Oregon Department of Transportation

Rogue Valley Intelligent Transportation Systems

Appendix D: Collision Data

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Oregon Department of Transportation

Safety Management System

Safety Priority Index System (SPIS)

OREGON DEPARTMENT of TRANSPORTATION
Traffic Management Section
Transportation Safety Division

August 2003

Safety Priority Index System (SPIS)

The Safety Priority Index System (SPIS) is a method developed in 1986 by the Oregon Department of Transportation (ODOT) for identifying potential safety problems on state highways. The Federal Highway Administration (FHWA) accepted SPIS as fulfilling the requirements of the Highway Safety Improvement Program (HSIP). When Oregon began developing its Safety Management System in response to the 1991 ISTEA, it identified SPIS as one of several essential building blocks. SPIS has been recognized as an effective problem identification tool for evaluating state highways for segments with higher crash histories.

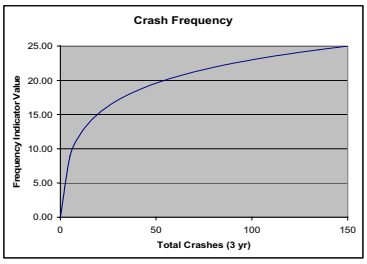
Several modifications to SPIS were implemented following the study, "An Evaluation of the Safety Priority Index System (SPIS)," completed by Dr. Robert Layton of the Transportation Research Institute at Oregon State University. These modifications were implemented in the 1998 SPIS reports, and were "fine-tuned" in the 1999 SPIS reports. These adjustments to the calculations created a large difference in the number of sites located in 1998 in comparison to years past, making it *appear* that more sites exist. However, the new calculations and listings are more applicable to both urban and rural sites, and allow for better understanding of the reported values.

Index Formulation

The SPIS is a method of identifying locations where safety money may be spent to the highest benefit. The SPIS score is based on three years of crash data and considers crash frequency, crash rate, and crash severity. A roadway segment becomes a SPIS site if a location has three or more crashes, **or** one or more fatal crashes over the three year period. SPIS sites are 0.10 mile sections on the state highway system. The priority index has three parameters and associated Indicator Values (IV):

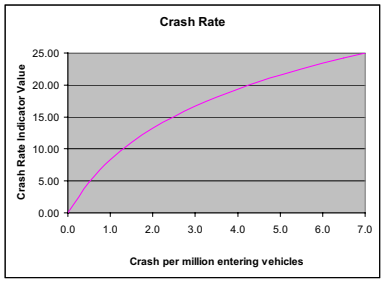
Crash frequency indicator value	(IV_{Freq})	25% of SPIS score
Crash rate indicator value	(IV_{Rate})	25% of SPIS score
Crash severity indicator value	($IV_{Severity}$)	50% of SPIS score

The crash frequency indicator value, **IV_{Freq}**, is a value between 0 and 25 determined using a logarithmic distribution based on total crashes in a three-year period. The maximum indicator value of 25% is obtained when the total number of crashes reaches 150 crashes on the same 0.10-mile segment over a 3-year period.



$$IV_{Freq} = \left[\frac{LOG(TotalCrashes + 1)}{LOG(150 + 1)}\right](25)$$

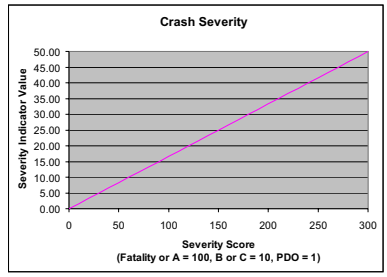
The crash rate indicator, **IV_{Rate}**, is a value between 0 and 25, also determined by using a logarithmic distribution based on the following crash rate calculations. Again, the maximum indicator value of 25% is obtained when the crash rate reaches seven crashes per million entering vehicles.



$$IV_{Rate} = \left[\frac{LOG\left(\left(\frac{(TotalCrashes)(1{,}000{,}000)}{(3yr)(365days)(ADT)} \right) + 1 \right)}{LOG(7+1)} \right] (25)$$

The crash severity indicator, **$IV_{Severity}$**, is a value between 0 and 50, which is determined by using a linear distribution from the calculation below. The formula considers severity values between 0 and 300 only, therefore severity products above 300 are assigned the maximum value, to match the maximum indicator value of 50%.

$$IV_{Severity} = \left[\frac{100(FATAL + INJ_A) + (10)(INJ_B + INJ_C) + (PDO)}{(300)} \right] (50)$$



Where:

FATAL = The number of fatalities;

INJ_A = the number of severe injuries (Class A);

INJ_B = the number of moderate injuries (Class B);

INJ_C = the number of minor injuries (Class C);

PDO = the number of "property damage only" crashes.

