Investigating Crash-Prone Driver Problems in Louisiana

Xiaoduan Sun, Ph.D., P.E.
Subasish Das, Ph.D student
Civil Engineering Department
University of Louisianan

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Motivation

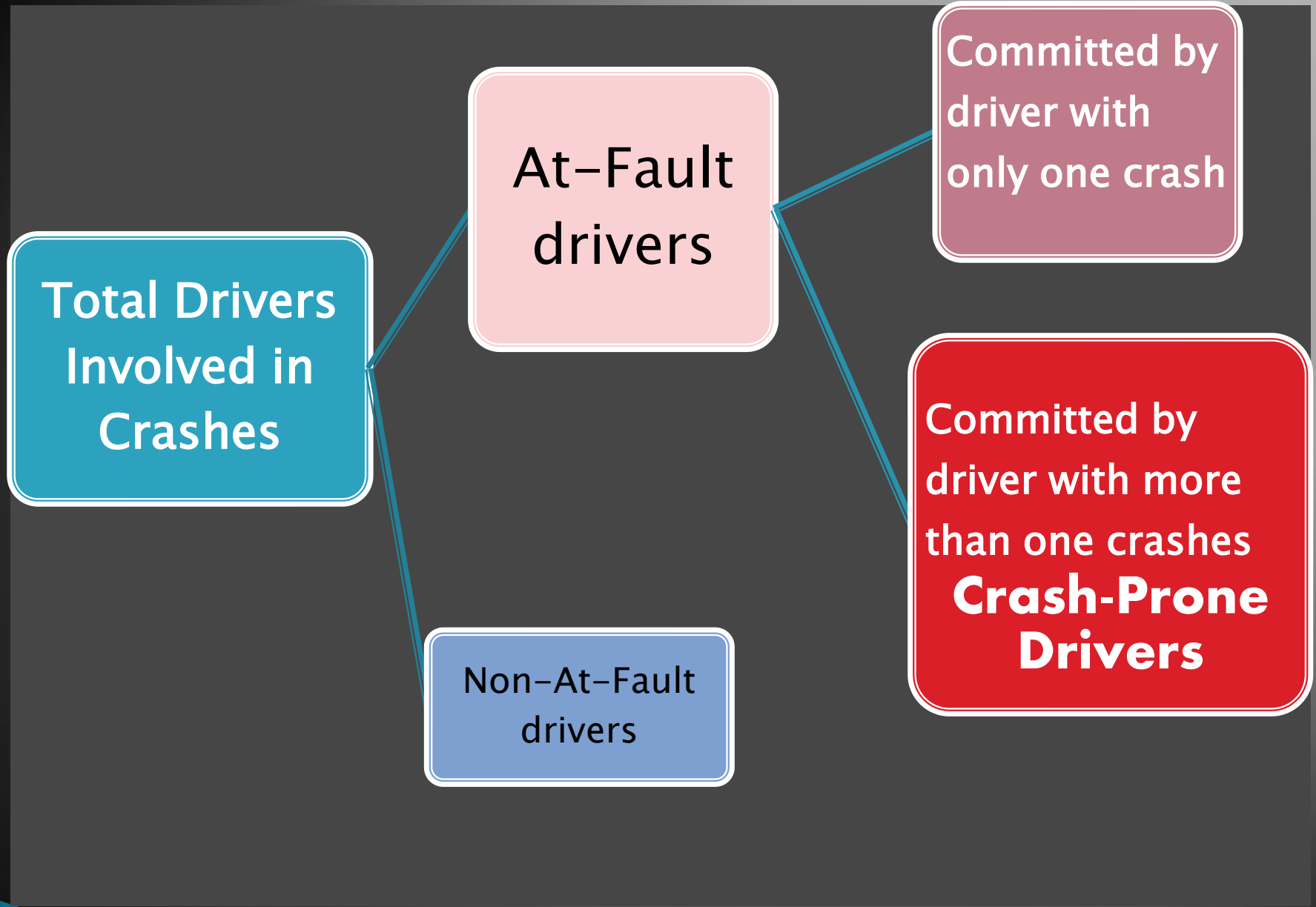
- More than 50% of crashes are caused by human errors each year based on highway crash reports.
- To fulfill the hefty goal established by the Louisiana Zero-Death Destination, it is important to have effective safety education and regulation programs.
- Since crash-prone drivers present a big adverse effect on highway safety, they should be effectively targeted in various safety education and enforcement programs.

Objective

- To investigate crash-prone drivers' characteristics and estimates their risk to have crashes based on the crash history
- To provide evidence for developing better and efficient safety education programs and supporting targeted traffic laws or programs on these crash over-involved drivers

Data

- Eight years of Louisiana crash records (2004-2011)
- More than two million crash records retrieved from this time period:
  - 1,070,891 at-fault drivers (52%)
  - 1,005,118 non-at-fault drivers (48%)


Total Drivers Involved in Crashes
At-Fault drivers
Non-At-Fault drivers
Committed by driver with only one crash
Committed by driver with more than one crashes
Crash-Prone Drivers

Preliminary Results

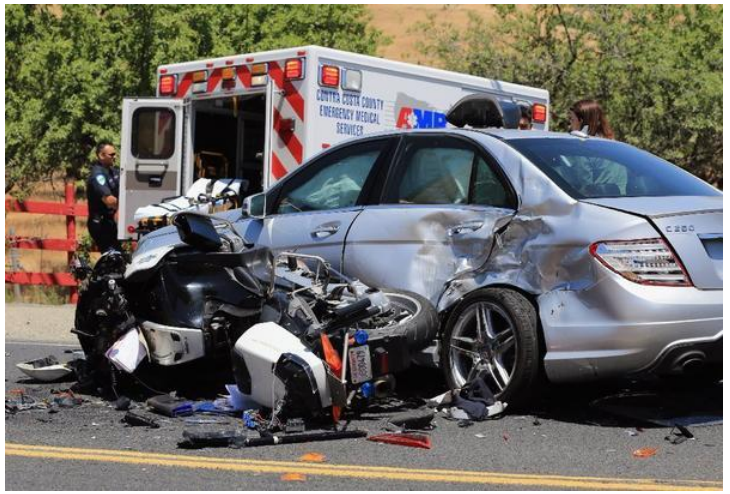
- **Number of At-Fault Drivers**

No. of crash(es)	2004	2005	2006	2007	2008	2009	2010	2011
1	129,009	123,901	123,290	121,854	121,166	121,904	114,025	121,343
2	6,076	5,507	5,801	5,830	5,346	5,356	4,818	2,982
3	450	384	437	433	423	376	316	73
4	49	40	63	79	44	42	35	24
5	7	10	10	12	6	8	15	1
6	1	3	1	0	0	4	1	0
7	2	0	0	1	1	0	1	0
8	1	14	9	1	0	5	8	2
9	0	2	1	0	0	0	0	0

Repeated # of crashes in seven years

Number of Crashes	Number of Drivers
13	7
12	5
11	6
10	23
9	31
8	95
7	223
6	573
5	1,675
4	6,139
3	23,414
2	105,621
1	618,388

- 66% with one crash
- 34% with multiple crashes
- 5% of Louisiana licensed drivers repeatedly having crashes

