of the difference between group means. The level of significance used was 0.01.

In addition to analyzing the total number of accidents per segment and the accident rate, the difference in mean accident frequencies for each accident type i.e., head-on, rear-end, etc. was examined for all roadway segments. A summary of the analysis is presented in Tables 62 through 67 for land use.

Analysis Of Variance Results For Average Daily Traffic And Signalized Intersections On Two-Lane, Two-Way Segments

Where there is more than one independent variable (as is most often the case in accident studies), the analysis of variance test can be used to determine the relationship between accidents and any two (or more) independent variables. Two-way analysis of variance tests were conducted to identify variables or combinations of variables that aid in explaining the difference in mean accident rates or frequencies.

A two-way analysis of variance table including a summary of the mean cell accident frequencies and a multiple classification analysis for accident frequencies on two-lane, two-way roadway segments is given in Table 68. The factors used in the analysis are average daily traffic and the number of signalized intersections per segment.

Analysis Of Covariance Results

Analysis of covariance was used to test for differences in means for several factors while the effects of other influencing variables were controlled. The study sampling strategy result in a sample with a wide range of values for characteristics which have been shown to affect highway safety. In testing the relationship between the accident rates for roadways with different numbers of signalized intersections, or numbers of traffic sign faces, for instance, it is desirable to control for the effect of average daily traffic. This is critical as segments of roadways with many signalized intersections or a larger number of sign faces may have high traffic volumes, and volume has been shown to be highly correlated with accidents.

An important feature of analysis of covariance is the ability to test for the significance of interactive effects among variables. Analysis of covariance conducted using the SPSS subprogram ANOVA analyzes interactions among factors but does not analyze factor-covariate interactions. Subprogram NEW REGRESSION, however, utilizes the multiple regression method to conduct an analysis of covariance which provides analysis of factor-covariate interactions.

Analysis of covariance tables shown in Tables 69 through 74 present the results of the analysis for six specific cases that are described in the research report.

Table 62. One-way analysis of variance table for annual accident frequency and land use.

- O N E W A Y -

VARIABLE VAD10 AVG ACCIDENT FREQ
BY VARIABLE VAT24 LAND USE

ANALYSIS OF VARIANCE

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES	F RATIO	F PROB.
BETWEEN GROUPS	3	13501.7622	4500.5859	175.158	0.0000
WITHIN GROUPS	8488	218094.9102	25.6945		
TOTAL	8491	231596.6250			

GROUP	COUNT	MEAN	STANDARD DEVIATION	STANDARD ERROR	MINIMUM	MAXIMUM	95 PCT CONF INT FOR MEAN		
GRP1	2618	5.4925	6.5009	0.1271	0.0	50.6667	5.2433	TO	5.7416
GRP2	4194	2.7804	4.1177	0.0636	0.0	51.6667	2.6557	TO	2.9051
GRP3	992	2.4442	4.4452	0.1411	0.0	35.0000	2.1672	TO	2.7211
GRP4	688	3.6763	4.9482	0.1886	0.0	32.6667	3.3059	TO	4.0467
TOTAL	8492	3.6498	5.2226	0.0567	0.0	51.6667	3.5387	TO	3.7609
	FIXED EFFECTS MODEL		5.0690	0.0550			3.5420	TO	3.7576
	RANDOM EFFECTS MODEL			0.9429			0.6492	TO	6.6505

RANDOM EFFECTS MODEL - ESTIMATE OF BETWEEN COMPONENT VARIANCE 2.4669

TESTS FOR HOMOGENEITY OF VARIANCES

COCHRANS C = MAX. VARIANCE/SUM(VARIANCES) = 0.4085, P = 0.0 (APPROX.)
BARTLETT-BOX F = 244.650, P = 0.000
MAXIMUM VARIANCE / MINIMUM VARIANCE = 2.492

Table 62. One-way analysis of variance table for annual accident frequency and land use (Continued).

- O N E W A Y -

```
    VARIABLE  VAD10      AVG ACCIDENT FREQ
 BY VARIABLE  VAT24      LAND USE
```

MULTIPLE RANGE TEST

LSD PROCEDURE
RANGES FOR THE 0.010 LEVEL -

3.65 3.65 3.65

THE RANGES ABOVE ARE TABLE RANGES. THE VALUE ACTUALLY COMPARED WITH MEAN(J)-MEAN(I) IS..
3.5843 * RANGE * SQRT(1/N(I) + 1/N(J))

(*) DENOTES PAIRS OF GROUPS SIGNIFICANTLY DIFFERENT AT THE 0.010 LEVEL

MEAN	GROUP	GRP 3	GRP 2	GRP 4	GRP 1
2.4442	GRP3				
2.7804	GRP2				
3.6763	GRP4	*	*		
5.4925	GRP1	*	*	*	

Table 63. One-way analysis of variance table for accident rate and land use.

- O N E W A Y -

VARIABLE VAC17 TOT ACCIDENT RATE
BY VARIABLE VAT24 LAND USE

ANALYSIS OF VARIANCE

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES	F RATIO	F PROB.
BETWEEN GROUPS	3	21159.5766	7053.1914	61.560	0.0000
WITHIN GROUPS	8488	972499.3750	114.5734		
TOTAL	8491	993658.9375			

GROUP	COUNT	MEAN	STANDARD DEVIATION	STANDARD ERROR	MINIMUM	MAXIMUM	95 PCT CONF INT FOR MEAN		
GRP1	2618	10.4603	11.7309	0.2293	0.0	68.1890	10.0107	TO	10.9099
GRP2	4194	7.6018	10.2654	0.1585	0.0	68.0780	7.2910	TO	7.9126
GRP3	992	5.6692	9.2424	0.2934	0.0	68.1890	5.0934	TO	6.2451
GRP4	688	8.5453	11.1790	0.4262	0.0	65.4490	7.7085	TO	9.3821
TOTAL	8492	8.3337	10.8178	0.1174	0.0	68.1890	8.1036	TO	8.5638
FIXED EFFECTS MODEL			10.7039	0.1162			8.1060	TO	8.5614
RANDOM EFFECTS MODEL				1.1778			4.5854	TO	12.0821

RANDOM EFFECTS MODEL - ESTIMATE OF BETWEEN COMPONENT VARIANCE 3.8251

TESTS FOR HOMOGENEITY OF VARIANCES

COCHRANS C = MAX. VARIANCE/SUM(VARIANCES) = 0.3035, P = 0.000 (APPROX.)
BARTLETT-BOX F = 34.165, P = 0.000
MAXIMUM VARIANCE / MINIMUM VARIANCE = 1.611

Table 63. One-way analysis of variance table for accident rate and land use (Continued).

```
- - - - - - - - - - - - - - - - - - - - - - - - - - O N E W A Y - - - - - - - - - - - - - - - - - - - - - - - - - -

       VARIABLE  VAC17      TOT ACCIDENT RATE
    BY VARIABLE  VAT24      LAND USE

MULTIPLE RANGE TEST

LSD PROCEDURE
RANGES FOR THE 0.010 LEVEL -

           3.65  3.65  3.65

THE RANGES ABOVE ARE TABLE RANGES.  THE VALUE ACTUALLY COMPARED WITH MEAN(J)-MEAN(I) IS..
        7.5688 * RANGE * SQRT(1/N(I) + 1/N(J))

  (*) DENOTES PAIRS OF GROUPS SIGNIFICANTLY DIFFERENT AT THE 0.010 LEVEL
```

MEAN	GROUP	GRP 3	GRP 2	GRP 4	GRP 1
5.6692	GRP3				
7.6018	GRP2	*			
8.5453	GRP4	*			
10.4603	GRP1	*	*	*	

Table 64. One-way analysis of variance table for annual head-on accidents and land use.

\- O N E W A Y -

VARIABLE VADO5 HEAD ON
BY VARIABLE VAT24 LAND USE

ANALYSIS OF VARIANCE

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES	F RATIO	F PROB.
BETWEEN GROUPS	3	11.2799	3.7600	10.460	0.0000
WITHIN GROUPS	5707	2051.5068	0.3595		
TOTAL	5710	2062.7866			

GROUP	COUNT	MEAN	STANDARD DEVIATION	STANDARD ERROR	MINIMUM	MAXIMUM	95 PCT CONF INT FOR MEAN		
GRP1	1668	0.2446	0.6480	0.0159	0.0	6.0000	0.2135	TO	0.2757
GRP2	2927	0.1681	0.5518	0.0102	0.0	9.0000	0.1481	TO	0.1881
GRP3	684	0.2529	0.6325	0.0242	0.0	5.0000	0.2054	TO	0.3004
GRP4	432	0.2917	0.6591	0.0317	0.0	4.0000	0.2293	TO	0.3540
TOTAL	5711	0.2099	0.6010	0.0080	0.0	9.0000	0.1944	TO	0.2255
FIXED EFFECTS MODEL			0.5996	0.0079			0.1944	TO	0.2255
RANDOM EFFECTS MODEL				0.0332			0.1042	TO	0.3157

RANDOM EFFECTS MODEL - ESTIMATE OF BETWEEN COMPONENT VARIANCE 0.0028

TESTS FOR HOMOGENEITY OF VARIANCES

COCHRANS C = MAX. VARIANCE/SUM(VARIANCES) = 0.2787, P = 0.001 (APPROX.)
BARTLETT-BOX F = 23.883, P = 0.000
MAXIMUM VARIANCE / MINIMUM VARIANCE = 1.427

Table 64. One-way analysis of variance table for annual head-on accidents and land use (Continued).

```
- - - - - - - - - - - - - - - - - - - - - - - - - - O N E W A Y - - - - - - - - - - - - - - - - - - - - - - - - -

    VARIABLE  VADOS       HEAD ON
 BY VARIABLE  VAT24       LAND USE

MULTIPLE RANGE TEST

LSD PROCEDURE
RANGES FOR THE 0.010 LEVEL -

           3.65  3.65  3.65

THE RANGES ABOVE ARE TABLE RANGES.  THE VALUE ACTUALLY COMPARED WITH MEAN(J)-MEAN(I) IS..
        0.4240 * RANGE * SQRT(1/N(I) + 1/N(J))

  (*) DENOTES PAIRS OF GROUPS SIGNIFICANTLY DIFFERENT AT THE 0.010 LEVEL

                           G G G G
                           R R R R
                           P P P P
     MEAN        GROUP     2 1 3 4

     .1681       GRP2
     .2446       GRP1      *
     .2529       GRP3      *
     .2917       GRP4      *
```

Table 65. One-way analysis of variance table for annual rear-end accidents and land use.