The SPIS value is the sum of the above indicator values (IV_{Freq}+IV_{Rate}+$IV_{Severity}$) for 0.10 mile (0.16 km) sections of urban and rural roads, shifted by 0.01 mile for each new section.

SPIS Report Formats

In 2001, the SPIS Reports were reformatted to enhance usability. The following changes were incorporated:

- SPIS sites have been "grouped" and are reported as such. A "group" is defined as consecutive SPIS sites that are less than 0.01 miles from the ending milepoint (EMP) of one site to the beginning milepoint (BMP) of the next SPIS site. Groups were defined for the Top 10% and for All Sites. Investigation reports can be reported for "group" rather than individual site. Complete SPIS lists are still available.
- City street, state highways, other connections are listed for the BMP of any SPIS site.
- City and county jurisdiction were added for each SPIS Site.
- Route Number (OR-22, I-5 etc.) were added for each SPIS site.
- Percentile reported for the each 5% increment of the top 25%.
- An Access database available to Region staff that allows for custom queries by highway, milepoint, and Region.

In 2002, two minor enhancements were made to the SPIS Reports:

- The code for the mileage type was added to most report. This allows for easy identification of any "Z" mileage locations.
- The 2002 SIP Segment Rating for the section the SPIS site is located within was determined and included.

Oregon Department of Transportation — Region 2

2002, Top 10% SPIS Groups - By Highway, Prefix, Milepoint

Rte	Pfx	Mlg	BMP	EMP	Lgth	ADT*	Crsh*	Fatal*	City	County	Connection in Group*	SPIS *	SIP *
1 PACIFIC													
I-5	0		184.91	185.09	0.18	42,300	7	1		Lane		49.22	3
I-5	0		248.91	249.09	0.18	54,800	8	0		Marion	CONN. NO. 3 M.P. 3C248.94	51.29	3
9 OREGON COAST													
US-101	0		20.96	21.14	0.18	15,700	22	0	Seaside	Clatsop	OCEAN WAY	75.53	4
US-101	0		65.21	65.32	0.11	17,800	26	0	Tillamook	Tillamook		46.29	1
US-101	0		114.12	114.26	0.14	22,000	27	0	Lincoln City	Lincoln	17TH ST.	58.64	3
US-101	0		114.21	114.33	0.12	22,000	18	0	Lincoln City	Lincoln	16TH ST.	49.16	3
US-101	0		115.47	115.63	0.16	23,000	12	0	Lincoln City	Lincoln	CUL 11TH ST	47.44	4

Field	Definition	Source
Hwy	Internal ODOT Highway Number	ITIS Database
Hwy Name	Internal ODOT Highway Name	ITIS Database
Route	Route Number	Arcview Dataset, data added by Traffic Management
Pfx	Prefix, See Crash Data Code Manual for descriptions	ITIS Database
Mlg	Mileage type	ITIS Database
BMP	Beginning Milepoint of SPIS site	ITIS Database
EMP	Ending Milepoint of SPIS site	ITIS Database
Lgth	Length, for SPIS Groups, the distance from the BMP to the EMP	Calculated
99ADT	Average Daily Traffic in 1999. For SPIS groups, the maximum value in the group is reported	ITIS Database
Crsh	Total number of crashes in three year period in 0.10 mile. For SPIS groups, the maximum value in the group is reported	Crash Database
Fatal	Total number of fatalities in three year period in 0.10 mile. For SPIS groups, the maximum value in the group is reported	Crash Database
Cul	Describes roadway environment, can be urban (U) or rural (R)	ITIS Database
City	If BMP of SPIS site is within city limits, city name is reported	Arcview Dataset, data added by Traffic Management
Percentile	The percentile of the SPIS site, relative to the entire list	Calculated

