Crash in the City of Madison

1 Demographics

Figure 1 shows the age distribution of drivers involved in crashes in the City of Madison and surrounding suburbs. We can see that the age distribution of drivers involved in crashes aren't very different. As age increases, we see drivers involved in less accidents.

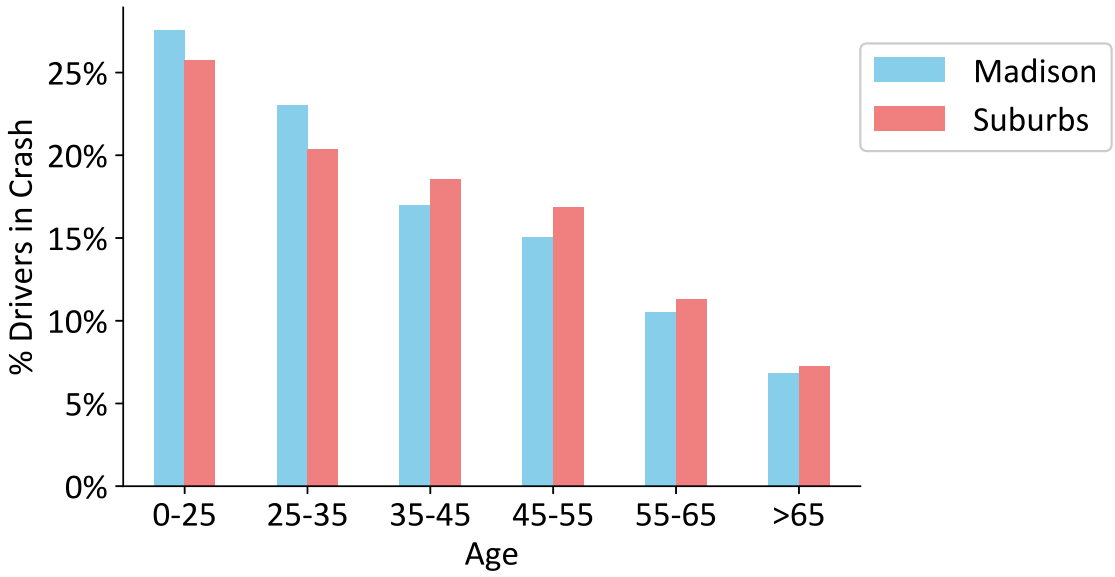

Figure 1: Age Distribution of Drivers in crashes

1.1 Is there a correlation between age and drunk driving accidents?

Figure 2 shows the percentage of drunk drivers in each age group. We can see that 21-25 year-olds have the highest proportion of drunk driving and that crashes are more likely to occur in the suburbs. It is also worth noting that many under-age drivers are also involved in drunk driving, which is a dangerous sign.

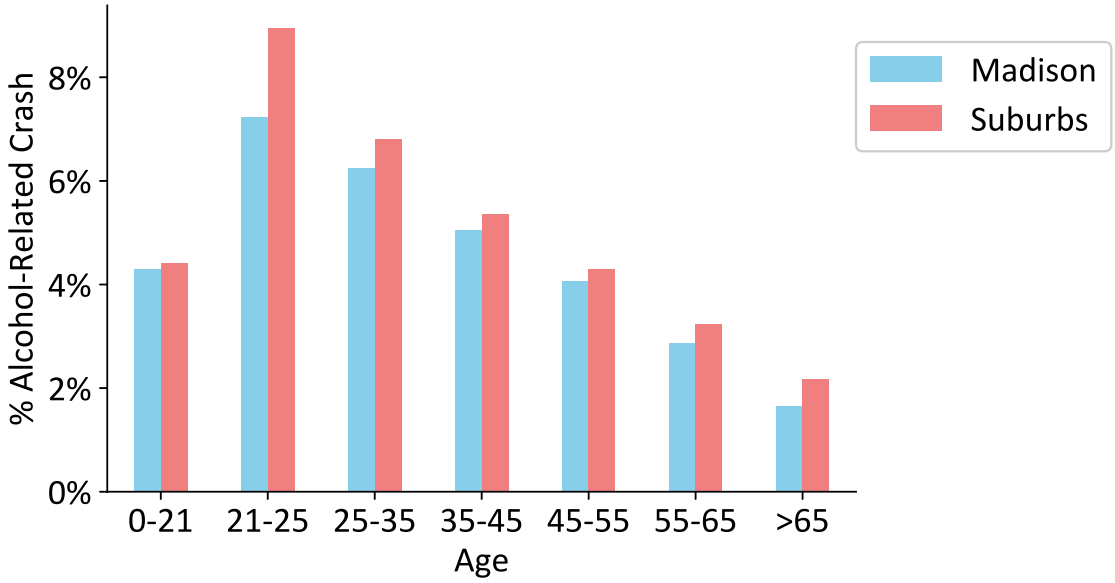

Figure 2: Alcohol-Related Age distribution of Drivers in Crashes

2 Gender-based research

Figure 3 shows the gender composition of drivers involved in crashes in the City of Madison and suburbs. For both regions, the proportion of men is higher than that of women.