\- O N E W A Y -

VARIABLE VADO6 REAR ENDS
BY VARIABLE VAT24 LAND USE

ANALYSIS OF VARIANCE

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES	F RATIO	F PROB.
BETWEEN GROUPS	3	9772.4300	3257.4766	83.463	0.0000
WITHIN GROUPS	5707	222737.1914	39.0288		
TOTAL	5710	232509.5625			

GROUP	COUNT	MEAN	STANDARD DEVIATION	STANDARD ERROR	MINIMUM	MAXIMUM	95 PCT CONF INT FOR MEAN		
GRP1	1668	5.4532	8.3729	0.2050	0.0	69.0000	5.0511	TO	5.8553
GRP2	2927	2.6279	4.7380	0.0876	0.0	46.0000	2.4562	TO	2.7997
GRP3	684	2.3173	5.3082	0.2030	0.0	51.0000	1.9187	TO	2.7158
GRP4	432	4.2361	6.9705	0.3354	0.0	65.0000	3.5770	TO	4.8953
TOTAL	5711	3.5376	6.3812	0.0844	0.0	69.0000	3.3720	TO	3.7031
FIXED EFFECTS MODEL			6.2473	0.0827			3.3755	TO	3.6996
RANDOM EFFECTS MODEL				0.9957			0.3688	TO	6.7063

RANDOM EFFECTS MODEL - ESTIMATE OF BETWEEN COMPONENT VARIANCE 2.6753

TESTS FOR HOMOGENEITY OF VARIANCES

COCHRANS C = MAX. VARIANCE/SUM(VARIANCES) = 0.4140, P = 0.0 (APPROX.)
BARTLETT-BOX F = 256.545, P = 0.000
MAXIMUM VARIANCE / MINIMUM VARIANCE = 3.123

Table 65. One-way analysis of variance table for annual rear-end accidents and land use (Continued).

```
- - - - - - - - - - - - - - - - - - - - - - - - - O N E W A Y - - - - - - - - - - - - - - - - - - - - - - - - -

      VARIABLE  VADO8       REAR ENDS
   BY VARIABLE  VAT24       LAND USE

MULTIPLE RANGE TEST

LSD PROCEDURE
RANGES FOR THE 0.010 LEVEL -

           3.65  3.65  3.65

THE RANGES ABOVE ARE TABLE RANGES.  THE VALUE ACTUALLY COMPARED WITH MEAN(J)-MEAN(I) IS..
        4.4175 * RANGE * SQRT(1/N(I) + 1/N(J))

  (*) DENOTES PAIRS OF GROUPS SIGNIFICANTLY DIFFERENT AT THE 0.010 LEVEL

                         G G G G
                         R R R R
                         P P P P
     MEAN      GROUP     3 2 4 1

     2.3173    GRP3
     2.6279    GRP2
     4.2361    GRP4      * *
     5.4532    GRP1      * * *
```

Table 66. One-way analysis of variance table for annual sideswipe accidents and land use.

- O N E W A Y -

VARIABLE VADO7 SIDESWIPE
BY VARIABLE VAT24 LAND USE

ANALYSIS OF VARIANCE

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES	F RATIO	F PROB.
BETWEEN GROUPS	3	303.6551	101.2184	68.684	0.0000
WITHIN GROUPS	5707	8410.2966	1.4737		
TOTAL	5710	8713.9492			

GROUP	COUNT	MEAN	STANDARD DEVIATION	STANDARD ERROR	MINIMUM	MAXIMUM	95 PCT CONF INT FOR MEAN		
GRP1	1668	0.8549	1.6877	0.0413	0.0	33.0000	0.7739	TO	0.9360
GRP2	2927	0.3683	0.9174	0.0170	0.0	11.0000	0.3350	TO	0.4015
GRP3	684	0.2515	0.7186	0.0275	0.0	7.0000	0.1975	TO	0.3054
GRP4	432	0.5509	1.4017	0.0674	0.0	14.0000	0.4184	TO	0.6835
TOTAL	5711	0.5102	1.2353	0.0163	0.0	33.0000	0.4782	TO	0.5423
FIXED EFFECTS MODEL			1.2140	0.0161			0.4788	TO	0.5417
RANDOM EFFECTS MODEL				0.1754			-0.0480	TO	1.0685

RANDOM EFFECTS MODEL - ESTIMATE OF BETWEEN COMPONENT VARIANCE 0.0829

TESTS FOR HOMOGENEITY OF VARIANCES

COCHRANS C = MAX. VARIANCE/SUM(VARIANCES) = 0.4616, P = 0.0 (APPROX.)
BARTLETT-BOX F = 377.442, P = 0.000
MAXIMUM VARIANCE / MINIMUM VARIANCE = 5.516

Table 66. One-way analysis of variance table for annual sideswipe accidents and land use (Continued).

```
- - - - - - - - - - - - - - - - - - - - - - - - - O N E W A Y - - - - - - - - - - - - - - - - - - - - - - - - -

     VARIABLE  VAD07       SIDESWIPE
  BY VARIABLE  VAT24       LAND USE

MULTIPLE RANGE TEST

LSD PROCEDURE
RANGES FOR THE 0.010 LEVEL -

          3.65  3.65  3.65

THE RANGES ABOVE ARE TABLE RANGES.  THE VALUE ACTUALLY COMPARED WITH MEAN(J)-MEAN(I) IS..
        0.8584 * RANGE * SQRT(1/N(I) + 1/N(J))

  (*) DENOTES PAIRS OF GROUPS SIGNIFICANTLY DIFFERENT AT THE 0.010 LEVEL

                                G G G G
                                R R R R
                                P P P P
     MEAN        GROUP          3 2 4 1

      .2515      GRP3
      .3683      GRP2
      .5509      GRP4           * *
      .8549      GRP1           * * *
```

Table 67. One-way analysis of variance table for annual angle accidents and land use.

\- O N E W A Y -

VARIABLE VADO8 ANGLE
BY VARIABLE VAT24 LAND USE

ANALYSIS OF VARIANCE

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES	F RATIO	F PROB.
BETWEEN GROUPS	3	6504.1365	2168.0454	51.805	0.0000
WITHIN GROUPS	5707	238839.4922	41.8503		
TOTAL	5710	245343.6250			

GROUP	COUNT	MEAN	STANDARD DEVIATION	STANDARD ERROR	MINIMUM	MAXIMUM	95 PCT CONF INT FOR MEAN		
GRP1	1668	5.0330	8.1787	0.2003	0.0	70.0000	4.6402	TO	5.4258
GRP2	2927	2.7301	5.4519	0.1008	0.0	64.0000	2.5325	TO	2.9277
GRP3	684	2.3582	5.9137	0.2261	0.0	48.0000	1.9142	TO	2.8022
GRP4	432	3.4537	6.1829	0.2975	0.0	44.0000	2.8690	TO	4.0384
TOTAL	5711	3.4129	6.5549	0.0867	0.0	70.0000	3.2428	TO	3.5829
FIXED EFFECTS MODEL			6.4692	0.0856			3.2451	TO	3.5807
RANDOM EFFECTS MODEL				0.8110			0.8318	TO	5.9940

RANDOM EFFECTS MODEL - ESTIMATE OF BETWEEN COMPONENT VARIANCE 1.7674

TESTS FOR HOMOGENEITY OF VARIANCES

COCHRANS C = MAX. VARIANCE/SUM(VARIANCES) = 0.3939, P = 0.0 (APPROX.)
BARTLETT-BOX F = 126.977, P = 0.000
MAXIMUM VARIANCE / MINIMUM VARIANCE = 2.251

Table 67. One-way analysis of variance table for annual angle accidents and land use (Continued).

- O N E W A Y -

```
     VARIABLE  VAD08       ANGLE
  BY VARIABLE  VAT24       LAND USE

MULTIPLE RANGE TEST

LSD PROCEDURE
RANGES FOR THE 0.010 LEVEL -

          3.65  3.65  3.65

THE RANGES ABOVE ARE TABLE RANGES.  THE VALUE ACTUALLY COMPARED WITH MEAN(J)-MEAN(I) IS..
        4.5744 * RANGE * SQRT(1/N(I) + 1/N(J))

  (*) DENOTES PAIRS OF GROUPS SIGNIFICANTLY DIFFERENT AT THE 0.010 LEVEL
```

MEAN	GROUP	GRP 3	GRP 2	GRP 4	GRP 1
2.3582	GRP3				
2.7301	GRP2				
3.4537	GRP4	*			
5.0330	GRP1	*	*	*	

Table 68. Two-way analysis of variance table for annual accident frequency on two-lane, two-way segments using average daily traffic and signalized intersections.

* * * * * * * * * * * * * * C E L L M E A N S * * * * * * * * * * * * * *

VAD10	AVG ACCIDENT FREQ
BY VAN06	ADT-DISCRETE
VAT18	NO. OF INTER SIG

* *

TOTAL POPULATION

2.50
(3459)

VAN06

1	2	3	4
1.45	2.53	4.50	4.70
(1569)	(1109)	(510)	(271)

VAT18

0	1	2	3
2.14	4.65	3.10	4.27
(2908)	(462)	(84)	(5)

VAN06 \ VAT18	0	1	2	3
1	1.30	2.45	2.41	1.89
	(1359)	(163)	(44)	(3)
2	2.17	4.36	2.69	6.67
	(918)	(177)	(13)	(1)
3	3.93	7.73	4.83	0.0
	(419)	(73)	(18)	(0)
4	3.87	8.42	3.56	9.00
	(212)	(49)	(9)	(1)

Table 68. Two-way analysis of variance table for annual accident frequency on two-lane, two-way segments using average daily traffic and signalized intersections (Continued).

* * * * * * * * * * * A N A L Y S I S   O F   V A R I A N C E * * * * * * * * * * *

VAD10 AVG ACCIDENT FREQ
BY VANO6 ADT-DISCRETE
VAT18 NO. OF INTER SIG

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	7216.895	6	1202.816	88.192	0.0
VANO6	4658.301	3	1552.767	113.850	0.000
VAT18	2138.479	3	712.[illegible]6	52.265	0.000
2-WAY INTERACTIONS	582.738	8	72.842	5.341	0.000
VANO6 VAT18	582.740	8	72.843	5.341	0.000
EXPLAINED	7799.633	14	557.116	40.848	0.0
RESIDUAL	46971.527	3444	13.639		
TOTAL	54771.160	3458	15.839		

3459 CASES WERE PROCESSED.
0 CASES (0.0 PCT) WERE MISSING.

Table 68. Two-way analysis of variance table for annual accident frequency on two-lane, two-way segments using average daily traffic and signalized intersections (Continued).