County	If BMP of SPIS site is within county limits, county name is reported	Arcview Dataset, data added by Traffic Management
SPIS	Composite score based on rate, frequency, and severity of crashes. For SPIS groups, the maximum value in the group is reported	SPIS program
Connection	Name of connection at BMP. Not all connections are reported. For SPIS groups, the maximum alphabetical value in the group is reported	ITIS Database, added by Traffic Management
SIP	The Safety Investment Program (SIP) Segment Rating of the segment that the SPIS site is located in. Varies from 1-5, with 5 having 10 or more fatal / injury A crashes in a three year period.	SIP database

SPIS Analysis

Each year, the Traffic Management Section generates regional reports of the top 10% ranked SPIS sites for review by the five Region Traffic Managers. The Region staff evaluates the sites on this "Top 10%" list and considers the safety problems which may be contributing to the crash history at these locations. If a correctable problem is identified, benefit/cost analysis is performed on viable options and appropriate projects are initiated. Regions report the results of these site evaluations, including potential causes and possible corrections, to the State Traffic Engineer. While the SPIS reports are computer-generated by the Traffic Management Section, the rest of the process is manual and is primarily performed by Regional personnel.

An Accident Summary Database is also created annually for use by region and consultant staff in evaluating sections of highway. The interface allows the user to enter a section of state highway, from milepost 'x' to milepost 'y'. The database then yields information for that section of highway regarding number and type of accidents, highest and lowest SPIS values, and traffic volume information.

Annual Process for SPIS Reports

- *April* The Crash Data Unit of the Transportation Data Section collects, compiles, and enters crash data into a database. This data is accessed by the Information Services Branch (ISB) and placed on the production server for use by the Traffic Management Section.
- *May* The Highway Safety Engineering Coordinator runs the Manage SPIS application, created by ISB, to compile the data on the production server. Once the necessary information has been compiled, the Highway Safety Engineering Coordinator produces the resulting reports for posting to the Intranet, and creates GIS points for the STIP-SIP map and the current Accident Summary Database. The Highway Safety Engineering Coordinator also has the ability to perform variable length analysis of SPIS values on state highway sections.
- *July* The Highway Safety Engineering Coordinator checks the SPIS reports, Accident Summary Database, and other elements for accuracy. The final reports are posted to the Intranet for use by the region traffic personnel in

investigating the SPIS sites. The new version of the Accident Summary Database is distributed to the holders of the old databases as well as any other transportation professionals that request the data. The GIS points are forwarded to the GIS Coordinator in the Transportation Inventory/Mapping Unit of the Transportation Data Section.

- *July-December* The Region Traffic Managers and staff review the Intranet reports and investigate the SPIS sites and associated crash data (using the Accident Summary Database, and other references) indicated for their area. Their goal is to determine the possible cause(s) of the listed crashes and estimate what, if any, fixes might reduce the crash potential at each site. If a correctable problem is identified, benefit/cost analysis is performed on viable options and appropriate projects are initiated. This information is entered into the "Top 10% Investigation" spreadsheet for submittal to the Traffic Management Section. Regions report the results of these site evaluations, including potential causes and possible corrections, to the State Traffic Engineer. These completed reports are due in the first quarter of the following year.

Contact Information

If you have any questions regarding the SPIS or the elements and tools involved, please contact:

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Table D-1. ODOT Region 3 2000 - 2002 Top 10% SPIS Groups- By Score