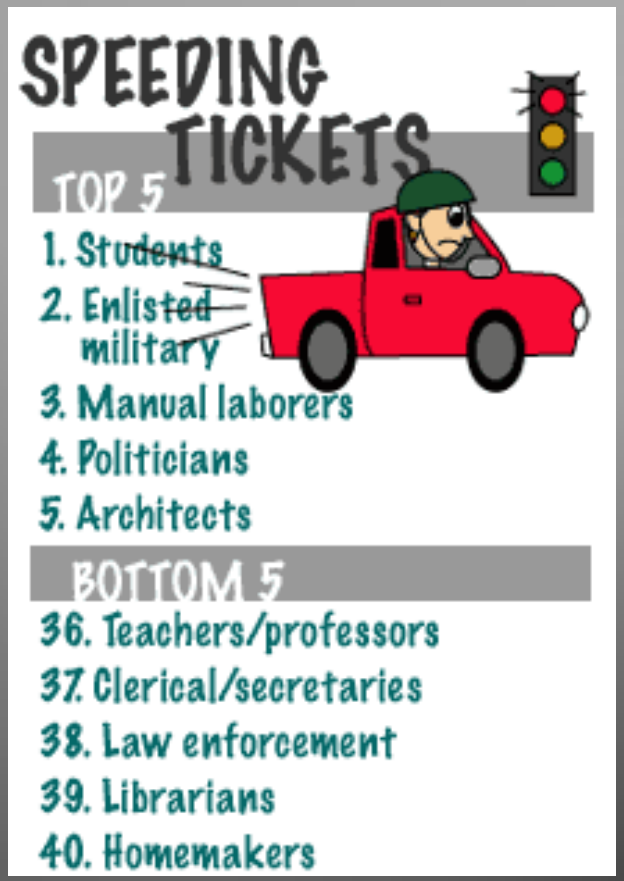


Number of Non-at-fault Drivers

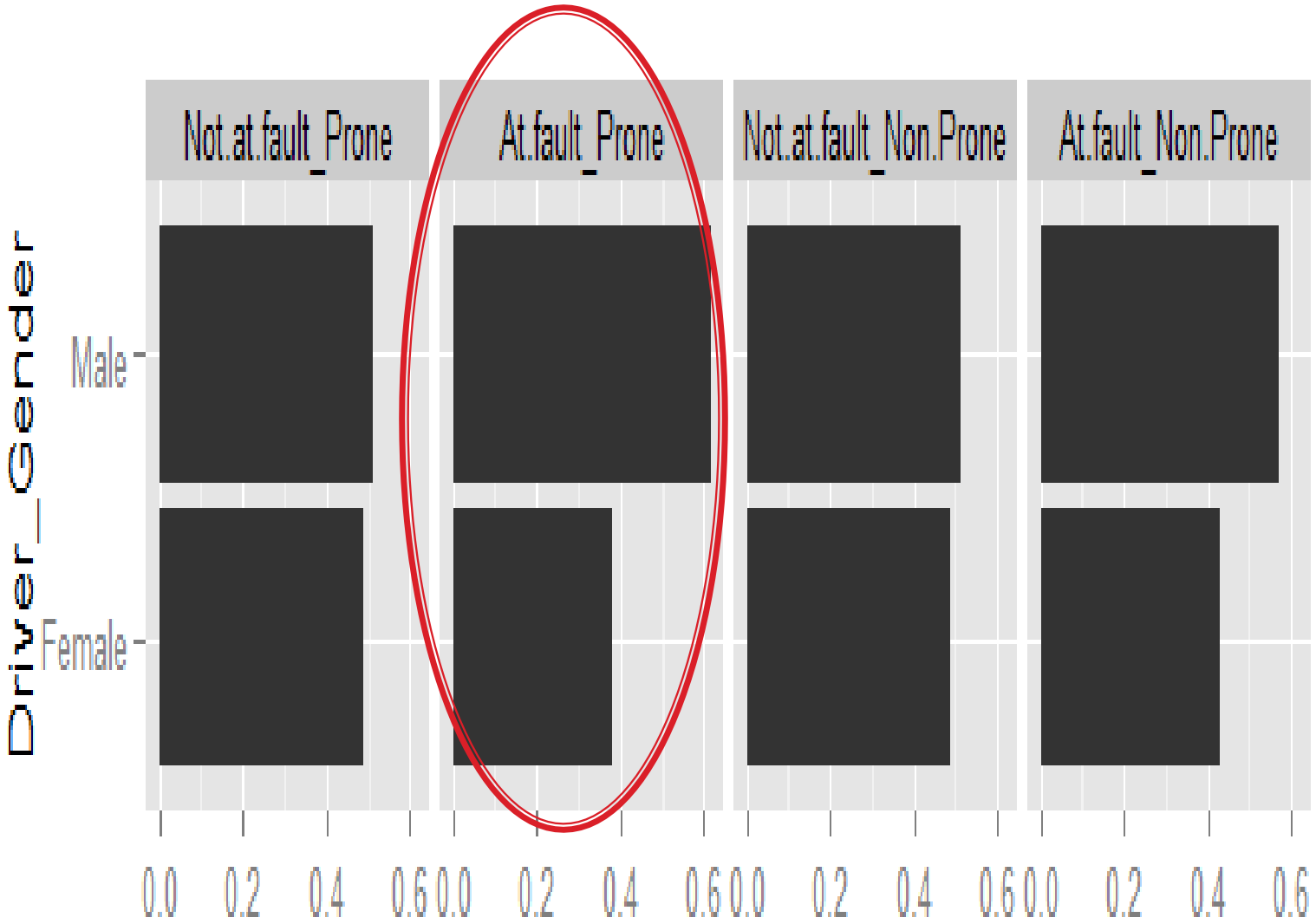
No. of crash(es)	2004	2005	2006	2007	2008	2009	2010	2011
1	123,050	119,375	120,373	118,439	117,085	115,298	109,672	114,799
2	4,420	4,399	4,265	4,110	3,972	3,717	3,617	2,520
3	197	190	197	167	164	160	144	66
4	17	25	14	32	18	9	23	24
5	1	2	2	5	5	2	4	1
6	0	1	6	0	0	0	1	0