* * * M U L T I P L E   C L A S S I F I C A T I O N   A N A L Y S I S * * *

VAD10 AVG ACCIDENT FREQ
BY VANO6 ADT-DISCRETE
VAT18 NO. OF INTER SIG

GRAND MEAN = 2.50

VARIABLE + CATEGORY	N	UNADJUSTED DEV'N	UNADJUSTED ETA	ADJUSTED FOR INDEPENDENTS DEV'N	ADJUSTED FOR INDEPENDENTS BETA	ADJUSTED FOR INDEPENDENTS + COVARIATES DEV'N	ADJUSTED FOR INDEPENDENTS + COVARIATES BETA
VANO6							
1 LESS THAN 7500	1569	-1.05		-0.98			
2 7501 - 12000	1109	0.03		-0.02			
3 12001 - 17000	510	2.00		1.97			
4 17001 OR MORE	271	2.20		2.08			
			0.30		0.29		
VAT18							
0	2908	-0.36		-0.33			
1	462	2.15		1.97			
2	84	0.59		0.47			
3	5	1.76		1.94			
			0.22		0.20		
MULTIPLE R SQUARED					0.132		
MULTIPLE R					0.363		

Table 69. Analysis of covariance table for signalized intersections and traffic sign faces on two-lane, two-way segments.

* * * * * * * * * * * * * * C E L L   M E A N S * * * * * * * * * * * * * *

	VAD10	AVG ACCIDENT FREQ
BY	VANOS	TRAFFIC SIGNS-DISC
	VAT18	NO. OF INTER SIG

TOTAL POPULATION

2.50
(3459)

VANOS

1	2	3	4
1.22	2.20	3.59	4.62
(1187)	(1060)	(707)	(505)

VAT18

0	1	2	3
2.14	4.65	3.10	4.27
(2908)	(462)	(84)	(5)

VANOS \ VAT18	0	1	2	3
1	1.16	2.53	0.77	1.00
	(1121)	(55)	(10)	(1)
2	2.07	2.89	3.28	0.0
	(907)	(134)	(19)	(0)
3	3.07	5.48	3.97	0.0
	(539)	(145)	(23)	(0)
4	4.07	6.48	3.08	5.08
	(341)	(128)	(32)	(4)

Table 69. Analysis of covariance table for signalized intersections and traffic sign faces on two-lane, two-way segments (Continued).

* * * * * * * * * * * A N A L Y S I S   O F   V A R I A N C E * * * * * * * * * *

VAD10	AVG ACCIDENT FREQ
BY VANO5	TRAFFIC SIGNS-DISC
VAT18	NO. OF INTER SIG
WITH VACO1	ADT

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
COVARIATES	5852.281	1	5852.281	456.484	0.0
VACO1	5852.281	1	5852.281	456.484	0.0
MAIN EFFECTS	4575.086	6	762.514	59.477	0.0
VANO5	2679.078	3	893.026	69.657	0.000
VAT18	937.652	3	312.551	24.379	0.000
2-WAY INTERACTIONS	190.508	7	27.215	2.123	0.038
VANO5 VAT18	190.508	7	27.215	2.123	0.038
EXPLAINED	10617.875	14	758.419	59.157	0.0
RESIDUAL	44153.285	3444	12.820		
TOTAL	54771.160	3458	15.839		

COVARIATE	RAW REGRESSION COEFFICIENT
VACO1	0.000

3459 CASES WERE PROCESSED.
0 CASES (0.0 PCT) WERE MISSING.

Table 69. Analysis of covariance table for signalized intersections and traffic sign faces on two-lane, two-way segments (Continued).

* * * M U L T I P L E   C L A S S I F I C A T I O N   A N A L Y S I S * * *

```
           VAD10     AVG ACCIDENT FREQ
        BY VANO5     TRAFFIC SIGNS-DISC
           VAT18     NO. OF INTER SIG
      WITH VACO1     ADT
```

* *

GRAND MEAN = 2.50

VARIABLE + CATEGORY	N	UNADJUSTED DEV'N	ETA	ADJUSTED FOR INDEPENDENTS DEV'N	BETA	ADJUSTED FOR INDEPENDENTS + COVARIATES DEV'N	BETA
VANO5							
1 0 - 3	1187	-1.28				-0.95	
2 4 - 7	1060	-0.30				-0.26	
3 8 - 11	707	1.09				0.86	
4 12 OR MORE	505	2.12				1.58	
			0.31				0.23
VAT18							
0	2908	-0.36				-0.22	
1	462	2.15				1.36	
2	84	0.59				-0.08	
3	5	1.76				0.95	
			0.22				0.13
MULTIPLE R SQUARED							0.190
MULTIPLE R							0.436

Table 70. Analysis of covariance table for small obstacles and traffic sign faces on two-lane, two-way segments.

* * * * * * * * * * * * * * C E L L M E A N S * * * * * * * * * * * * * *

	VAD10	AVG ACCIDENT FREQ
BY	VANO7	SMALL OBS.-DISCRETE
	VANO5	TRAFFIC SIGNS-DISC

* *

TOTAL POPULATION

2.65
(2575)

VANO7

0	1	2
3.11	2.06	0.0
(1461)	(1114)	(0)

VANO5

1	2	3	4
1.27	2.19	4.05	5.88
(950)	(826)	(481)	(318)

VANO7 \ VANO5	1	2	3	4
0	1.27	2.27	4.65	6.53
	(476)	(454)	(300)	(231)
1	1.27	2.08	3.07	4.17
	(474)	(372)	(181)	(87)
2	0.0	0.0	0.0	0.0
	(0)	(0)	(0)	(0)

Table 70. Analysis of covariance table for small obstacles and traffic sign faces on two-lane, two-way segments (Continued).

```
* * * * * * * * * * * A N A L Y S I S   O F   V A R I A N C E * * * * * * * * * * *
              VAD10    AVG ACCIDENT FREQ
           BY VANO7    SMALL OBS.-DISCRETE
              VANO5    TRAFFIC SIGNS-DISC
         WITH VACO1    ADT
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
```

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
COVARIATES	5983.793	1	5983.793	410.103	0.000
VACO1	5983.793	1	5983.793	410.103	0.000
MAIN EFFECTS	3769.109	4	942.277	64.580	0.000
VANO7	337.655	1	337.655	23.141	0.000
VANO5	3013.047	3	1004.349	68.834	0.000
2-WAY INTERACTIONS	316.230	3	105.410	7.224	0.000
VANO7 VANO5	316.233	3	105.411	7.224	0.000
EXPLAINED	10069.133	8	1258.642	86.262	0.0
RESIDUAL	37440.344	2566	14.591		
TOTAL	47509.477	2574	18.457		

COVARIATE	RAW REGRESSION COEFFICIENT
VACO1	0.000

3459 CASES WERE PROCESSED.
884 CASES (25.6 PCT) WERE MISSING.

Table 70. Analysis of covariance table for small obstacles and traffic sign faces on two-lane, two-way segments (Continued).

* * * MULTIPLE CLASSIFICATION ANALYSIS * * *

	VAD10	AVG ACCIDENT FREQ
BY	VANO7	SMALL OBS.-DISCRETE
	VANO5	TRAFFIC SIGNS-DISC
WITH	VACO1	ADT

GRAND MEAN = 2.65

VARIABLE + CATEGORY	N	UNADJUSTED DEV'N	UNADJUSTED ETA	ADJUSTED FOR INDEPENDENTS DEV'N	ADJUSTED FOR INDEPENDENTS BETA	ADJUSTED FOR INDEPENDENTS + COVARIATES DEV'N	ADJUSTED FOR INDEPENDENTS + COVARIATES BETA
VANO7							
0 NONE	1461	0.45				0.32	
1 1 - 4	1114	-0.59				-0.42	
			0.12				0.09
VANO5							
1 0 - 3	950	-1.38				-1.04	
2 4 - 7	826	-0.47				-0.34	
3 8 - 11	481	1.40				1.12	
4 12 OR MORE	318	3.23				2.30	
			0.36				0.27
MULTIPLE R SQUARED							0.205
MULTIPLE R							0.453

Table 71. Analysis of covariance table for roadway classification and land use on all roadway segments.

* * * * * * * * * * * * * * C E L L   M E A N S * * * * * * * * * * * * * *

```
        VAD10     AVG ACCIDENT FREQ
     BY VAT31     ROADWAY CLASS
        VAT24     LAND USE
```

TOTAL POPULATION

3.65
(8492)

VAT31

1	2	3	4
3.62	2.52	4.73	4.39
(702)	(3410)	(1934)	(2446)

VAT24

1	2	3	4
5.49	2.78	2.44	3.68
(2618)	(4194)	(992)	(688)

VAT31 \ VAT24	1	2	3	4
1	5.29 (217)	3.02 (393)	1.49 (43)	2.92 (49)
2	4.49 (638)	2.07 (2043)	1.81 (477)	2.49 (252)
3	5.93 (859)	3.86 (653)	3.04 (247)	4.47 (175)
4	5.85 (904)	3.37 (1105)	3.32 (225)	4.60 (212)

Table 71. Analysis of covariance table for roadway classification and land use on all roadway segments (Continued).

* * * * * * * * * * * A N A L Y S I S   O F   V A R I A N C E * * * * * * * * * *

VAD10	AVG ACCIDENT FREQ
BY VAT31	ROADWAY CLASS
VAT24	LAND USE
WITH VACO1	ADT

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
COVARIATES	24222.211	1	24222.211	1029.643	0.0
VACO1	24222.211	1	24222.211	1029.643	0.0
MAIN EFFECTS	7625.074	6	1270.846	54.021	0.0
VAT31	385.349	3	128.450	5.460	0.001
VAT24	6803.984	3	2267.995	96.408	0.000
2-WAY INTERACTIONS	218.691	9	24.299	1.033	0.410
VAT31 VAT24	218.694	9	24.299	1.033	0.410
EXPLAINED	32066.000	16	2004.125	85.192	0.0
RESIDUAL	199373.188	8475	23.525		
TOTAL	231439.188	8491	27.257		

COVARIATE	RAW REGRESSION COEFFICIENT
VACO1	0.000

8678 CASES WERE PROCESSED.
186 CASES (2.1 PCT) WERE MISSING.

Table 71. Analysis of covariance table for roadway classification and land use on all roadway segments (Continued).

*** M U L T I P L E   C L A S S I F I C A T I O N   A N A L Y S I S ***

	VAD10	AVG ACCIDENT FREQ
BY	VAT31	ROADWAY CLASS
	VAT24	LAND USE
WITH	VACO1	ADT

GRAND MEAN = 3.65

VARIABLE + CATEGORY	N	UNADJUSTED DEV'N	UNADJUSTED ETA	ADJUSTED FOR INDEPENDENTS DEV'N	ADJUSTED FOR INDEPENDENTS BETA	ADJUSTED FOR INDEPENDENTS + COVARIATES DEV'N	ADJUSTED FOR INDEPENDENTS + COVARIATES BETA
VAT31							
1 ONE WAY	702	-0.03				0.37	
2 TWO WAY,TWO LANE	3410	-1.14				-0.18	
3 MULTLANE DIV	1934	1.08				-0.14	
4 MULTLANE UNDIV	2446	0.74				0.25	
			0.19				0.04
VAT24							
1 COMMERICAL	2618	1.84				1.34	
2 RESIDENTIAL	4194	-0.87				-0.58	
3 VACANT	992	-1.21				-1.10	
4 OTHER	688	0.03				0.03	
			0.24				0.18
MULTIPLE R SQUARED							0.138
MULTIPLE R							0.371

Table 72. Analysis of covariance table for roadway classification and city size on all roadway segments.