Oregon Department of Transportation

Region 3

2003, Top 10% SPIS Groups - By Score

Rte.	Hwy	Pf	Mlg	BMP	EMP	Lgth	ADT*	Crsh	Fatal*	City	County	Connection in Group*	SPIS	SIP *
OR-99	234	0	0	17.4	17.49	0.09		42	0	Roseburg	Douglas		89.99	5
OR-62	22	0	0	0.78	0.98	0.20	36,400	76	0	Medford	Jackson	ROAD	84.47	3
OR-99	25	0	0	-2.52	-2.32	0.20	9,500	55	0	Grants Pass	Josephine	025AQ CONN. (MORGAN LA	84.33	5
OR-99	63	0	0	11.05	11.23	0.18	18,600	40	0	Phoenix	Jackson	CHERYL AVE.	76.66	3
OR-238	272	0	0	0.13	0.33	0.20	27,800	35	0	Grants Pass	Josephine		73.39	4
I-5	1	0	0	107.91	108.09	0.18	26,000	23	0		Douglas		72.95	3
OR-140	270	0	0	2.2	2.38	0.18	4,200	12	1		Jackson		72.21	3
	240	0	0	2	2.18	0.18	24,700	25	0	North Bend	Coos		71.77	4
OR-99	35	0	0	71.64	71.82	0.18	6,000	15	0		Douglas	DILLARD-BROCKWAY RD.	71.25	5
OR-38	45	0	0	14.84	15.08	0.24	2,800	10	1		Douglas		67.04	3
US-199	25	0	0	2.47	2.65	0.18	23,000	14	1		Josephine	WILLOW LANE	66.14	5
US-101	9	0	0	235.32	235.5	0.18	10,800	30	0	North Bend	Coos	HWY. 240 (VIRGINIA AVE) M.	66.11	5
OR-38	45	0	0	15	15.09	0.09	2,900	9	1		Douglas		65.13	3
OR-99	25	2	0	-0.95	-0.81	0.14	18,600	24	0	Grants Pass	Josephine	N.E. "F" ST.	62.47	5
	240	0	0	0.02	0.2	0.18	15,400	18	0	North Bend	Coos		62.4	4
I-5	1	0	0	129.91	130.09	0.18	29,900	5	1		Douglas		60.64	4
OR-62	22	0	0	5.3	5.47	0.17	32,100	16	0		Jackson	COREY RD.	60.29	4
OR-62	22	0	0	1.5	1.68	0.18	41,000	44	0	Medford	Jackson	DELTA WATERS RD.	58.51	3
US-199	25	0	0	0.7	0.87	0.17	35,000	35	0	Grants Pass	Josephine		58.44	3
OR-99	234	0	0	17.3	17.42	0.12	23,400	27	0	Roseburg	Douglas		58.27	5
OR-99	25	0	0	-2.17	-2.07	0.10	15,700	22	0	Grants Pass	Josephine	HILLCREST DR.	57.7	5
US-101	9	0	0	238.64	238.73	0.09	15,600	11	0	Coos Bay	Coos		57.69	5
US-199	25	0	0	0.54	0.71	0.17	35,000	21	0	Grants Pass	Josephine	RINGUETTE ST.	57.15	3
US-199	25	0	0	1.96	2.14	0.18	23,000	18	0		Josephine	DOWELL RD.	57.15	5
	240	0	0	0.68	0.82	0.14	18,800	33	0	North Bend	Coos		57.07	4
OR-62	22	0	0	3.56	3.74	0.18	32,000	32	0	Medford	Jackson	VILAS RD. E.	56.16	3
OR-99	25	2	0	-2.35	-2.17	0.18	15,200	18	0	Grants Pass	Josephine	HILLCREST DR.	56.16	5
OR-138	73	0	0	46.91	47.09	0.18	850	6	0		Douglas		55.83	3
US-101	9	0	0	236.42	236.58	0.16	21,800	19	0	North Bend	Coos	NEWMARK ST.	55.13	5
OR-99	60	0	0	0.66	0.84	0.18	11,300	19	0	Grants Pass	Josephine	PARKDALE DR.	54.78	4
OR-138	73	0	0	0.01	0.19	0.18	18,300	31	0	Roseburg	Douglas	WINCHESTER ST.	54.68	2
	240	0	0	4.91	5.09	0.18	10,800	7	0		Coos		54.62	4
US-101	9	0	0	238.12	238.29	0.17	13,600	20	0	Coos Bay	Coos	MARKET AVE.	54.24	5
OR-99	25	0	0	-0.96	-0.84	0.12	20,900	36	0	Grants Pass	Josephine	N. "E" ST.	53.83	5
OR-99	25	0	0	-0.88	-0.78	0.10	19,800	31	0	Grants Pass	Josephine	N. "F" ST.	53.42	5
OR-99	63	0	0	19.23	19.34	0.11	13,700	20	0	Ashland	Jackson	PIONEER ST.	52.69	3
OR-42	35	0	0	31.91	32.09	0.18	3,100	4	1		Coos		52.55	3
OR-99	25	2	0	-1.09	-0.91	0.18	19,400	18	0	Grants Pass	Josephine	N.E. "E" ST.	52.29	5
US-199	25	0	0	0.97	1.13	0.16	35,300	17	0	Grants Pass	Josephine	REDWOOD AVE.	51.92	3
US-199	25	0	0	21.89	22.03	0.14	9,700	5	1		Josephine		51.9	3
OR-99	63	0	0	8	8.14	0.14	30,100	18	0	Medford	Jackson		51.41	5
I-5	1	0	0	80.91	81.09	0.18	18,700	6	0		Douglas		51.29	3
OR-62	22	0	0	6.24	6.42	0.18	23,300	25	0		Jackson	ANTELOPE RD.	51.29	4
US-101	9	0	0	203.91	204.09	0.18	4,300	4	1		Douglas		50.58	4
OR-99	35	0	0	73.28	73.41	0.13	10,000	5	0	Winston	Douglas	ROSE ST.	50.28	5
US-101	9	0	0	238.27	238.4	0.13	15,900	20	0	Coos Bay	Coos	HWY. 243 (ANDERSON AVE.)	50.2	5
OR-99	45	0	0	50.34	50.45	0.11	7,300	5	0	Drain	Douglas	2ND ST.	50.17	3
OR-99	35	0	0	75.63	75.79	0.16	22,000	25	0		Douglas		49.96	5
US-199	25	9	Y	0.94	1.08	0.14	27,000	27	0	Grants Pass	Josephine		49.9	3
OR-99	35	0	0	76.29	76.43	0.14	22,900	6	1		Douglas		49.28	5
US-101	9	0	0	228.91	229.09	0.18	10,600	5	0		Coos	HAUSER RD.	48.57	4
OR-42	35	0	0	45.91	46.03	0.12	2,900	3	0		Douglas		48.4	4