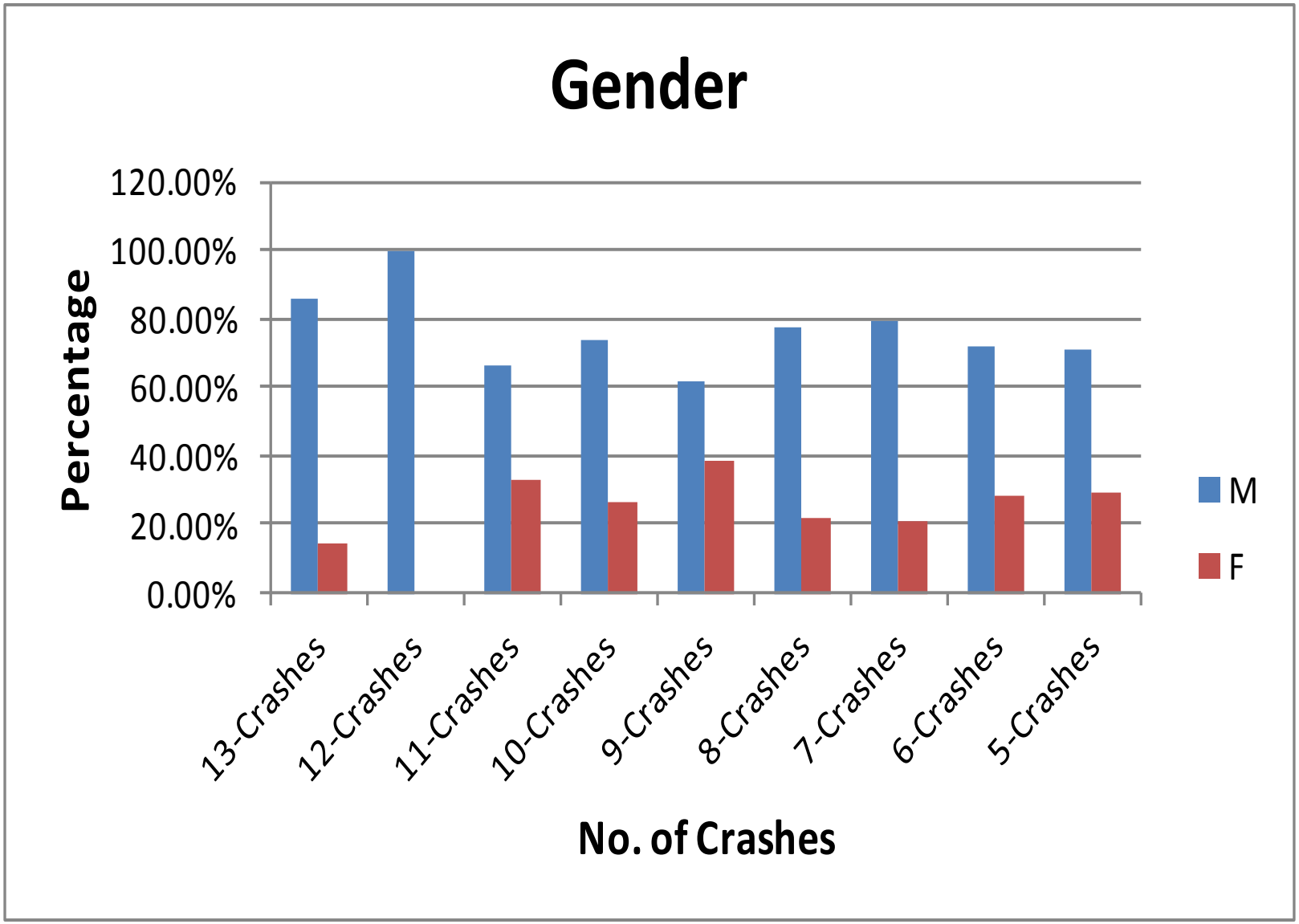
Who are they? By Peter Valdes-Dapena, CNN/Money Staff Writer

believe it or not…..



Who are they?


Not.at.fault_Prone
At.fault_Prone
Not.at.fault_Non.Prone
At.fault_Non.Prone
Driver_Gender
Male
Female
0.0
0.2
0.4
0.6


Gender
120.00%
100.00%
80.00%
60.00%
40.00%
20.00%
0.00%
Percentage
13-Crashes
12-Crashes
11-Crashes
10-Crashes
9-Crashes
8-Crashes
7-Crashes
6-Crashes
5-Crashes
No. of Crashes
M
F

Gender and License State

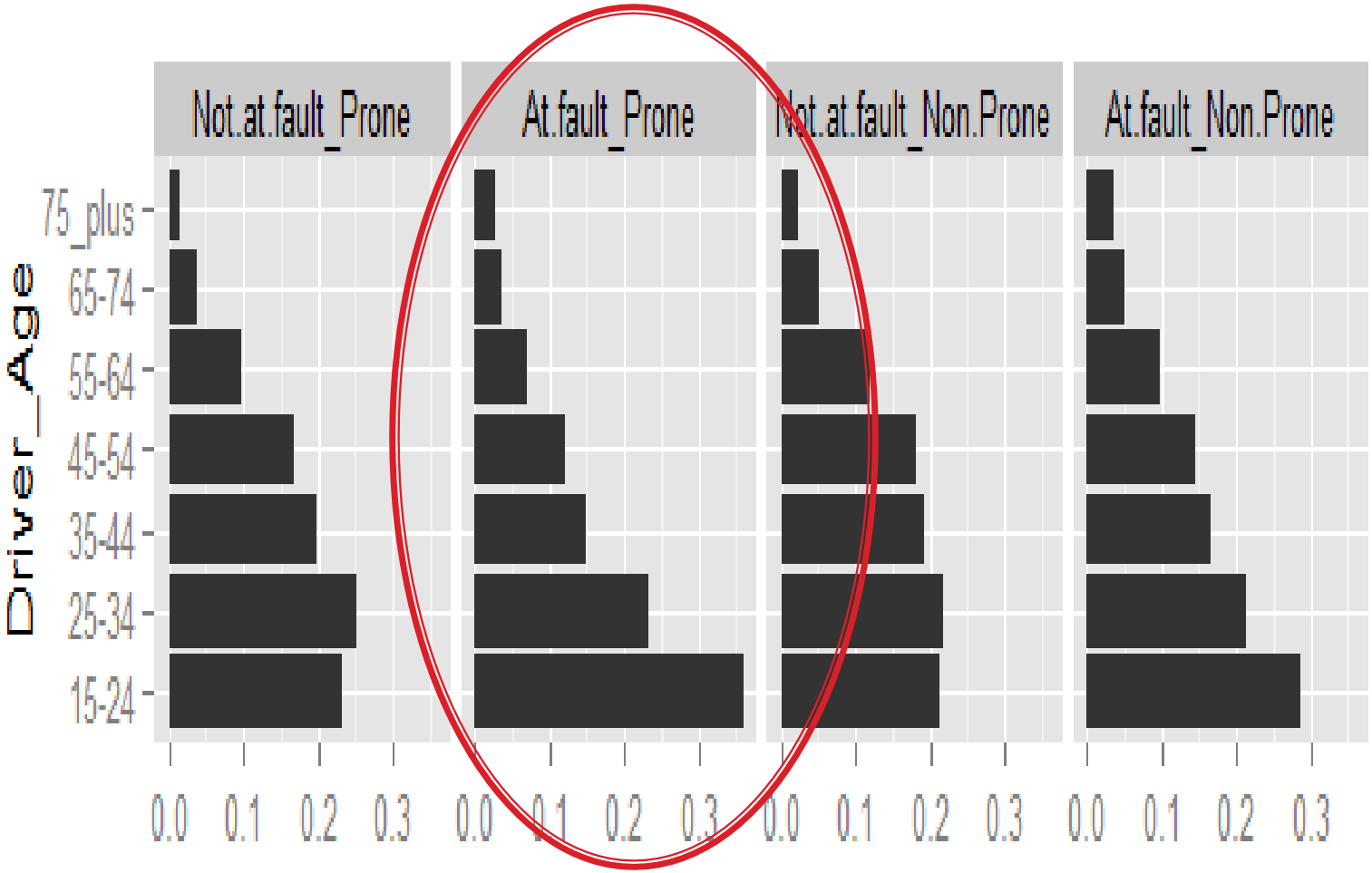
Number of Crashes	Number of Drivers	Gender		Licensed By		% of Total Crashes
		Male	Female	Louisiana	Other	
13	7	85.71%	14.29%	100.00%	0.00%	0.01%
12	5	100.00%	0.00%	100.00%	0.00%	0.01%
11	6	66.67%	33.33%	100.00%	0.00%	0.01%
10	23	73.91%	26.09%	100.00%	0.00%	0.02%
9	31	61.29%	38.71%	100.00%	0.00%	0.03%
8	95	77.89%	22.11%	100.00%	0.00%	0.08%
7	223	78.92%	21.08%	100.00%	0.00%	0.17%
6	573	71.73%	28.27%	99.83%	0.17%	0.37%
5	1,675	70.93%	29.07%	99.28%	0.72%	0.89%
4	6,139	68.99%	30.85%	80.24%	19.76%	2.61%
3	23,414	64.60%	35.40%	98.51%	1.49%	7.48%
2	105,621	59.36%	40.62%	97.09%	2.91%	22.49%
1	618,388	56.13%	43.54%	90.21%	9.79%	65.84%