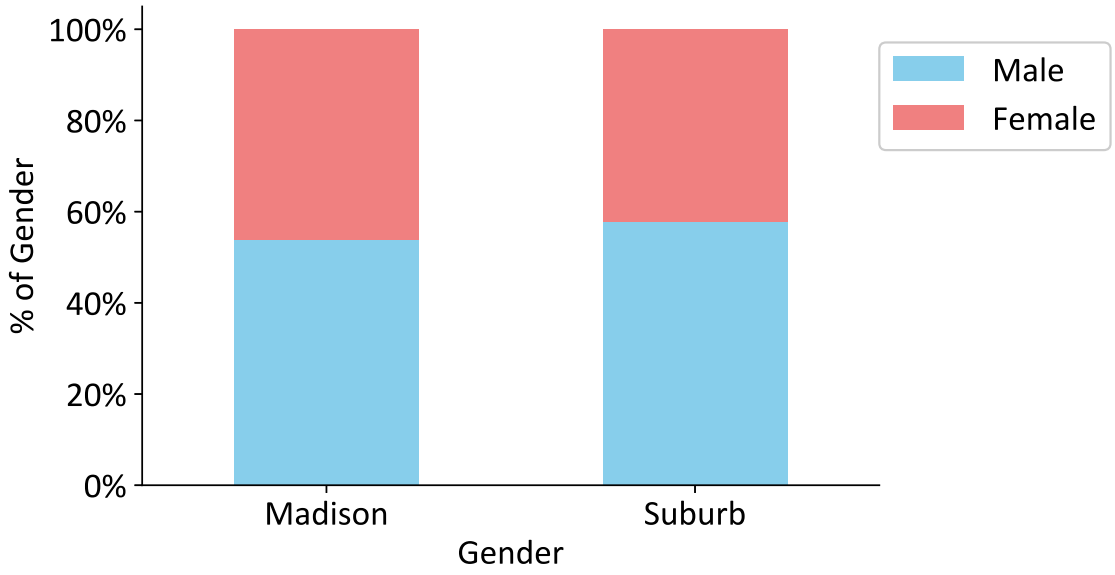

Figure 3: Gender Distribution of Drivers in Crashes

2.1 Is there a correlation between gender and drunk driving?

As shown in Figure 4, The percentage of men involved in accidents is above 60% in both regions. From the results obtained in Figure 3, male drivers accounted for 50 and 60 percent of all crashes in Madison and Suburbs, respectively. It could be inferred that men drunk drive at a higher rate than women.