* * * * * * * * * * * * * * C E L L   M E A N S * * * * * * * * * * * * * *

VAD10	AVG ACCIDENT FREQ
BY VAT31	ROADWAY CLASS
VAT30	CITY SIZE

*

TOTAL POPULATION

3.66
(8678)

VAT31

1	2	3	4
3.72	2.50	4.73	4.37
(726)	(3459)	(1997)	(2496)

VAT30

1	2	3
2.15	3.89	3.60
(448)	(3806)	(4424)

VAT31 \ VAT30	1	2	3
1	1.10	4.28	2.73
	(16)	(481)	(229)
2	1.61	2.64	2.53
	(310)	(1602)	(1547)
3	4.01	5.54	4.45
	(38)	(531)	(1428)
4	3.52	4.69	4.13
	(84)	(1192)	(1220)

Table 72. Analysis of covariance table for roadway classification and city size on all roadway segments (Continued).

```
* * * * * * * * * * * A N A L Y S I S   O F   V A R I A N C E * * * * * * * * * * *
                VAD10     AVG ACCIDENT FREQ
             BY VAT31     ROADWAY CLASS
                VAT30     CITY SIZE
           WITH VACO1     ADT
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
```

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
COVARIATES	25371.473	1	25371.473	1048.545	0.000
VACO1	25371.473	1	25371.473	1048.545	0.000
MAIN EFFECTS	1813.945	5	362.789	14.993	0.000
VAT31	667.739	3	222.580	9.199	0.000
VAT30	962.671	2	481.336	19.893	0.000
2-WAY INTERACTIONS	693.215	6	115.536	4.775	0.000
VAT31 VAT30	693.215	6	115.536	4.775	0.000
EXPLAINED	27878.688	12	2323.224	96.014	0.0
RESIDUAL	209665.500	8665	24.197		
TOTAL	237544.188	8677	27.376		

COVARIATE	RAW REGRESSION COEFFICIENT
VACO1	0.000

8678 CASES WERE PROCESSED.
0 CASES (0.0 PCT) WERE MISSING.

Table 72. Analysis of covariance table for roadway classification and city size on all roadway segments (Continued).

* * * M U L T I P L E   C L A S S I F I C A T I O N   A N A L Y S I S * * *

```
        VAD10     AVG ACCIDENT FREQ
   BY   VAT31     ROADWAY CLASS
        VAT30     CITY SIZE
   WITH VACO1     ADT
```

GRAND MEAN = 3.66

VARIABLE + CATEGORY	N	UNADJUSTED DEV'N	UNADJUSTED ETA	ADJUSTED FOR INDEPENDENTS DEV'N	ADJUSTED FOR INDEPENDENTS BETA	ADJUSTED FOR INDEPENDENTS + COVARIATES DEV'N	ADJUSTED FOR INDEPENDENTS + COVARIATES BETA
VAT31							
1 ONE WAY	726	0.07				0.38	
2 TWO WAY,TWO LANE	3459	-1.15				-0.35	
3 MULTLANE DIV	1997	1.08				0.10	
4 MULTLANE UNDIV	2496	0.72				0.29	
			0.19				0.06
VAT30							
1 SMALL	448	-1.50				-0.97	
2 MEDIUM	3806	0.24				0.33	
3 LARGE	4424	-0.05				-0.18	
			0.07				0.06
MULTIPLE R SQUARED							0.114
MULTIPLE R							0.338

Table 73. Analysis of covariance table for median curb and median width on multilane divided segments.

* * * * * * * * * * * * * * C E L L   M E A N S * * * * * * * * * * * * *

VAD10 AVG ACCIDENT FREQ
BY VAT09 MED TYPE CURB
VANO2 MEDIAN WIDTH-DISC

* *

TOTAL POPULATION

4.73
(1484)

VAT09

1	2
4.69	5.48
(1408)	(76)

VANO2

1	2	3	4	5
5.07	4.97	3.66	4.45	4.96
(317)	(318)	(167)	(324)	(358)

VAT09 \ VANO2	1	2	3	4	5
1	5.09	5.03	3.23	4.16	5.19
	(316)	(289)	(156)	(313)	(334)
2	-0.00	4.40	9.70	12.61	1.82
	(1)	(29)	(11)	(11)	(24)

Table 73. Analysis of covariance table for median curb and median width on multilane divided segments (Continued).

* * * * * * * * * * * A N A L Y S I S   O F   V A R I A N C E * * * * * * * * * * *

	VAD10	AVG ACCIDENT FREQ
BY	VAT09	MED TYPE CURB
	VAN02	MEDIAN WIDTH-DISC
WITH	VAC01	ADT

* *

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
COVARIATES	4876.027	1	4876.027	130.008	0.000
VAC01	4876.027	1	4876.027	130.008	0.000
MAIN EFFECTS	321.711	5	64.342	1.716	0.128
VAT09	27.145	1	27.145	0.724	0.395
VAN02	298.947	4	74.737	1.993	0.093
2-WAY INTERACTIONS	1191.945	4	297.986	7.945	0.000
VAT09 VAN02	1191.948	4	297.987	7.945	0.000
EXPLAINED	6389.684	10	638.968	17.037	0.0
RESIDUAL	55245.875	1473	37.506		
TOTAL	61635.559	1483	41.561		

COVARIATE	RAW REGRESSION COEFFICIENT
VAC01	0.000

1997 CASES WERE PROCESSED.
513 CASES (25.7 PCT) WERE MISSING.

Table 73. Analysis of covariance table for median curb and median width on multilane divided segments (Continued).

* * * M U L T I P L E   C L A S S I F I C A T I O N   A N A L Y S I S * * *

	VAD10	AVG ACCIDENT FREQ
BY	VATO9	MED TYPE CURB
	VANO2	MEDIAN WIDTH-DISC
WITH	VACO1	ADT

GRAND MEAN = 4.73

VARIABLE + CATEGORY	N	UNADJUSTED DEV'N	UNADJUSTED ETA	ADJUSTED FOR INDEPENDENTS DEV'N	ADJUSTED FOR INDEPENDENTS BETA	ADJUSTED FOR INDEPENDENTS + COVARIATES DEV'N	ADJUSTED FOR INDEPENDENTS + COVARIATES BETA
VATO9							
1 CURB	1408	-0.04				0.03	
2 NO CURB	76	0.75				-0.60	
			0.03				0.02
VANO2							
1 1 - 6	317	0.34				-0.03	
2 7 - 15	318	0.24				0.53	
3 16 - 25	167	-1.07				-0.93	
4 26 - 40	324	-0.28				0.33	
5 41 OR MORE	358	0.24				-0.31	
			0.07				0.07

MULTIPLE R SQUARED	0.084
MULTIPLE R	0.290

Table 74. Analysis of covariance table for lane width and driveways on multilane undivided segments.

* * * * * * * * * * * * * * C E L L   M E A N S * * * * * * * * * * * * * *

	VAD10	AVG ACCIDENT FREQ
BY	VANO8	LANE WIDTH-DISCRETE
	VANO1	DRIVEWAYS-DISCRETE

* *

TOTAL POPULATION

4.41
(2413)

VANO8

1	2	3	4
5.36	4.13	4.28	4.05
(451)	(590)	(965)	(407)

VANO1

1	2	3	4
4.27	4.29	4.71	4.40
(618)	(771)	(607)	(417)

VANO8 \ VANO1	1	2	3	4
1	4.16	5.60	5.41	6.61
	(113)	(151)	(110)	(77)
2	4.37	4.31	4.17	3.36
	(166)	(183)	(142)	(99)
3	4.40	3.86	4.78	4.13
	(238)	(315)	(257)	(155)
4	3.90	3.77	4.51	4.10
	(101)	(122)	(98)	(86)

Table 74. Analysis of covariance table for lane width and driveways on multilane undivided segments (Continued).

* * * * * * * * * * * A N A L Y S I S   O F   V A R I A N C E * * * * * * * * * * *

VAD10 AVG ACCIDENT FREQ
BY VANO8 LANE WIDTH-DISCRETE
VANO1 DRIVEWAYS-DISCRETE
WITH VACO1 ADT

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
COVARIATES	4464.340	1	4464.340	150.268	0.000
VACO1	4464.340	1	4464.340	150.268	0.000
MAIN EFFECTS	948.793	6	158.132	5.323	0.000
VANO8	805.723	3	268.574	9.040	0.000
VANO1	150.870	3	50.290	1.693	0.167
2-WAY INTERACTIONS	350.063	9	38.896	1.309	0.226
VANO8 VANO1	350.061	9	38.896	1.309	0.226
EXPLAINED	5763.250	16	360.203	12.124	0.0
RESIDUAL	71183.000	2396	29.709		
TOTAL	76946.250	2412	31.901		

COVARIATE	RAW REGRESSION COEFFICIENT
VACO1	0.000

2496 CASES WERE PROCESSED.
83 CASES (3.3 PCT) WERE MISSING.

Table 74. Analysis of covariance table for lane width and driveways on multilane undivided segments (Continued).

* * * M U L T I P L E   C L A S S I F I C A T I O N   A N A L Y S I S * * *

	VAD10	AVG ACCIDENT FREQ
BY	VANO8	LANE WIDTH-DISCRETE
	VANO1	DRIVEWAYS-DISCRETE
WITH	VACO1	ADT

GRAND MEAN = 4.41

VARIABLE + CATEGORY	N	UNADJUSTED DEV'N	UNADJUSTED ETA	ADJUSTED FOR INDEPENDENTS DEV'N	ADJUSTED FOR INDEPENDENTS BETA	ADJUSTED FOR INDEPENDENTS + COVARIATES DEV'N	ADJUSTED FOR INDEPENDENTS + COVARIATES BETA
VANO8							
1 7 - 10 FT	451	0.96				1.18	
2 11 FT	590	-0.28				-0.29	
3 12 FT	965	-0.13				-0.38	
4 13 FT+	407	-0.36				0.00	
			0.08				0.10
VANO1							
1 0 - 2	618	-0.14				-0.28	
2 3 - 5	771	-0.12				-0.14	
3 6 - 8	607	0.30				0.36	
4 9 OR MORE	417	-0.01				0.15	
			0.03				0.04

MULTIPLE R SQUARED	0.070
MULTIPLE R	0.265

APPENDIX I - REGRESSION RESULTS OF 0.5 MILE (0.8 KM) SEGMENT LENGTHS

Introduction

Multiple linear regression analysis was conducted on the 0.5 mile (0.8 km) segment lengths for the four roadway classification groups included in the data base. The details of the regression equations which include mean values for the dependent and independent variables, the correlation coefficients, and the statistics for the stepwise development of the regression equations are presented in the following tables. In Tables 75 through 78, the regression statistics using annual accident frequency as a dependent variable are presented. The regression statistics for accident rate are given in Tables 79 through 82. A discussion of the results is included in the research report.