Driver Class

DR_CLASS	13-Crashes	12-Crashes	11-Crashes	10-Crashes	9-Crashes	8-Crashes	7_crashes
Commercial Driver	1	3	1	3	3	15	41
Chauffeurs Driver		2			1	9	11
Personal Vehicle Driver	6	2	5	19	28	79	182
Total	7	7	6	22	32	103	234

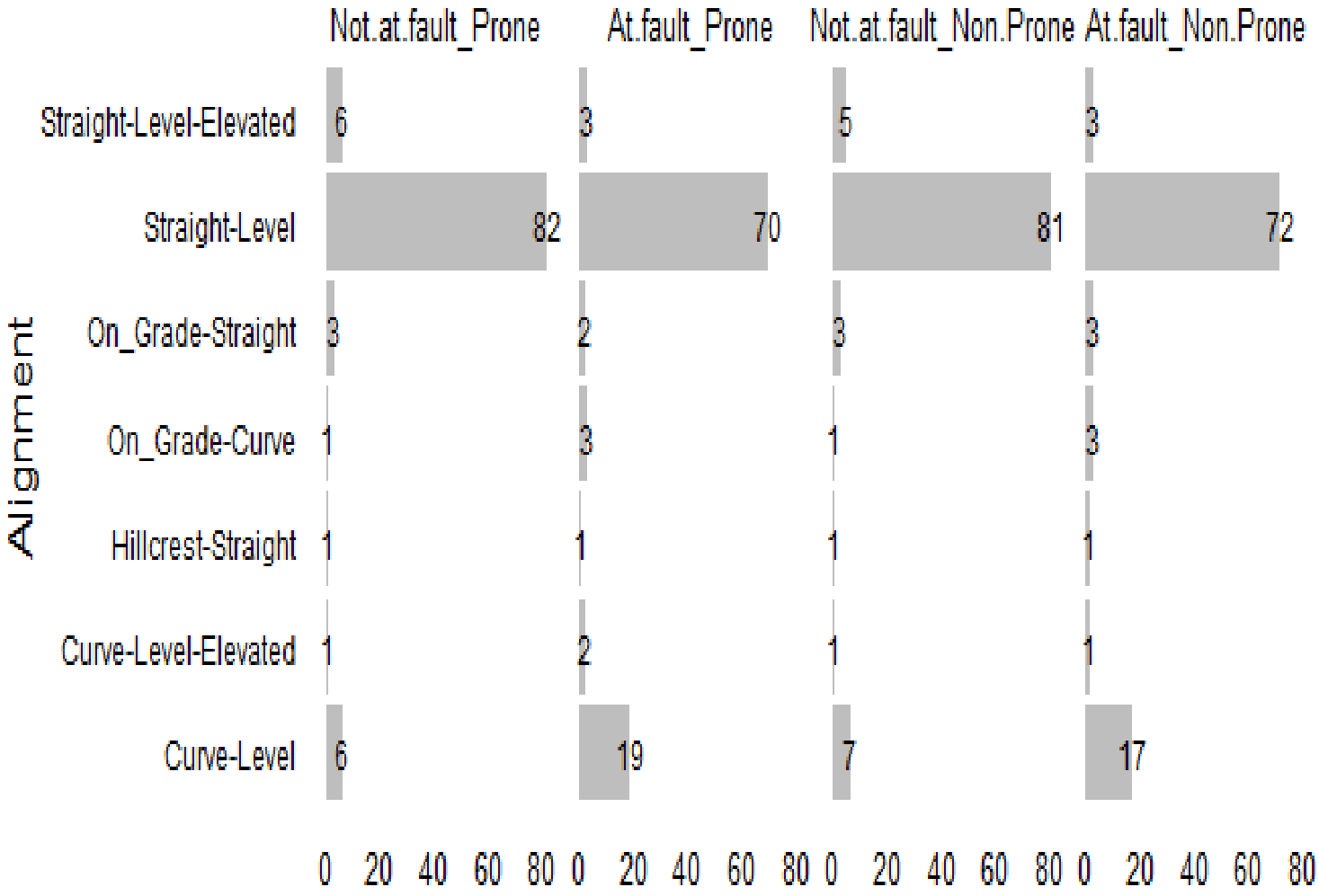
DR_CLASS	13-Crashes	12-Crashes	11-Crashes	10-Crashes	9-Crashes	8-Crashes	7_crashes
Commercial Driver	14.29%	20.00%	16.67%	13.64%	9.38%	14.56%	17.52%
Chauffeurs Driver	0.00%	40.00%	0.00%	0.00%	3.13%	8.74%	4.70%
Personal Vehicle Driver	85.71%	40.00%	83.33%	86.36%	87.50%	76.70%	77.78%

Who are they?


Not.at.fault_Prone
At.fault_Prone
Not.at.fault_Non.Prone
At.fault_Non.Prone
Driver_Age
75_plus
65-74
55-64
45-54
35-44
25-34
15-24
0.0
0.1
0.2
0.3