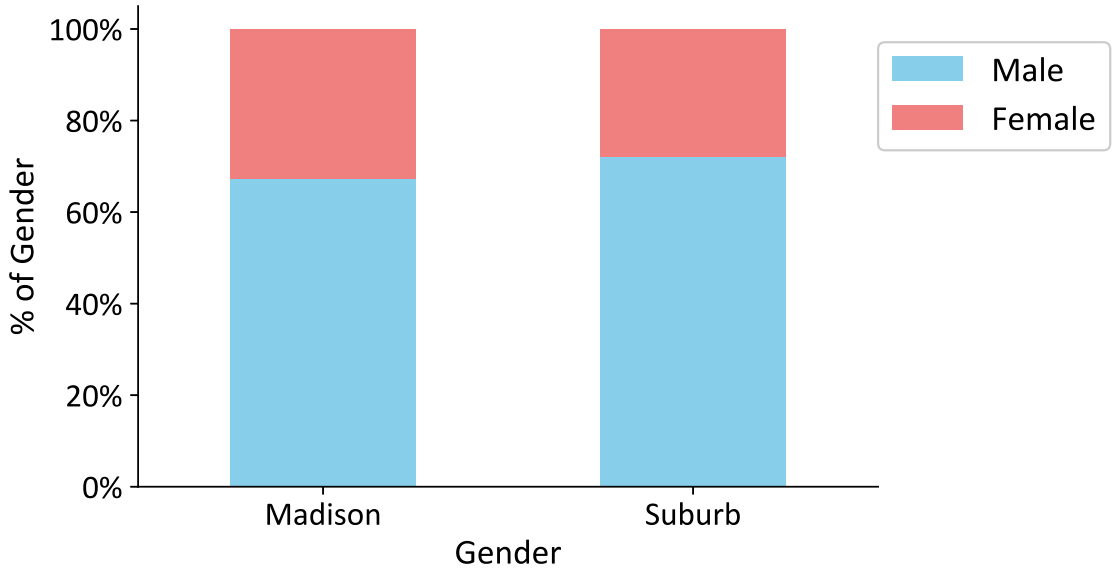

Figure 4: Gender Distribution of Drivers in Alcohol-Related Crashes

3 Over time

3.1 Year

Figure 5 shows the total number of crashes in the City of Madison v.s. the suburbs from 2000 to 2018. Before 2009, the number of crashes in the Suburbs was always higher than that of the City of Madison. Post 2009, the opposite was the case.

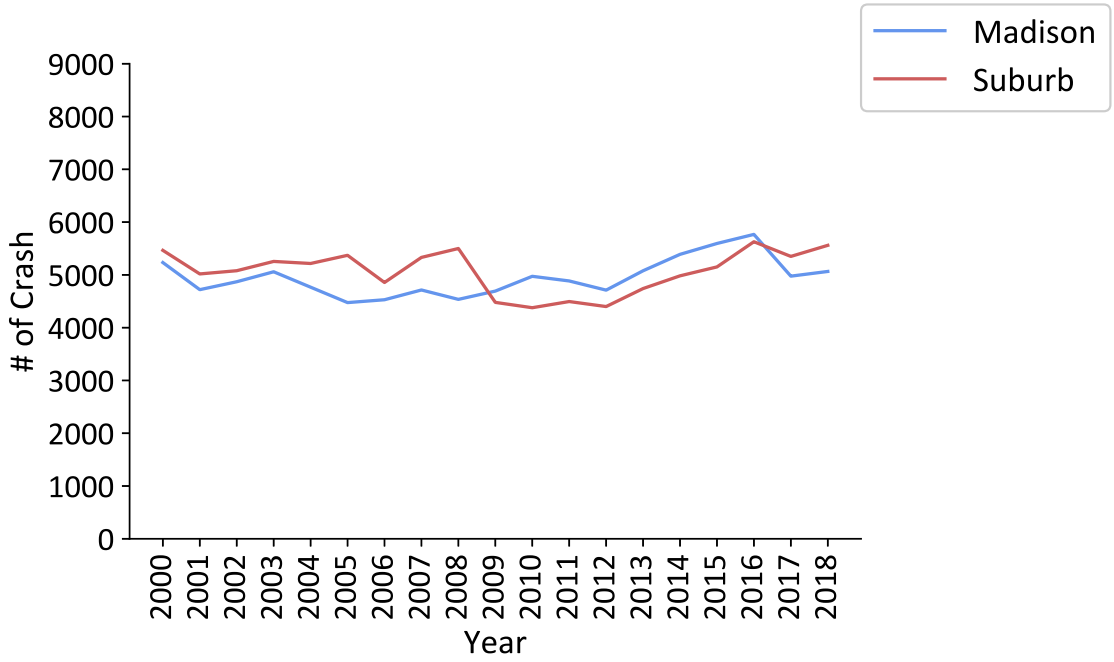

Figure 5: # of Crash Distributed by Year

Figure 6 shows the trends in the percentage of drunk driving in the two regions from 2000 to 2018. We can see that 2010 is a turning point. The ratio of the City of Madison was higher than that of the suburbs before 2010, and the opposite was true after 2010.