Table 75. Regression results for 0.5 mile (0.8 km) two-lane, two-way segments using annual accident frequency.

* * * * M U L T I P L E   R E G R E S S I O N * * * *

VARIABLE LIST NUMBER 1. LISTWISE DELETION OF MISSING DATA.

	MEAN	STD DEV	LABEL
V18	2.180	0.817	LAND USE
V16	4.939	2.934	NO OF INTER NSIG
V25	8995.748	5087.019	ADT
V02	31.274	19.369	SIGNS
V15	0.976	1.260	NO OF INTER SIG
V28	25.368	30.360	ACCIDENT FREQUENCY
V37	8.171	7.746	TOT ACCIDENT RATE

N OF CASES = 544

CORRELATION

	V18	V16	V25	V02	V15	V28	V37
V18	1.000	-0.162	-0.052	-0.325	-0.266	-0.192	-0.177
V16	-0.162	1.000	-0.016	0.493	0.028	0.170	0.243
V25	-0.052	-0.016	1.000	0.247	0.112	0.421	-0.102
V02	-0.325	0.493	0.247	1.000	0.429	0.514	0.433
V15	-0.266	0.028	0.112	0.429	1.000	0.334	0.310
V28	-0.192	0.170	0.421	0.514	0.334	1.000	0.713
V37	-0.177	0.243	-0.102	0.433	0.310	0.713	1.000

Table 75. Regression results for 0.5 mile (0.8 km) two-lane, two-way segments using annual accident frequency (Continued).

* * * * M U L T I P L E   R E G R E S S I O N * * * *

EQUATION NUMBER 1.

DEPENDENT VARIABLE.. V28 ACCIDENT FREQUENCY

BEGINNING BLOCK NUMBER 1. METHOD: STEPWISE

VARIABLE(S) ENTERED ON STEP NUMBER 1.. V02 SIGNS

MULTIPLE R	0.51428		
R SQUARE	0.26449	R SQUARE CHANGE	0.26449
ADJUSTED R SQUARE	0.26313	F CHANGE	194.89869
STANDARD ERROR	26.06130	SIGNIF F CHANGE	0.0000

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	1	132373.51307	132373.51307
RESIDUAL	542	368121.72793	679.19138

F = 194.89869 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
V02	0.80611	0.05774	0.69268	0.91953	0.51428	13.961	0.0000
(CONSTANT)	0.15746	2.12355	-4.01394	4.32885		0.074	0.9409

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
V18	-0.02778	-0.03063	0.89425	-0.713	0.4763
V16	-0.11038	-0.11201	0.75740	-2.622	0.0090
V25	0.31369	0.35445	0.93912	8.817	0.0000
V15	0.13846	0.14585	0.81606	3.429	0.0007

Table 75. Regression results for 0.5 mile (0.8 km) two-lane, two-way segments using annual accident frequency (Continued).

* * * * M U L T I P L E   R E G R E S S I O N * * * *

DEPENDENT VARIABLE.. V28 ACCIDENT FREQUENCY

VARIABLE(S) ENTERED ON STEP NUMBER 2.. V25 ADT

MULTIPLE R	0.58741		
R SQUARE	0.35689	R SQUARE CHANGE	0.09241
ADJUSTED R SQUARE	0.35452	F CHANGE	77.73692
STANDARD ERROR	24.39174	SIGNIF F CHANGE	0.0000

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	2	178623.62072	89311.81036
RESIDUAL	541	321871.62028	594.95678

F = 150.11479 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
V02	0.68479	0.05577	0.57525	0.79434	0.43688	12.280	0.0000
V25	0.00187	0.2123E-03	0.00146	0.00229	0.31369	8.817	0.0000
(CONSTANT)	-12.88958	2.47789	-17.75705	-8.02212		-5.202	0.0000

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
V18	-0.03787	-0.04463	0.84123	-1.038	0.2996
V16	-0.05507	-0.05897	0.69268	-1.373	0.1704
V15	0.13627	0.15350	0.77600	3.610	0.0003

Table 75. Regression results for 0.5 mile (0.8 km) two-lane, two-way segments using annual accident frequency (Continued).

*** * * * M U L T I P L E   R E G R E S S I O N * * * ***

DEPENDENT VARIABLE.. V28 ACCIDENT FREQUENCY

VARIABLE(S) ENTERED ON STEP NUMBER 3.. V15 NO OF INTER SIG

MULTIPLE R	0.60996		
R SQUARE	0.37205	R SQUARE CHANGE	0.01515
ADJUSTED R SQUARE	0.36856	F CHANGE	13.03042
STANDARD ERROR	24.12497	SIGNIF F CHANGE	0.0003

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	3	186207.50966	62069.16989
RESIDUAL	540	314287.73133	582.01432

F = 106.64543 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
V02	0.59351	0.06068	0.47432	0.71270	0.37865	9.781	0.0000
V25	0.00187	0.2100E-03	0.00145	0.00228	0.31286	8.891	0.0000
V15	3.28222	0.90926	1.49610	5.06834	0.13627	3.610	0.0003
(CONSTANT)	-13.19390	2.45224	-18.01100	-8.37680		-5.380	0.0000

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
V18	-0.01898	-0.02238	0.72999	-0.520	0.6034
V16	-0.02270	-0.02391	0.54138	-0.555	0.5789

FOR BLOCK NUMBER 1 PIN = 0.050 LIMITS REACHED.

Table 76. Regression results for 0.5 mile (0.8 km) one-way segments using annual accident frequency.

* * * * M U L T I P L E   R E G R E S S I O N * * * *

VARIABLE LIST NUMBER 1. LISTWISE DELETION OF MISSING DATA.

	MEAN	STD DEV	LABEL
V25	11127.418	6951.443	ADT
V02	52.373	28.879	SIGNS
V15	2.282	2.014	NO OF INTER SIG
V14	21.718	13.077	NO OF DRIVEWAYS
V24	24.991	12.473	UTILITY POLES
V28	41.667	42.375	ACCIDENT FREQUENCY
V37	10.768	7.773	TOT ACCIDENT RATE

N OF CASES = 110

CORRELATION

	V25	V02	V15	V14	V24	V28	V37
V25	1.000	0.146	0.213	0.072	0.311	0.556	-0.106
V02	0.146	1.000	0.479	0.469	0.310	0.240	0.253
V15	0.213	0.479	1.000	0.334	0.256	0.397	0.238
V14	0.072	0.469	0.334	1.000	0.297	0.028	0.036
V24	0.311	0.310	0.256	0.297	1.000	0.347	0.167
V28	0.556	0.240	0.397	0.028	0.347	1.000	0.644
V37	-0.106	0.253	0.238	0.036	0.167	0.644	1.000

Table 75. Regression results for 0.5 mile (0.8 km) one-way segments using annual accident frequency (Continued).

* * * * M U L T I P L E   R E G R E S S I O N * * * *

EQUATION NUMBER 1.

DEPENDENT VARIABLE.. V28 ACCIDENT FREQUENCY

BEGINNING BLOCK NUMBER 1. METHOD: ENTER

VARIABLE(S) ENTERED ON STEP NUMBER

Step	Variable	Label
1..	V24	UTILITY POLES
2..	V15	NO OF INTER SIG
3..	V25	ADT
4..	V14	NO OF DRIVEWAYS
5..	V02	SIGNS

MULTIPLE R	0.65658		
R SQUARE	0.43109	R SQUARE CHANGE	0.43109
ADJUSTED R SQUARE	0.40374	F CHANGE	15.76119
STANDARD ERROR	32.72079	SIGNIF F CHANGE	0.0000

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	5	84373.61158	16874.72232
RESIDUAL	104	111347.61012	1070.65010

F = 15.76119 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
V24	0.56716	0.28099	0.00995	1.12437	0.16694	2.018	0.0461
V15	6.00568	1.81905	2.39844	9.61293	0.28549	3.302	0.0013
V25	0.00272	0.4806E-03	0.00176	0.00367	0.44580	5.655	0.0000
V14	-0.59204	0.27852	-1.14436	-0.03972	-0.18271	-2.126	0.0359
V02	0.10541	0.13484	-0.16197	0.37280	0.07184	0.782	0.4361
(CONSTANT)	-9.11223	8.86895	-26.69969	8.47522		-1.027	0.3066

FOR BLOCK NUMBER 1 ALL REQUESTED VARIABLES ENTERED.

Table 76. Regression results for 0.5 mile (0.8 km) one-way segments using annual accident frequency (Continued).

* * * * M U L T I P L E   R E G R E S S I O N * * * *

DEPENDENT VARIABLE.. V28 ACCIDENT FREQUENCY

BEGINNING BLOCK NUMBER 2. METHOD: BACKWARD

VARIABLE(S) REMOVED ON STEP NUMBER 6.. VO2 SIGNS

MULTIPLE R	0.65402		
R SQUARE	0.42775	R SQUARE CHANGE	-0.00334
ADJUSTED R SQUARE	0.40595	F CHANGE	0.61116
STANDARD ERROR	32.66015	SIGNIF F CHANGE	0.4361

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	4	83719.27005	20929.81751
RESIDUAL	105	112001.95164	1066.68525

F = 19.62136 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
V24	0.59787	0.27771	0.04722	1.14853	0.17598	2.153	0.0336
V15	6.51701	1.69425	3.15763	9.87639	0.30979	3.847	0.0002
V25	0.00272	0.4796E-03	0.00177	0.00367	0.44666	5.677	0.0000
V14	-0.51799	0.26144	-1.03637	0.38393E-03	-0.15986	-1.981	0.0502
(CONSTANT)	-7.19274	8.50652	-24.05958	9.67409		-0.846	0.3997

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
VO2	0.07184	0.07643	0.64780	0.782	0.4361

FOR BLOCK NUMBER 2 POUT = 0.100 LIMITS REACHED.

Table 77. Regression results for 0.5 mile (0.8 km) multilane divided segments using annual accident frequency.

* * * * M U L T I P L E   R E G R E S S I O N * * * *

VARIABLE LIST NUMBER 1. LISTWISE DELETION OF MISSING DATA.