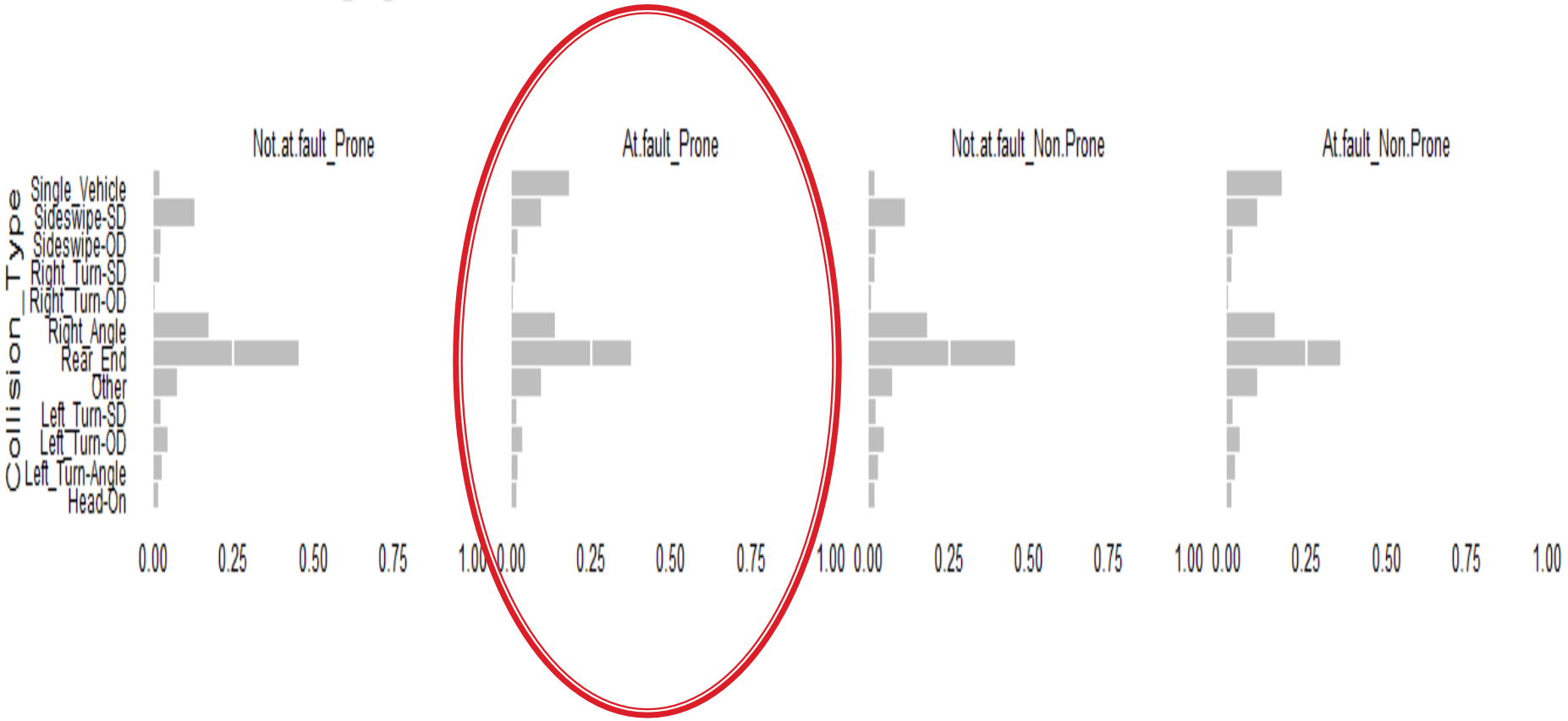
driver age group in fatalities

Where are the crashes?



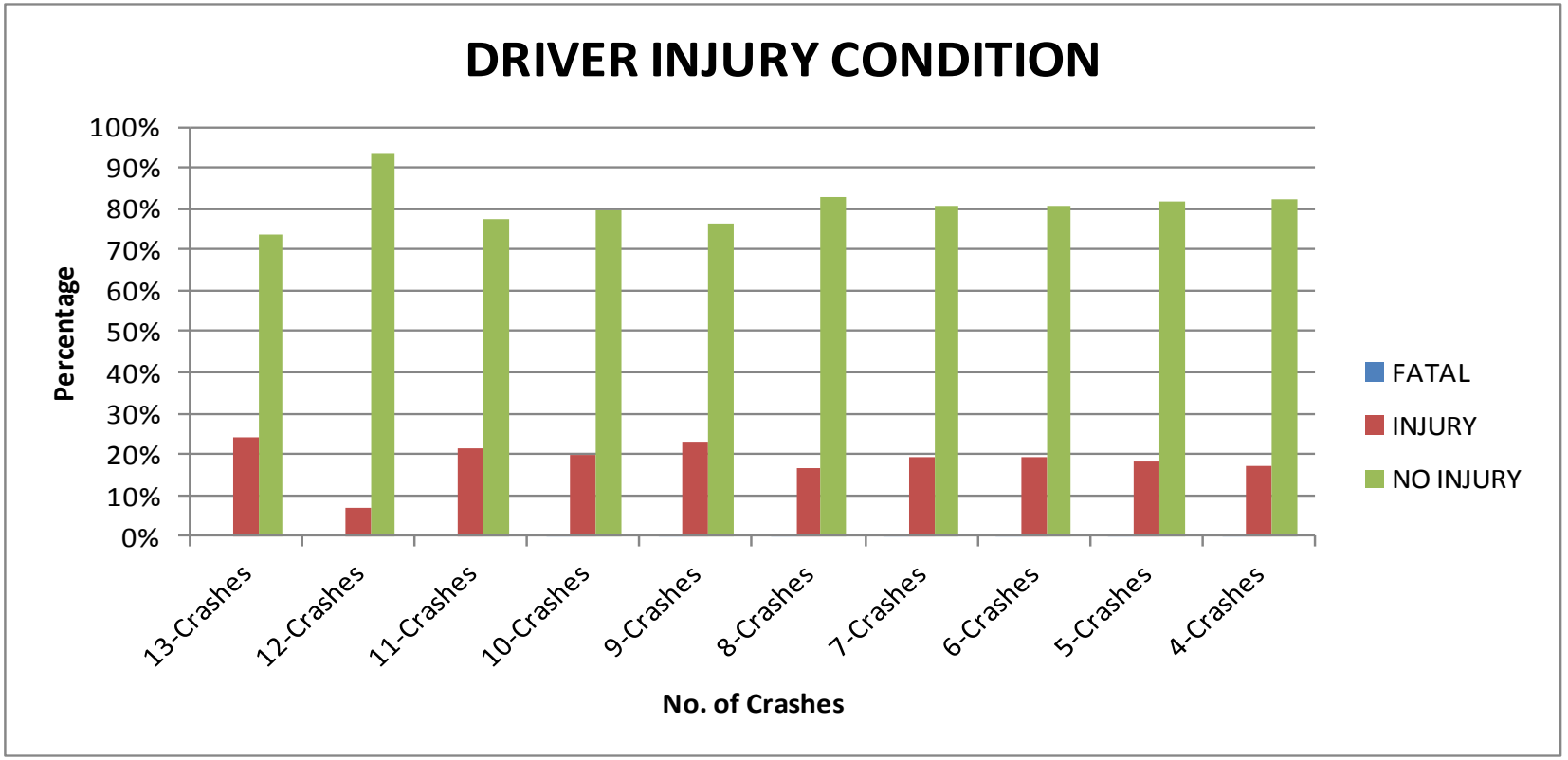
- 19% and 17% of at-fault prone drivers are involved in crashes in dark, curved roadways

What type of crashes?

