

Chapter 4: Probability with Accident Data

Find the following probabilities, and be able to explain what they tell you.

- 1) $P(A \text{ Inj})$
- 2) $P(\text{Head On})$
- 3) $P(\text{Head On} \cap \text{PDO})$
- 4) $P(\text{Head on} \cup \text{PDO})$
- 5) $P(\text{Angle})$
- 6) $P(\text{Angle} \cap \text{Rear End, Slow or Stop})$
- 7) $P(\text{Angle} \cup \text{Rear End, Slow or Stop})$
- 8) $P(A \text{ Inj} \mid \text{Pedestrian})$
- 9) $P(A \text{ Inj} \mid \text{Pedalcyclist})$
- 10) $P(\text{Pedalcyclist} \mid A \text{ Inj})$
- 11) $P((A \text{ Inj})^C)$
- 12) $P((A \text{ Inj})^C \cup \text{Angle})$

13) Are Angle and PDO Statistically Independent?
Do the Calculations! What does your answer MEAN?

14) Are Rear End, Turn and PDO Independent?
Do the Calculations! What does your answer MEAN?

15) Suppose you did not have the table with all of the probabilities, but only know the following: $P(\text{PDO} \cup \text{Angle}) = .7067$ $P(\text{PDO}) = .5465$ $P(\text{Angle}) = .3265$
Can you find $P(\text{PDO} \cap \text{Angle})$?

Homework Questions: Do these on a separate sheet to turn in.

- 1) Explain what happens for the event PDO^C . What is $P(\text{PDO}^C)$?
- 2) Calculate and explain in words: $P(\text{Angle} \cap C \text{ Inj})$
- 3) Calculate and explain in words: $P(\text{Angle} \cup C \text{ Inj})$
- 4) Calculate and explain in words: $P(\text{Angle} \mid C \text{ Inj})$
- 5) Calculate and explain in words: $P(C \text{ Inj} \mid \text{Angle})$
- 6) Are Angle and C Inj Mutually Exclusive? Explain.
- 7) Are Angle and C Inj Statistically Independent? Explain.
- 8) Are Sideswipe, Same Direction and A Inj Mutually Exclusive? Explain Why or Why not, and why your answer makes sense for this type of accident.

Chapter 4: Probability Using Real World Data in Crosstabulations

Corrected Accident Crosstab: Greensboro Jan. 1999-Sept 2002

	FTL	A-INJ	B-INJ	C-INJ	PDO	Grand Total
ANGLE	4	26	284	900	1261	2475
REAR END, SLOW OR STOP		4	74	1046	1249	2373
LEFT TURN, SAME ROADWAY	2	11	103	365	511	992
SIDESWIPE, SAME DIRECTION			12	60	357	429
LEFT TURN, DIFFERENT ROADWAYS			29	113	175	317
RAN OFF ROAD - RIGHT	2	1	20	29	79	131
HEAD ON	2	2	21	36	34	95
RIGHT TURN, SAME ROADWAY			2	18	71	91
REAR END, TURN			5	36	49	90
BACKING UP			1	6	80	87
FIXED OBJECT	1	1	6	10	61	79
RIGHT TURN, DIFFERENT ROADWAYS			3	20	55	78
PEDESTRIAN	3	4	23	24	7	61
RAN OFF ROAD - LEFT		1	6	15	31	53
SIDESWIPE, OPPOSITE DIRECTION			4	14	25	43
PARKED MOTOR VEHICLE			1	6	29	36
PEDALCYCLIST		4	11	15	1	31
RAN OFF ROAD - STRAIGHT		1	4	8	12	25
OTHER NON-COLLISION			3	9	9	21
OTHER COLLISION WITH VEHICLE			6	5	9	20
UNKNOWN			1	4	14	19
ANIMAL			2	3	11	16
MOVABLE OBJECT			1		9	10
OVERTURN/ROLLOVER			2	3	4	9
Grand Total	14	55	624	2745	4143	7581

Joint Probability Table	FTL	A-INJ	B-INJ	C-INJ	PDO	Grand Total
ANGLE	0.000528	0.00343	0.037462	0.118718	0.166337	0.3264741
REAR END, SLOW OR STOP	0	0.000528	0.009761	0.137977	0.164754	0.3130194
LEFT TURN, SAME ROADWAY	0.000264	0.001451	0.013587	0.048147	0.067405	0.1308534
SIDESWIPE, SAME DIRECTION	0	0	0.001583	0.007915	0.047091	0.0565888
LEFT TURN, DIFFERENT ROADWAYS	0	0	0.003825	0.014906	0.023084	0.0418151
RAN OFF ROAD - RIGHT	0.000264	0.000132	0.002638	0.003825	0.010421	0.01728
HEAD ON	0.000264	0.000264	0.00277	0.004749	0.004485	0.0125313
RIGHT TURN, SAME ROADWAY	0	0	0.000264	0.002374	0.009366	0.0120037
REAR END, TURN	0	0	0.00066	0.004749	0.006464	0.0118718
BACKING UP	0	0	0.000132	0.000791	0.010553	0.0114761
FIXED OBJECT	0.000132	0.000132	0.000791	0.001319	0.008046	0.0104208
RIGHT TURN, DIFFERENT ROADWAYS	0	0	0.000396	0.002638	0.007255	0.0102889
PEDESTRIAN	0.000396	0.000528	0.003034	0.003166	0.000923	0.0080464
RAN OFF ROAD - LEFT	0	0.000132	0.000791	0.001979	0.004089	0.0069912
SIDESWIPE, OPPOSITE DIRECTION	0	0	0.000528	0.001847	0.003298	0.0056721
PARKED MOTOR VEHICLE	0	0	0.000132	0.000791	0.003825	0.0047487
PEDALCYCLIST	0	0.000528	0.001451	0.001979	0.000132	0.0040892
RAN OFF ROAD - STRAIGHT	0	0.000132	0.000528	0.001055	0.001583	0.0032977
OTHER NON-COLLISION	0	0	0.000396	0.001187	0.001187	0.0027701
OTHER COLLISION WITH VEHICLE	0	0	0.000791	0.00066	0.001187	0.0026382
UNKNOWN	0	0	0.000132	0.000528	0.001847	0.0025063
ANIMAL	0	0	0.000264	0.000396	0.001451	0.0021105
MOVABLE OBJECT	0	0	0.000132	0	0.001187	0.0013191
OVERTURN/ROLLOVER	0	0	0.000264	0.000396	0.000528	0.0011872
Grand Total	0.001847	0.007255	0.082311	0.362089	0.546498	1