	MEAN	STD DEV	LABEL
V16	4.447	2.723	NO OF INTER NSIG
V18	1.942	1.010	LAND USE
V25	18343.928	9652.663	ADT
V02	41.038	19.762	SIGNS
V15	1.849	1.830	NO OF INTER SIG
V17	34.911	6.556	POSTED SPEED
V28	47.457	41.904	ACCIDENT FREQUENCY
V37	7.610	6.363	TOT ACCIDENT RATE

N OF CASES = 291

CORRELATION

	V16	V18	V25	V02	V15	V17	V28	V37
V16	1.000	-0.180	-0.068	0.247	-0.091	-0.262	-0.037	0.034
V18	-0.180	1.000	-0.127	-0.277	-0.150	0.181	-0.237	-0.163
V25	-0.068	-0.127	1.000	0.198	0.172	0.034	0.419	-0.156
V02	0.247	-0.277	0.198	1.000	0.414	-0.162	0.445	0.295
V15	-0.091	-0.150	0.172	0.414	1.000	-0.377	0.303	0.211
V17	-0.262	0.181	0.034	-0.162	-0.377	1.000	-0.030	-0.076
V28	-0.037	-0.237	0.419	0.445	0.303	-0.030	1.000	0.707
V37	0.034	-0.163	-0.156	0.295	0.211	-0.076	0.707	1.000

Table 77. Regression results for 0.5 mile (0.8 km) multilane divided segments using annual accident frequency (Continued).

* * * * M U L T I P L E   R E G R E S S I O N * * * *

EQUATION NUMBER 1.

DEPENDENT VARIABLE.. V28 ACCIDENT FREQUENCY

BEGINNING BLOCK NUMBER 1. METHOD: STEPWISE

VARIABLE(S) ENTERED ON STEP NUMBER 1.. V02 SIGNS

MULTIPLE R	0.44519		
R SQUARE	0.19819	R SQUARE CHANGE	0.19819
ADJUSTED R SQUARE	0.19542	F CHANGE	71.43507
STANDARD ERROR	37.58739	SIGNIF F CHANGE	0.0000

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	1	100924.33533	100924.33533
RESIDUAL	289	408302.69817	1412.81210

F = 71.43507 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
V02	0.94397	0.11169	0.72415	1.16379	0.44519	8.452	0.0000
(CONSTANT)	8.71855	5.08552	-1.29079	18.72790		1.714	0.0875

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
V16	-0.15645	-0.16933	0.93919	-2.916	0.0038
V18	-0.12272	-0.13170	0.92342	-2.255	0.0249
V25	0.34404	0.37661	0.96079	6.899	0.0000
V15	0.14313	0.14552	0.82890	2.496	0.0131
V17	0.04293	0.04731	0.97375	0.804	0.4222

Table 77. Regression results for 0.5 mile (0.8 km) multilane divided segments using annual accident frequency (Continued).

* * * * M U L T I P L E   R E G R E S S I O N * * * *

DEPENDENT VARIABLE.. V28 ACCIDENT FREQUENCY

VARIABLE(S) ENTERED ON STEP NUMBER 2.. V25 ADT

MULTIPLE R	0.55849			ANALYSIS OF VARIANCE			
R SQUARE	0.31192	R SQUARE CHANGE	0.11372		DF	SUM OF SQUARES	MEAN SQUARE
ADJUSTED R SQUARE	0.30714	F CHANGE	47.59944	REGRESSION	2	158835.57927	79417.78964
STANDARD ERROR	34.88032	SIGNIF F CHANGE	0.0000	RESIDUAL	288	350391.45423	1216.63699

F = 65.27649 SIGNIF F = 0.0000

------------------------------- VARIABLES IN THE EQUATION -------------------------------

VARIABLE	B	SE B	95% CONFDNCE	INTRVL B	BETA	T	SIG T
V02	0.79951	0.10574	0.59140	1.00763	0.37706	7.561	0.0000
V25	0.00149	0.2165E-03	0.00107	0.00192	0.34404	6.899	0.0000
(CONSTANT)	-12.75083	5.65287	-23.87701	-1.62465		-2.256	0.0248

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
V16	-0.11527	-0.13364	0.89279	-2.284	0.0231
V18	-0.09621	-0.11112	0.89649	-1.894	0.0592
V15	0.10690	0.11673	0.81229	1.991	0.0474
V17	0.01978	0.02348	0.93229	0.398	0.6911

Table 77. Regression results for 0.5 mile (0.8 km) multilane divided segments using annual accident frequency (Continued).

* * * * MULTIPLE REGRESSION * * * *

DEPENDENT VARIABLE.. V28 ACCIDENT FREQUENCY

VARIABLE(S) ENTERED ON STEP NUMBER 3.. V16 NO OF INTER NSIG

MULTIPLE R	0.56939			ANALYSIS OF VARIANCE			
R SQUARE	0.32420	R SQUARE CHANGE	0.01229		DF	SUM OF SQUARES	MEAN SQUARE
ADJUSTED R SQUARE	0.31714	F CHANGE	5.21872	REGRESSION	3	165093.20218	55031.06739
STANDARD ERROR	34.62763	SIGNIF F CHANGE	0.0231	RESIDUAL	287	344133.83132	1199.07258

F = 45.89469 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
V02	0.86569	0.10889	0.65135	1.08002	0.40827	7.950	0.0000
V25	0.00143	0.2166E-03	0.00101	0.00186	0.32998	6.615	0.0000
V16	-1.77398	0.77655	-3.30243	-0.24554	-0.11527	-2.284	0.0231
(CONSTANT)	-6.45823	6.25149	-18.76281	5.84634		-1.033	0.3024

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
V18	-0.11326	-0.13087	0.84966	-2.232	0.0264
V15	0.08505	0.09164	0.72660	1.556	0.1207
V17	-0.00596	-0.00695	0.87770	-0.118	0.9065

Table 77. Regression results for 0.5 mile (0.8 km) multilane divided segments using annual accident frequency (Continued).

* * * * M U L T I P L E   R E G R E S S I O N * * * *

DEPENDENT VARIABLE.. V28 ACCIDENT FREQUENCY

VARIABLE(S) ENTERED ON STEP NUMBER 4.. V18 LAND USE

MULTIPLE R	0.57946		
R SQUARE	0.33578	R SQUARE CHANGE	0.01157
ADJUSTED R SQUARE	0.32649	F CHANGE	4.98363
STANDARD ERROR	34.38978	SIGNIF F CHANGE	0.0264

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	4	170987.13261	42746.78315
RESIDUAL	286	338239.90089	1182.65700

F = 36.14470 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
V02	0.81129	0.11086	0.59309	1.02949	0.38261	7.318	0.0000
V25	0.00139	0.2160E-03	0.96230E-03	0.00181	0.31961	6.423	0.0000
V16	-2.00088	0.77788	-3.53197	-0.46978	-0.13001	-2.572	0.0106
V18	-4.69775	2.10434	-8.83971	-0.55578	-0.11326	-2.232	0.0264
(CONSTANT)	6.72988	8.57004	-10.13846	23.59822		0.785	0.4329

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
V15	0.07775	0.08434	0.70462	1.429	0.1541
V17	0.00806	0.00941	0.84398	0.159	0.8738

FOR BLOCK NUMBER 1 PIN = 0.050 LIMITS REACHED.

Table 78. Regression results for 0.5 mile (0.8 km) multilane undivided segments using annual accident frequency.

```
                    * * * *   M U L T I P L E   R E G R E S S I O N   * * * *

EQUATION NUMBER  1.

DEPENDENT VARIABLE..  V28           ACCIDENT FREQUENCY


BEGINNING BLOCK NUMBER  1.  METHOD:  STEPWISE


VARIABLE(S) ENTERED ON STEP NUMBER  1..    V25         ADT


MULTIPLE R            0.32886                                       ANALYSIS OF VARIANCE
R SQUARE              0.10815     R SQUARE CHANGE    0.10815                         DF      SUM OF SQUARES      MEAN SQUARE
ADJUSTED R SQUARE     0.10560     F CHANGE          42.44257        REGRESSION         1         57059.90456      57059.90456
STANDARD ERROR       36.66610     SIGNIF F CHANGE    0.0000         RESIDUAL         350        470540.98616       1344.40282

                                                                    F =       42.44257       SIGNIF F = 0.0000


------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE              B         SE B     95% CONFDNCE INTRVL B        BETA          T  SIG T

V25             0.00185  0.2834E-03     0.00129      0.00240     0.32886       6.515 0.0000
(CONSTANT)     17.15061     4.67946     7.94722     26.35399                   3.665 0.0003


------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE     BETA IN   PARTIAL  MIN TOLER          T  SIG T

V04         -0.12910  -0.13620    0.99270     -2.568 0.0106
V16         -0.08527  -0.08946    0.98179     -1.678 0.0942
V02          0.21317   0.22165    0.96424      4.246 0.0000
V24          0.27842   0.29184    0.97991      5.700 0.0000
V17         -0.10503  -0.10786    0.94045     -2.027 0.0434
```

Table 78. Regression results for 0.5 mile (0.8 km) multilane undivided segments using annual accident frequency (Continued).

* * * * M U L T I P L E R E G R E S S I O N * * * *

DEPENDENT VARIABLE.. V28 ACCIDENT FREQUENCY

VARIABLE(S) ENTERED ON STEP NUMBER 2.. V24 UTILITY POLES

MULTIPLE R	0.42908		
R SQUARE	0.18411	R SQUARE CHANGE	0.07596
ADJUSTED R SQUARE	0.17943	F CHANGE	32.49124
STANDARD ERROR	35.12016	SIGNIF F CHANGE	0.0000

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	2	97135.42824	48567.71412
RESIDUAL	349	430465.46248	1233.42539

F = 39.37629 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
V25	0.00162	0.2742E-03	0.00109	0.00216	0.28940	5.925	0.0000
V24	0.84124	0.14758	0.55098	1.13151	0.27842	5.700	0.0000
(CONSTANT)	-5.15742	5.95030	-16.86038	6.54553		-0.867	0.3867

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
V04	-0.03427	-0.03529	0.85380	-0.659	0.5105
V16	-0.10716	-0.11721	0.95944	-2.202	0.0283
V02	0.14012	0.14495	0.87309	2.733	0.0066
V17	0.00741	0.00732	0.79620	0.137	0.8915

Table 78. Regression results for 0.5 mile (0.8 km) multilane undivided segments using annual accident frequency (Continued).