Pfx: (0) 2-way, add dir; (2) Couplet, non-add dir; (9) Spur; (R) Spur, Couplet, non-add dir; (8) Temporary Max (num or alpha) in SPIS group

Oregon Department of Transportation

2003, Top 10% SPIS Groups - By Score

Region 3

Rte.	Hwy	Pf	Mlg	BMP	EMP	Lgth	ADT*	Crsh	Fatal*	City	County	Connection in Group*	SPIS	SIP *
OR-42	35	0	0	34.91	35.09	0.18	3,100	3	0		Coos		48.02	3
US-101	9	0	0	201.91	202.06	0.15	4,300	7	0		Douglas		47.98	4
US-101	9	0	0	357.4	357.5	0.10	17,000	18	0	Brookings	Curry	WILLOW ST.	47.67	3
OR-138	231	0	0	25.3	25.39	0.09	11,400	11	1	Sutherlin	Douglas		47.31	2
US-199	25	0	0	2.98	3.14	0.16	16,100	5	0		Josephine		47.26	5
OR-99	25	0	0	-2.23	-2.11	0.12	13,400	27	0	Grants Pass	Josephine		47.15	5
OR-99	60	0	0	3.92	4.07	0.15	5,100	3	1		Josephine		47.08	4
OR-238	272	0	0	4.08	4.26	0.18	8,100	9	0		Josephine		46.89	4
US-199	25	9	Y	0.16	0.32	0.16	28,200	13	0	Grants Pass	Josephine		46.7	3
I-5	1	0	0	65.91	66.06	0.15	20,600	5	0		Josephine		46.67	3
OR-99	234	2	0	17.38	17.48	0.10	11,800	15	0	Roseburg	Douglas		46.58	5
US-101	9	0	0	201.41	201.56	0.15	4,300	3	1		Douglas	BOOTH RD.	46.33	4
US-199	25	9	Y	1.16	1.25	0.09	27,000	16	1	Grants Pass	Josephine		45.98	3
OR-99	25	9	Y	-0.09	0.06	0.15	28,200	14	0	Grants Pass	Josephine	PARKDALE DR.	45.82	5
	241	0	0	3.88	4.01	0.13	1,200	5	1		Coos		45.13	4

Pfx: (0) 2-way, add dir; (2) Couplet, non-add dir; (9) Spur; (R) Spur, Couplet, non-add dir; (8) Temporary Max (num or alpha) in SPIS group

Table D-2. City of Medford 2000 - 2002 Top 40 Collision Intersections

Intersection Magic VER 5.509
City of Medford, OR 02/04/2004

Intersection listing
01/01/2000 - 12/31/2002
Top 40 intersections with at least 1 accidents.
Sorted by accident count
Filter: (clear filter)