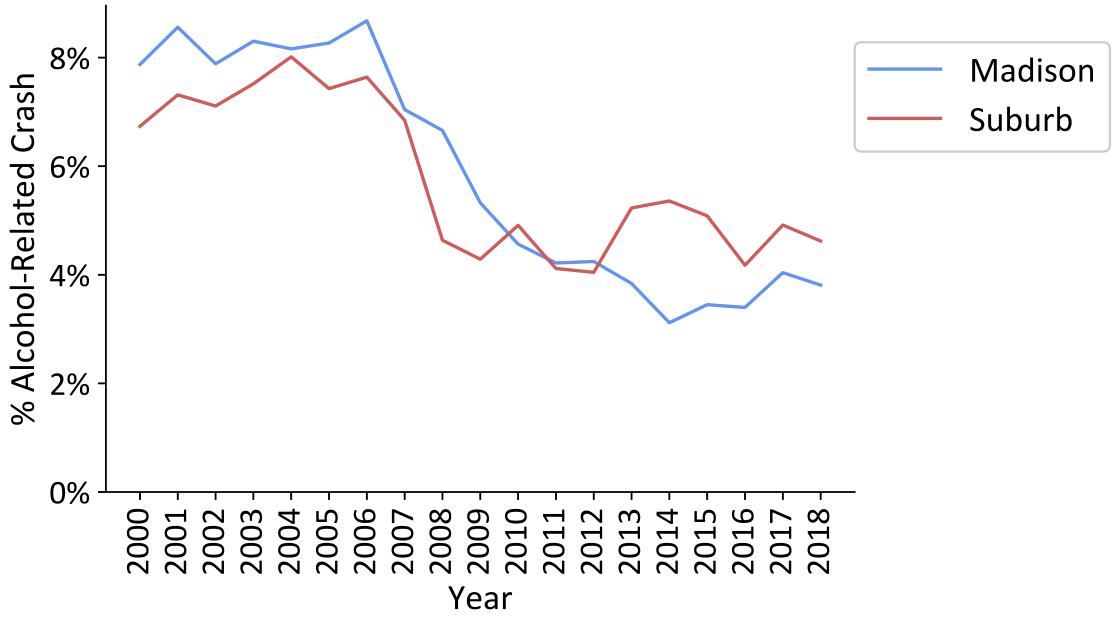

Figure 6: % Alcohol-Related Crash Distributed by Year

3.2 Month

From Figure 7, we see that more crashes occured during the colder months.

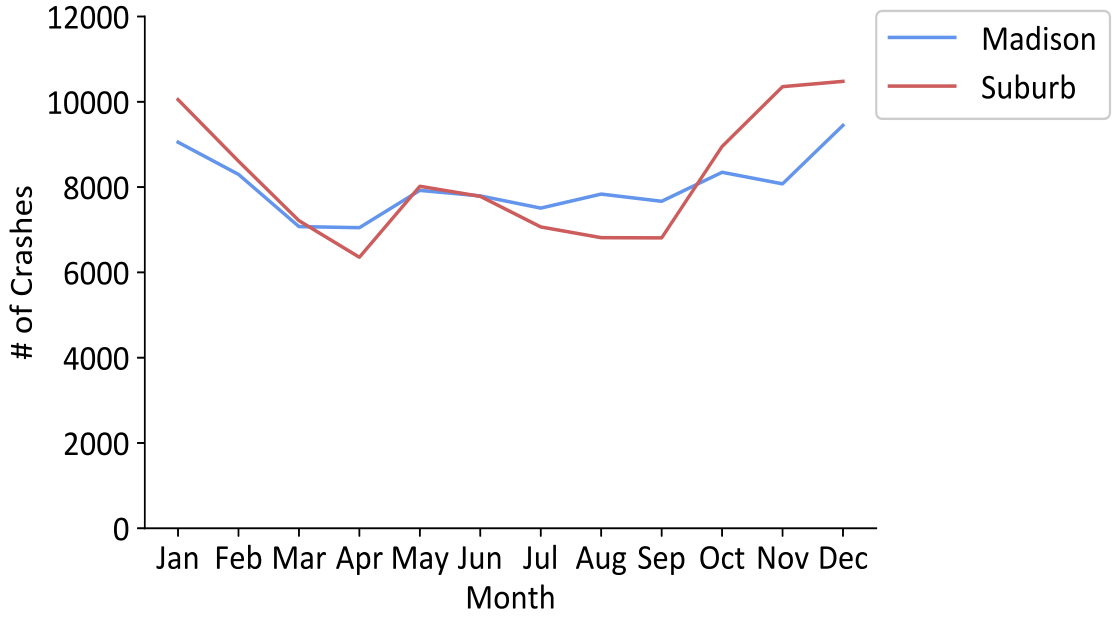

Figure 7: # of Crash Distributed by Month

From Figure 8, we see that Spring and Autumn are 2 most dangerous seasons in the surrounding surbubs. However, the drunk driving rate in Madison doesn't fluctuate significantly between seasons.