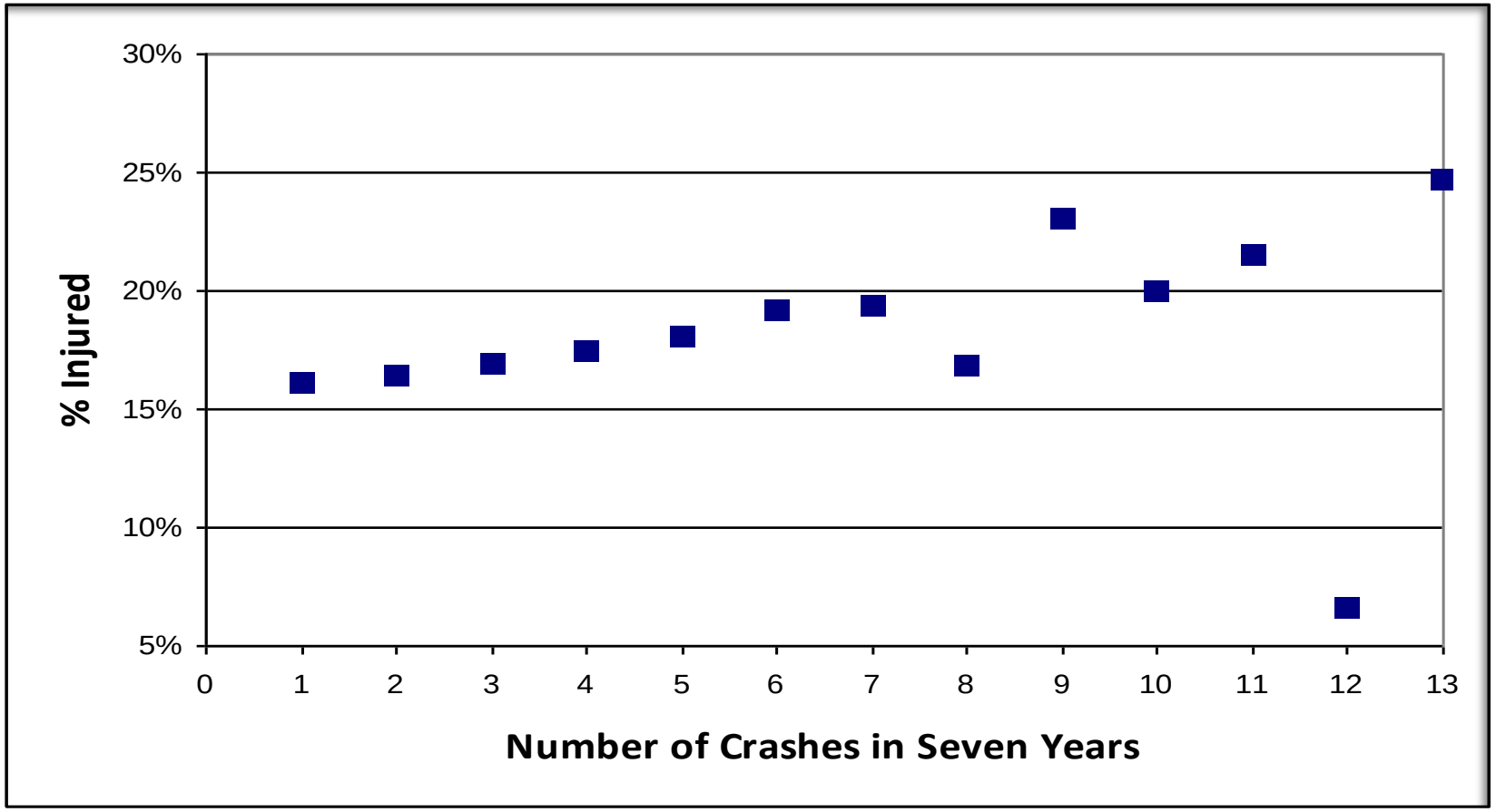


At-fault drivers are involved more in single vehicle ROR

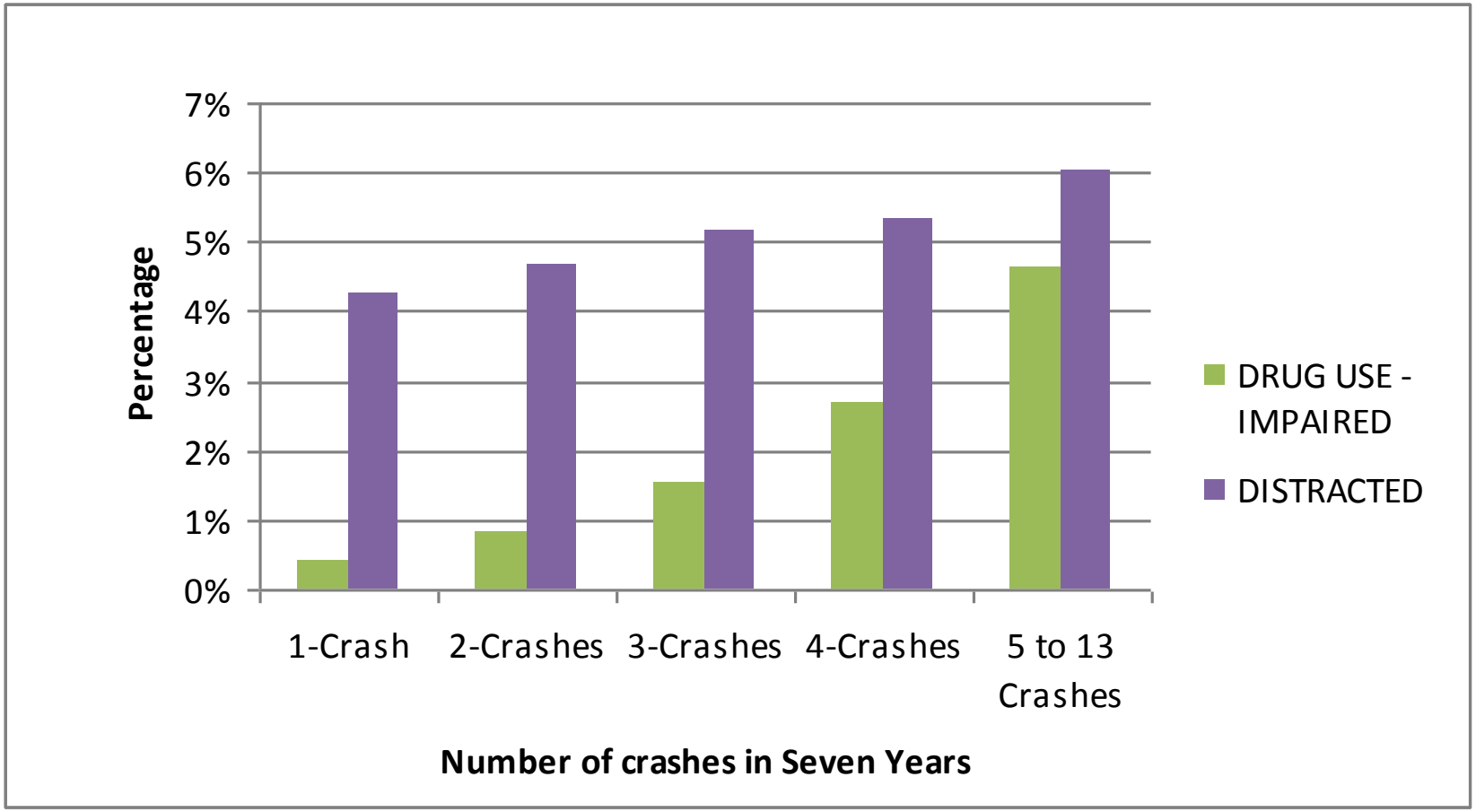
Crash severity



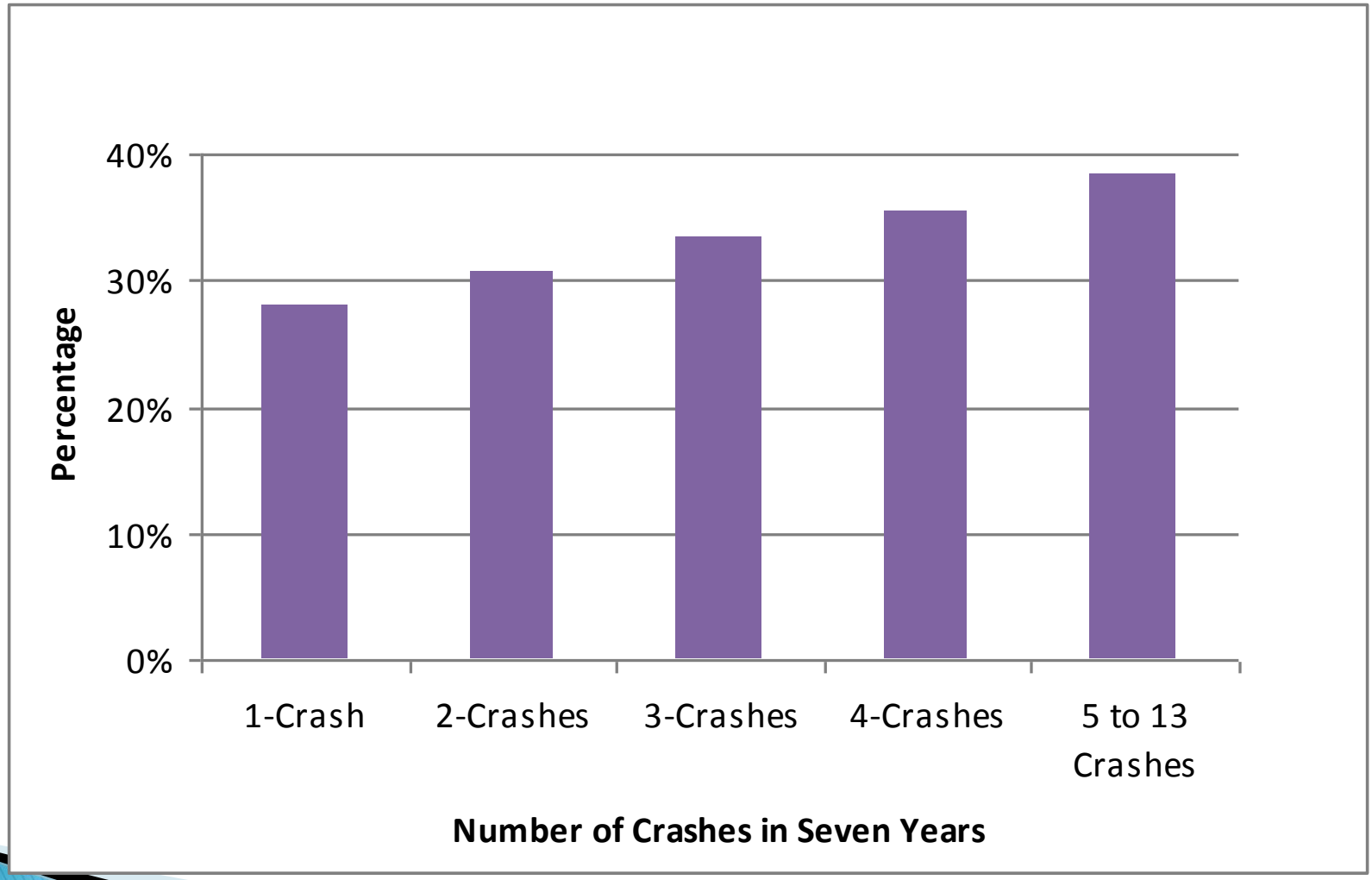
Crash severity

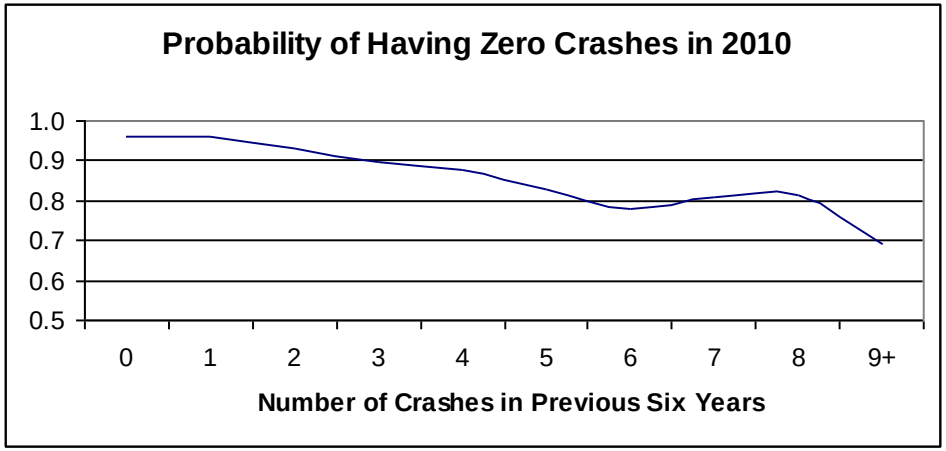


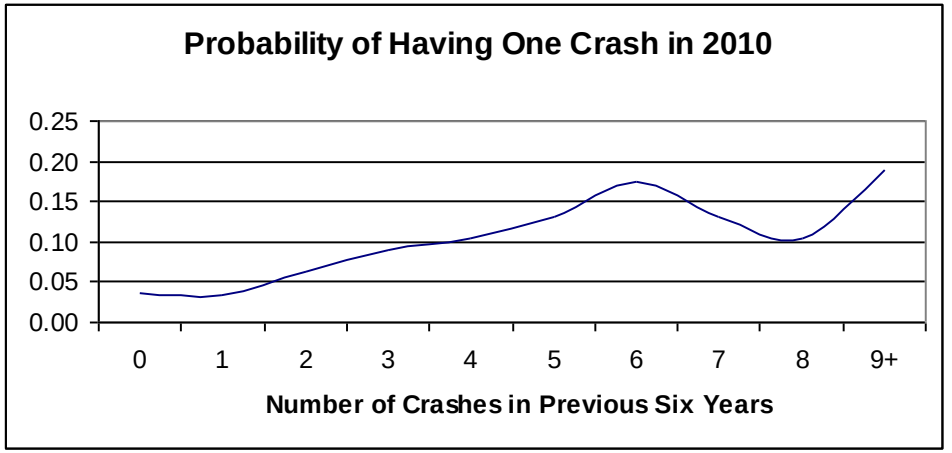
Drivers' Condition

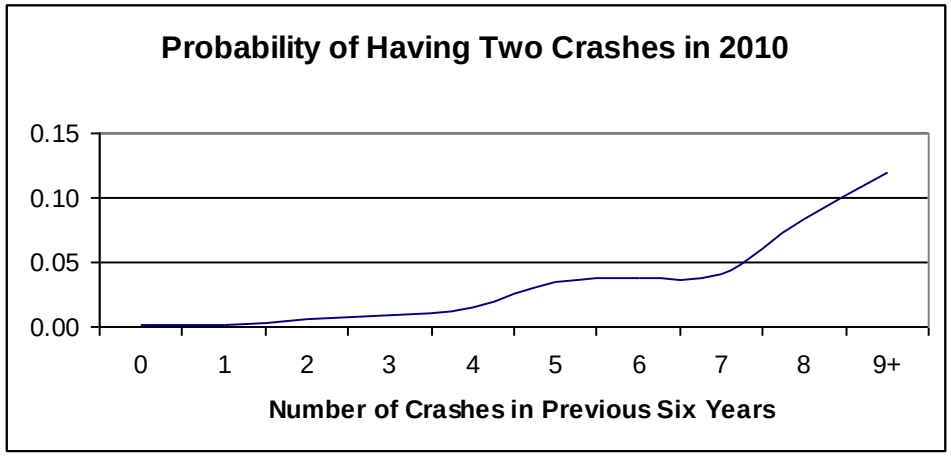


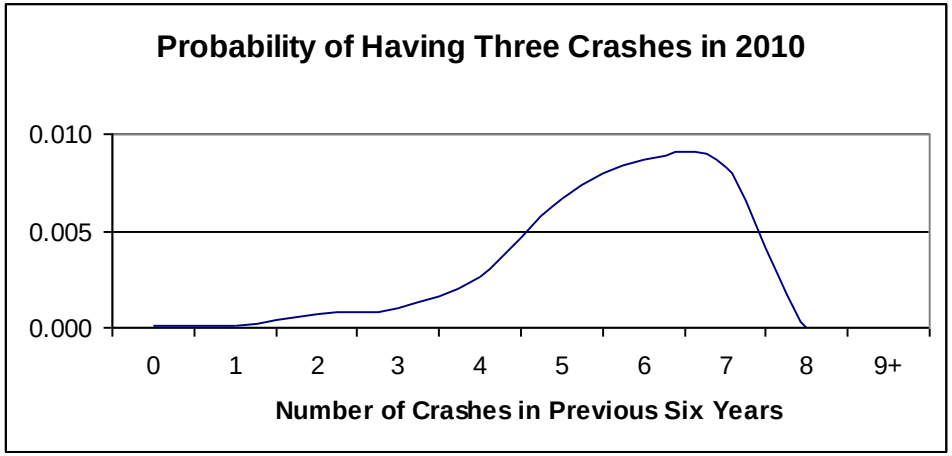
Careless operations vs. percentage of crashes





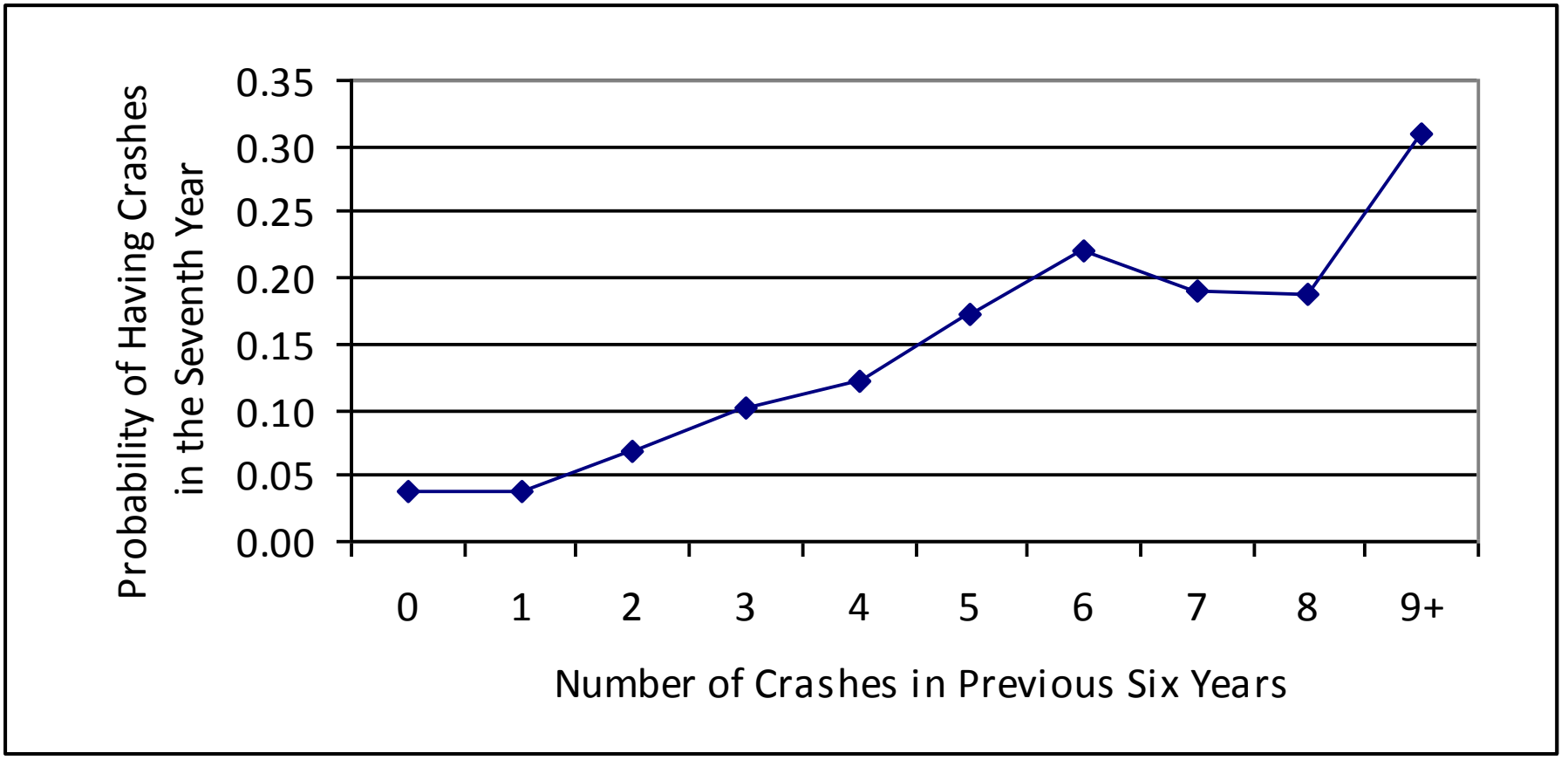






$$P(j/i) = \frac{P(j \cap i)}{P(i)}$$

Conditional probability of having crash(es) in future



On-going modeling work

- Probability of crash occurrence (At-fault crashes by crash-prone drivers),

$$p_i = \frac{1}{1+e^{-l_i}}$$

$$l_i = a_0 + b_1 Y_{1i} + b_2 Y_{2i} + b_3 Y_{3i} + b_4 Y_{4i} + \ldots\ldots\ldots\ldots\ldots\ldots + b_n Y_{ni}$$

Where the *b*'s are coefficients, estimated using the maximum likelihood method, and the Y_i's are the independent predictor variables as identified in the analysis

Discussion

- Crash-prone driver is a problem in Louisiana.
- Crash-prone drivers are likely to be in the 16-34 age group.
- Probability of having crash(s) in the coming year for drivers with a crash history is more than seven times higher than the probability for drivers with zero crash.

Conclusion

Crash-prone drivers should be effectively targeted for various safety education and regulation programs .

Thank you!

Questions?

xsun@louisiana.edu