Intersection name:	Count:	Volume:	Rate:
*****			
JACKSON ST & RIVERSIDE AV N	62	0	0.000
STEWART AV E & BARNETT RD E	58	0	0.000
HWY 62 & DELTA WATERS RD	57	0	0.000
RIVERSIDE AV S & BARNETT RD E	52	0	0.000
CRATER LAKE AV & DELTA WATERS RD	49	0	0.000
CENTRAL AV N & 4TH ST E	48	0	0.000
BARNETT RD E & ALBA DR	48	0	0.000
HWY 62 & POPLAR DR	44	0	0.000
MCANDREWS RD E & COURT ST	40	0	0.000
MCANDREWS RD E & BIDDLE RD	40	0	0.000
MCANDREWS RD E & RIVERSIDE AV N	38	0	0.000
HWY 62 & VILAS RD	37	0	0.000
HILTON RD & HWY 62	32	0	0.000
CRATER LAKE AV & STEVENS ST	32	0	0.000
MCANDREWS RD E & CRATER LAKE AV	31	0	0.000
HWY 62 & FRED MEYER ENT	29	0	0.000
CENTRAL AV N & JACKSON ST	28	0	0.000
MCANDREWS RD E & ROYAL AV	27	0	0.000
RIVERSIDE AV S & 8TH ST E	27	0	0.000
CRATER LAKE AV & BROOKHURST ST	25	0	0.000
HILTON RD & POPLAR DR	24	0	0.000
BIDDLE RD & STEVENS ST	24	0	0.000
CARDINAL AV & HWY 62	23	0	0.000
BARNETT RD E & HIGHLAND DR	22	0	0.000
BLACK OAK DR & BARNETT RD E	22	0	0.000
MCANDREWS RD E & POPLAR DR	22	0	0.000
CENTRAL AV S & 10TH ST E	21	0	0.000
RIVERSIDE AV N & 4TH ST E	20	0	0.000
6TH ST E & RIVERSIDE AV N	20	0	0.000
RIVERSIDE AV S & BANK ST	19	0	0.000
MURPHY RD & BARNETT RD E	18	0	0.000
OAKDALE AV S & 10TH ST W	18	0	0.000
SPRING ST & CRATER LAKE AV	18	0	0.000
8TH ST E & CENTRAL AV S	18	0	0.000
N. PACIFIC HW & TABLE ROCK RD	16	0	0.000
RIVERSIDE AV S & BOYD ST	16	0	0.000
RIVERSIDE AV N & HWY 62	16	0	0.000
HILTON RD & BULLOCK RD	16	0	0.000
HWY 62 & SKYPARK DR	16	0	0.000
HWY 62 & N. PACIFIC HW	16	0	0.000
*****			
Totals: 40	1189	0	0.000
Averages:	29.7	0	0.000

Table D-3. City of Ashland 2003 Top 5 Collision Intersections

Top 5 Collision Intersections (*listed in no particular order*)
Wimer Street/Scenic Drive
Wimer Street/N Main Street
Lithia Way/N 1st Street
Lithia Way/E Main Street
Siskiyou Boulevard/Wightman Street

Table D-4. Jackson County 2000 – 2002 Top 10 Collision Intersections[1]

Intersection	Average Daily Traffic (ADT)	Million Entering Vehicles (MEV)	Number of Accidents	Rate	Rank Rate
Antelope Road/Bigham-Brown Road	3,658	2.00	3	1.50	1
Agate Road/Nick Young Road	6,659	3.65	4	1.10	2
Arnold Lane/Bellinger Lane	6,884	3.77	4	1.06	3
Antelope Road/Division Road	23,257	12.73	13	1.02	4
Kirtland Road/Table Rock Road	22,739	12.45	12	0.96	5
Antioch Road/Modoc Road	7,658	4.19	3	0.72	6
Upton Road/Wilson Road	7,781	4.26	3	0.70	7
Peninger Road/Upton Road	10,531	5.77	4	0.69	8
Biddle Road/Hamrick Road	57,234	31.34	21	0.67	9
Antelope Road/Gladstone Avenue	14,347	7.85	5	0.64	10

[1] *2004 – 2005 Traffic Safety Improvement Program*, Jackson County, Dec. 22, 2003.