* * * * MULTIPLE REGRESSION * * * *

DEPENDENT VARIABLE.. V28 ACCIDENT FREQUENCY

VARIABLE(S) ENTERED ON STEP NUMBER 3.. V02 SIGNS

MULTIPLE R	0.44861		
R SQUARE	0.20125	R SQUARE CHANGE	0.01714
ADJUSTED R SQUARE	0.19436	F CHANGE	7.46841
STANDARD ERROR	34.79915	SIGNIF F CHANGE	0.0066

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	3	106179.53526	35393.17842
RESIDUAL	348	421421.35547	1210.98091

F = 29.22687 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
V25	0.00151	0.2749E-03	0.96912E-03	0.00205	0.26896	5.492	0.0000
V24	0.71212	0.15368	0.40986	1.01437	0.23568	4.634	0.0000
V02	0.26288	0.09619	0.07369	0.45207	0.14012	2.733	0.0066
(CONSTANT)	-10.88668	6.25755	-23.19405	1.42069		-1.740	0.0828

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
V04	-0.05283	-0.05453	0.76085	-1.017	0.3097
V16	-0.11943	-0.13153	0.86664	-2.472	0.0139
V17	0.02137	0.02124	0.77643	0.396	0.6926

Table 78. Regression results for 0.5 mile (0.8 km) multilane undivided segments using annual accident frequency (Continued).

* * * * M U L T I P L E   R E G R E S S I O N * * * *

DEPENDENT VARIABLE.. V28 ACCIDENT FREQUENCY

VARIABLE(S) ENTERED ON STEP NUMBER 4.. V16 NO OF INTER NSIG

MULTIPLE R	0.46375		
R SQUARE	0.21507	R SQUARE CHANGE	0.01382
ADJUSTED R SQUARE	0.20602	F CHANGE	6.10898
STANDARD ERROR	34.54649	SIGNIF F CHANGE	0.0139

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	4	113470.36135	28367.59034
RESIDUAL	347	414130.52938	1193.45974

F = 23.76921 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
V25	0.00140	0.2763E-03	0.85976E-03	0.00195	0.24997	5.079	0.0000
V24	0.72974	0.15273	0.42934	1.03013	0.24151	4.778	0.0000
V02	0.28324	0.09585	0.09472	0.47176	0.15097	2.955	0.0033
V16	-1.83079	0.74072	-3.28765	-0.37392	-0.11943	-2.472	0.0139
(CONSTANT)	-2.06627	7.16418	-16.15697	12.02443		-0.288	0.7732

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
V04	-0.02585	-0.02625	0.74817	-0.488	0.6256
V17	0.02201	0.02207	0.77483	0.411	0.6817

FOR BLOCK NUMBER 1 PIN = 0.050 LIMITS REACHED.

Table 79. Regression results for 0.5 mile (0.8 km) two-lane, two-way segments using accident rate.

* * * * M U L T I P L E   R E G R E S S I O N * * * *

EQUATION NUMBER 2.

DEPENDENT VARIABLE.. V37 TOT ACCIDENT RATE

BEGINNING BLOCK NUMBER 1. METHOD: STEPWISE

VARIABLE(S) ENTERED ON STEP NUMBER 1.. VO2 SIGNS

MULTIPLE R	0.43282		
R SQUARE	0.18733	R SQUARE CHANGE	0.18733
ADJUSTED R SQUARE	0.18584	F CHANGE	124.94108
STANDARD ERROR	6.98964	SIGNIF F CHANGE	0.0000

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	1	6104.00816	6104.00816
RESIDUAL	542	26479.46140	48.85509

F = 124.94108 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
VO2	0.17310	0.01549	0.14268	0.20352	0.43282	11.178	0.0000
(CONSTANT)	2.75723	0.56954	1.63846	3.87600		4.841	0.0000

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
V18	-0.04057	-0.04255	0.89425	-0.991	0.3223
V16	0.03896	0.03761	0.75740	0.875	0.3818
V25	-0.22206	-0.23872	0.93912	-5.718	0.0000
V15	0.15301	0.15333	0.81606	3.609	0.0003

Table 79. Regression results for 0.5 mile (0.8 km) two-lane, two-way segments using accident rate (Continued).

* * * * MULTIPLE REGRESSION * * * *

DEPENDENT VARIABLE.. V37 TOT ACCIDENT RATE

VARIABLE(S) ENTERED ON STEP NUMBER 2.. V25 ADT

MULTIPLE R	0.48337			ANALYSIS OF VARIANCE			
R SQUARE	0.23364	R SQUARE CHANGE	0.04631		DF	SUM OF SQUARES	MEAN SQUARE
ADJUSTED R SQUARE	0.23081	F CHANGE	32.69183	REGRESSION	2	7612.94013	3806.47006
STANDARD ERROR	6.79384	SIGNIF F CHANGE	0.0000	RESIDUAL	541	24970.52943	46.15625

F = 82.46923 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
V02	0.19501	0.01553	0.16450	0.22553	0.48761	12.555	0.0000
V25	-0.33815E-03	0.5914E-04	-0.45433E-03	-0.22198E-03	-0.22206	-5.718	0.0000
(CONSTANT)	5.11385	0.69017	3.75812	6.46959		7.410	0.0000

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
V18	-0.03348	-0.03615	0.84123	-0.841	0.4009
V16	-0.00126	-0.00123	0.69268	-0.029	0.9772
V15	0.15458	0.15951	0.77600	3.755	0.0002

Table 79. Regression results for 0.5 mile (0.8 km) two-lane, two-way segments using accident rate (Continued).

* * * * MULTIPLE REGRESSION * * * *

DEPENDENT VARIABLE.. V37 TOT ACCIDENT RATE

VARIABLE(S) ENTERED ON STEP NUMBER 3.. V15 NO OF INTER SIG

MULTIPLE R	0.50313			
R SQUARE	0.25314		R SQUARE CHANGE	0.01950
ADJUSTED R SQUARE	0.24899		F CHANGE	14.09739
STANDARD ERROR	6.71306		SIGNIF F CHANGE	0.0002

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	3	8248.26415	2749.42138
RESIDUAL	540	24335.20541	45.06520

F = 61.00986 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
V02	0.16859	0.01688	0.13543	0.20176	0.42155	9.985	0.0000
V25	-0.33959E-03	0.5844E-04	-0.45438E-03	-0.22479E-03	-0.22301	-5.811	0.0000
V15	0.94999	0.25301	0.45298	1.44700	0.15456	3.755	0.0002
(CONSTANT)	5.02577	0.68237	3.68536	6.36619		7.365	0.0000

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
V18	-0.01184	-0.01281	0.72999	-0.297	0.7663
V16	0.03902	0.03770	0.54138	0.876	0.3815

FOR BLOCK NUMBER 1 PIN = 0.050 LIMITS REACHED.

Table 80. Regression results for 0.5 mile (0.8 km) one-way segments using accident rate.

* * * * M U L T I P L E   R E G R E S S I O N * * * *

EQUATION NUMBER 2.

DEPENDENT VARIABLE.. V37 TOT ACCIDENT RATE

BEGINNING BLOCK NUMBER 1. METHOD: ENTER

VARIABLE(S) ENTERED ON STEP NUMBER

1..	V24	UTILITY POLES
2..	V15	NO OF INTER SIG
3..	V25	ADT
4..	V14	NO OF DRIVEWAYS
5..	V02	SIGNS

MULTIPLE R	0.38177		
R SQUARE	0.14575	R SQUARE CHANGE	0.14575
ADJUSTED R SQUARE	0.10468	F CHANGE	3.54884
STANDARD ERROR	7.35488	SIGNIF F CHANGE	0.0053

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	5	959.85938	191.97188
RESIDUAL	104	5625.79583	54.09419

F = 3.54884 SIGNIF F = 0.0053

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
V24	0.10383	0.06316	-0.02142	0.22908	0.16660	1.644	0.1032
V15	0.74351	0.40888	-0.06731	1.55434	0.19268	1.818	0.0719
V25	-0.24447E-03	0.1080E-03	-0.45868E-03	-0.30261E-04	-0.21863	-2.263	0.0257
V14	-0.09711	0.06261	-0.22126	0.02704	-0.16338	-1.551	0.1239
V02	0.05847	0.03031	-0.00163	0.11857	0.21724	1.929	0.0564
(CONSTANT)	8.24350	1.99354	4.29025	12.19675		4.135	0.0001

FOR BLOCK NUMBER 1 ALL REQUESTED VARIABLES ENTERED.

Table 80. Regression results for 0.5 mile (0.8 km) one-way segments using accident rate (Continued).

**** MULTIPLE REGRESSION ****

DEPENDENT VARIABLE.. V37 TOT ACCIDENT RATE

BEGINNING BLOCK NUMBER 2. METHOD: BACKWARD

VARIABLE(S) REMOVED ON STEP NUMBER 6.. V14 NO OF DRIVEWAYS

MULTIPLE R	0.35495		
R SQUARE	0.12599	R SQUARE CHANGE	-0.01976
ADJUSTED R SQUARE	0.09269	F CHANGE	2.40605
STANDARD ERROR	7.40396	SIGNIF F CHANGE	0.1239

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	4	829.70625	207.42656
RESIDUAL	105	5755.94897	54.81856

F = 3.78387 SIGNIF F = 0.0065

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
V24	0.08653	0.06258	-0.03756	0.21062	0.13884	1.383	0.1697
V15	0.66221	0.40821	-0.14720	1.47162	0.17161	1.622	0.1078
V25	-0.23329E-03	0.1085E-03	-0.44842E-03	-0.18155E-04	-0.20863	-2.150	0.0338
V02	0.04248	0.02869	-0.01441	0.09937	0.15784	1.481	0.1417
(CONSTANT)	7.46518	1.94223	3.61410	11.31626		3.844	0.0002

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
V14	-0.16338	-0.15037	0.64780	-1.551	0.1239

Table 80. Regression results for 0.5 mile (0.8 km) one-way segments using accident rate (Continued).

* * * * M U L T I P L E   R E G R E S S I O N * * * *

DEPENDENT VARIABLE.. V37 TOT ACCIDENT RATE

VARIABLE(S) REMOVED ON STEP NUMBER 7.. V24 UTILITY POLES

MULTIPLE R	0.33177			ANALYSIS OF VARIANCE			
R SQUARE	0.11007	R SQUARE CHANGE	-0.01591		DF	SUM OF SQUARES	MEAN SQUARE
ADJUSTED R SQUARE	0.08489	F CHANGE	1.91163	REGRESSION	3	724.91330	241.63777
STANDARD ERROR	7.43573	SIGNIF F CHANGE	0.1697	RESIDUAL	106	5860.74192	55.29002

F = 4.37037 SIGNIF F = 0.0061

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE	INTRVL B	BETA	T	SIG T
V15	0.71088	0.40844	-0.09889	1.52065	0.18422	1.740	0.0847
V25	-0.19324E-03	0.1050E-03	-0.40144E-03	0.14950E-04	-0.17282	-1.840	0.0685
V02	0.05105	0.02814	-0.00473	0.10683	0.18966	1.814	0.0724
(CONSTANT)	8.62234	1.76017	5.13263	12.11206		4.899	0.0000

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
V14	-0.13280	-0.12307	0.66071	-1.271	0.2066
V24	0.13884	0.13372	0.73251	1.383	0.1697

FOR BLOCK NUMBER 2 POUT = 0.100 LIMITS REACHED.

Table 81. Regression results for 0.5 mile (0.8 km) multilane divided segments using accident rate.

* * * * M U L T I P L E   R E G R E S S I O N * * * *

EQUATION NUMBER 2.

DEPENDENT VARIABLE.. V37 TOT ACCIDENT RATE

BEGINNING BLOCK NUMBER 1. METHOD: STEPWISE

VARIABLE(S) ENTERED ON STEP NUMBER 1.. V02 SIGNS

MULTIPLE R	0.29495			ANALYSIS OF VARIANCE			
R SQUARE	0.08700	R SQUARE CHANGE	0.08700		DF	SUM OF SQUARES	MEAN SQUARE
ADJUSTED R SQUARE	0.08384	F CHANGE	27.53741	REGRESSION	1	1021.30411	1021.30411
STANDARD ERROR	6.08998	SIGNIF F CHANGE	0.0000	RESIDUAL	289	10718.39683	37.08788

F = 27.53741 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
V02	0.09496	0.01810	0.05934	0.13058	0.29495	5.248	0.0000
(CONSTANT)	3.71265	0.82397	2.09092	5.33438		4.506	0.0000

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
V16	-0.04148	-0.04207	0.93919	-0.715	0.4754
V18	-0.08850	-0.08900	0.92342	-1.516	0.1305
V25	-0.22354	-0.22932	0.96079	-3.998	0.0001
V15	0.10701	0.10196	0.82890	1.739	0.0830
V17	-0.02863	-0.02956	0.97375	-0.502	0.6161

Table 81. Regression results for 0.5 mile (0.8 km) multilane divided segments using accident rate (Continued).

* * * * M U L T I P L E   R E G R E S S I O N * * * *

DEPENDENT VARIABLE.. V37 TOT ACCIDENT RATE

VARIABLE(S) ENTERED ON STEP NUMBER 2.. V25 ADT

MULTIPLE R	0.36743		
R SQUARE	0.13501	R SQUARE CHANGE	0.04801
ADJUSTED R SQUARE	0.12900	F CHANGE	15.98562
STANDARD ERROR	5.93798	SIGNIF F CHANGE	0.0001

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	2	1584.94983	792.47492
RESIDUAL	288	10154.75110	35.25955

F = 22.47547 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE	INTRVL B	BETA	T	SIG T
V02	0.10921	0.01800	0.07378	0.14464	0.33922	6.067	0.0000
V25	-0.14735E-03	0.3685E-04	-0.21988E-03	-0.74811E-04	-0.22354	-3.998	0.0001
(CONSTANT)	5.83072	0.96234	3.93662	7.72483		6.059	0.0000

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
V16	-0.07046	-0.07286	0.89279	-1.238	0.2169
V18	-0.10673	-0.10895	0.89649	-1.874	0.0619
V15	0.13260	0.12914	0.81229	2.206	0.0282
V17	-0.01359	-0.01438	0.93229	-0.244	0.8076

Table 82. Regression results for 0.5 mile (0.8 km) multilane undivided segments using accident rate.

* * * * M U L T I P L E   R E G R E S S I O N * * * *

EQUATION NUMBER 2.

DEPENDENT VARIABLE.. V37 TOT ACCIDENT RATE

BEGINNING BLOCK NUMBER 1. METHOD: STEPWISE

VARIABLE(S) ENTERED ON STEP NUMBER 1.. V24 UTILITY POLES

MULTIPLE R	0.30015		
R SQUARE	0.09009	R SQUARE CHANGE	0.09009
ADJUSTED R SQUARE	0.08749	F CHANGE	34.65337
STANDARD ERROR	6.94456	SIGNIF F CHANGE	0.0000

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	1	1671.22666	1671.22666
RESIDUAL	350	16879.43423	48.22695

F = 34.65337 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
V24	0.17006	0.02889	0.11324	0.22687	0.30015	5.887	0.0000
(CONSTANT)	3.45437	0.95485	1.57641	5.33234		3.618	0.0003

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
V04	-0.00704	-0.00687	0.86609	-0.128	0.8980
V16	-0.04186	-0.04381	0.99688	-0.819	0.4132
V25	-0.18000	-0.18680	0.97991	-3.552	0.0004
V02	0.09728	0.09642	0.89394	1.810	0.0712
V17	0.01831	0.01804	0.88345	0.337	0.7363

Table 82. Regression results for 0.5 mile (0.8 km) multilane undivided segments using accident rate (Continued).

* * * * MULTIPLE REGRESSION * * * *

DEPENDENT VARIABLE.. V37 TOT ACCIDENT RATE

VARIABLE(S) ENTERED ON STEP NUMBER 2.. V25 ADT

MULTIPLE R	0.34906		
R SQUARE	0.12184	R SQUARE CHANGE	0.03135
ADJUSTED R SQUARE	0.11681	F CHANGE	12.61810
STANDARD ERROR	6.83209	SIGNIF F CHANGE	0.0004

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	2	2260.20806	1130.10403
RESIDUAL	349	16290.45283	46.67752

F = 24.21089 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE INTRVL B		BETA	T	SIG T
V24	0.18451	0.02871	0.12804	0.24098	0.32566	6.427	0.0000
V25	-0.18947E-03	0.5334E-04	-0.29437E-03	-0.84563E-04	-0.18000	-3.552	0.0004
(CONSTANT)	5.85692	1.15754	3.58029	8.13356		5.060	0.0000

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
V04	-0.01404	-0.01394	0.85380	-0.260	0.7950
V16	-0.06910	-0.07284	0.95544	-1.363	0.1739
V02	0.12908	0.12870	0.87309	2.421	0.0160
V17	0.08642	0.08229	0.79620	1.540	0.1244

Table 82. Regression results for 0.5 mile (0.8 km) multilane undivided segments using accident rate (Continued).

* * * * M U L T I P L E   R E G R E S S I O N * * * *

DEPENDENT VARIABLE.. V37 TOT ACCIDENT RATE

VARIABLE(S) ENTERED ON STEP NUMBER 3.. VO2 SIGNS

MULTIPLE R	0.36931		
R SQUARE	0.13639	R SQUARE CHANGE	0.01455
ADJUSTED R SQUARE	0.12894	F CHANGE	5.86164
STANDARD ERROR	6.78500	SIGNIF F CHANGE	0.0160

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	3	2530.05597	843.35199
RESIDUAL	348	16020.60493	46.03622

F = 18.31931 SIGNIF F = 0.0000

------------------------------ VARIABLES IN THE EQUATION ------------------------------

VARIABLE	B	SE B	95% CONFDNCE	INTRVL B	BETA	T	SIG T
V24	0.16221	0.02896	0.10327	0.22114	0.28629	5.413	0.0000
V25	-0.20929E-03	0.5360E-04	-0.31471E-03	-0.10387E-03	-0.19883	-3.905	0.0001
V02	0.04541	0.01876	0.00852	0.08230	0.12908	2.421	0.0160
(CONSTANT)	4.86729	1.22007	2.46765	7.26693		3.989	0.0001

------------- VARIABLES NOT IN THE EQUATION -------------

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
V04	-0.03085	-0.03063	0.76085	-0.571	0.5685
V16	-0.08018	-0.08492	0.86664	-1.588	0.1133
V17	0.09998	0.09558	0.77643	1.789	0.0745

FOR BLOCK NUMBER 1 PIN = 0.050 LIMITS REACHED.

FEDERALLY COORDINATED PROGRAM (FCP) OF HIGHWAY RESEARCH AND DEVELOPMENT

The Offices of Research and Development (R&D) of the Federal Highway Administration (FHWA) are responsible for a broad program of staff and contract research and development and a Federal-aid program, conducted by or through the State highway transportation agencies, that includes the Highway Planning and Research (HP&R) program and the National Cooperative Highway Research Program (NCHRP) managed by the Transportation Research Board. The FCP is a carefully selected group of projects that uses research and development resources to obtain timely solutions to urgent national highway engineering problems.*

The diagonal double stripe on the cover of this report represents a highway and is color-coded to identify the FCP category that the report falls under. A red stripe is used for category 1, dark blue for category 2, light blue for category 3, brown for category 4, gray for category 5, green for categories 6 and 7, and an orange stripe identifies category 0.

FCP Category Descriptions

1. Improved Highway Design and Operation for Safety

Safety R&D addresses problems associated with the responsibilities of the FHWA under the Highway Safety Act and includes investigation of appropriate design standards, roadside hardware, signing, and physical and scientific data for the formulation of improved safety regulations.

2. Reduction of Traffic Congestion, and Improved Operational Efficiency

Traffic R&D is concerned with increasing the operational efficiency of existing highways by advancing technology, by improving designs for existing as well as new facilities, and by balancing the demand-capacity relationship through traffic management techniques such as bus and carpool preferential treatment, motorist information, and rerouting of traffic.

3. Environmental Considerations in Highway Design, Location, Construction, and Operation

Environmental R&D is directed toward identifying and evaluating highway elements that affect the quality of the human environment. The goals are reduction of adverse highway and traffic impacts, and protection and enhancement of the environment.

4. Improved Materials Utilization and Durability

Materials R&D is concerned with expanding the knowledge and technology of materials properties, using available natural materials, improving structural foundation materials, recycling highway materials, converting industrial wastes into useful highway products, developing extender or substitute materials for those in short supply, and developing more rapid and reliable testing procedures. The goals are lower highway construction costs and extended maintenance-free operation.

5. Improved Design to Reduce Costs, Extend Life Expectancy, and Insure Structural Safety

Structural R&D is concerned with furthering the latest technological advances in structural and hydraulic designs, fabrication processes, and construction techniques to provide safe, efficient highways at reasonable costs.

6. Improved Technology for Highway Construction

This category is concerned with the research, development, and implementation of highway construction technology to increase productivity, reduce energy consumption, conserve dwindling resources, and reduce costs while improving the quality and methods of construction.

7. Improved Technology for Highway Maintenance

This category addresses problems in preserving the Nation's highways and includes activities in physical maintenance, traffic services, management, and equipment. The goal is to maximize operational efficiency and safety to the traveling public while conserving resources.

0. Other New Studies

This category, not included in the seven-volume official statement of the FCP, is concerned with HP&R and NCHRP studies not specifically related to FCP projects. These studies involve R&D support of other FHWA program office research.

* The complete seven-volume official statement of the FCP is available from the National Technical Information Service, Springfield, Va. 22161. Single copies of the introductory volume are available without charge from Program Analysis (HRD-3), Offices of Research and Development, Federal Highway Administration, Washington, D.C. 20590.