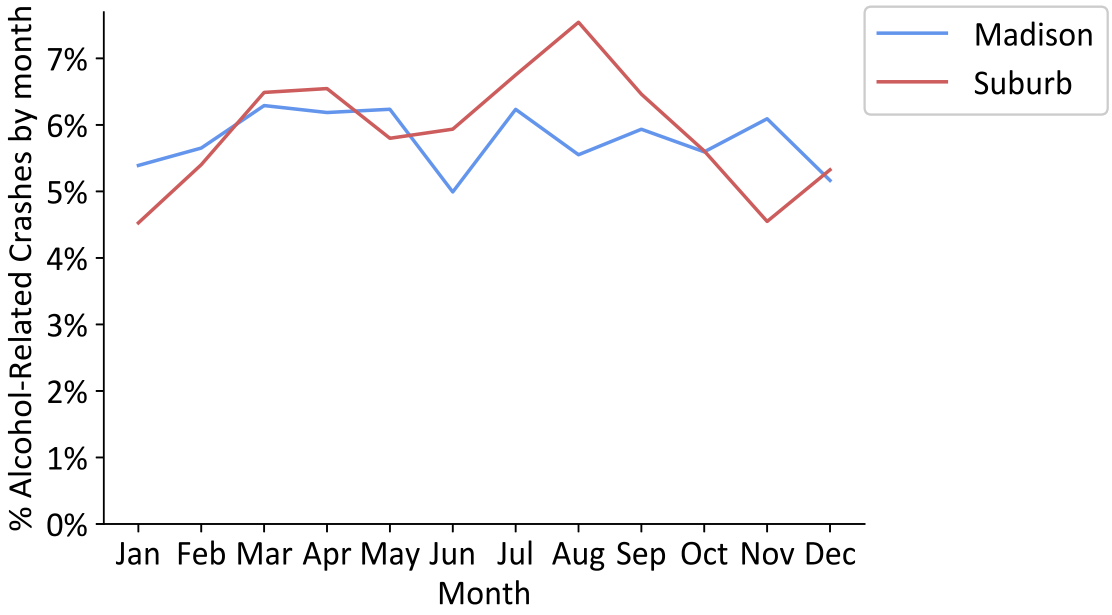

Figure 8: % Alcohol-Related Crash Distributed by Month

3.3 Week

From Figure 8, we see that as the week goes on, more and more people go out, which correlates to more alcohol-related incidents!

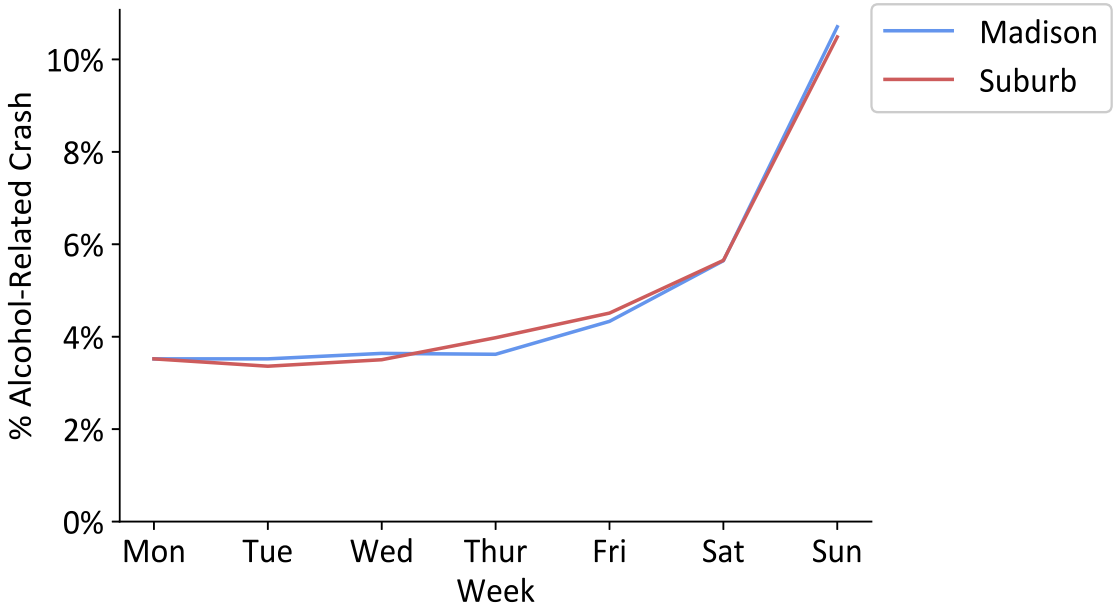

Figure 9: % Alcohol-Related Crash Distributed by Week

3.4 Hour

The peak hours of alcohol-related incidents are from 12 AM till 3 AM. Around 3 AM, we see that there is a bigger percentage of suburbians involved in crashes compared to that of Madison. One theory is that people who live in the suburbs have to drive a longer distance home on the weekends, where buses don't run after 12 AM, which in turn leads to drunk driving.

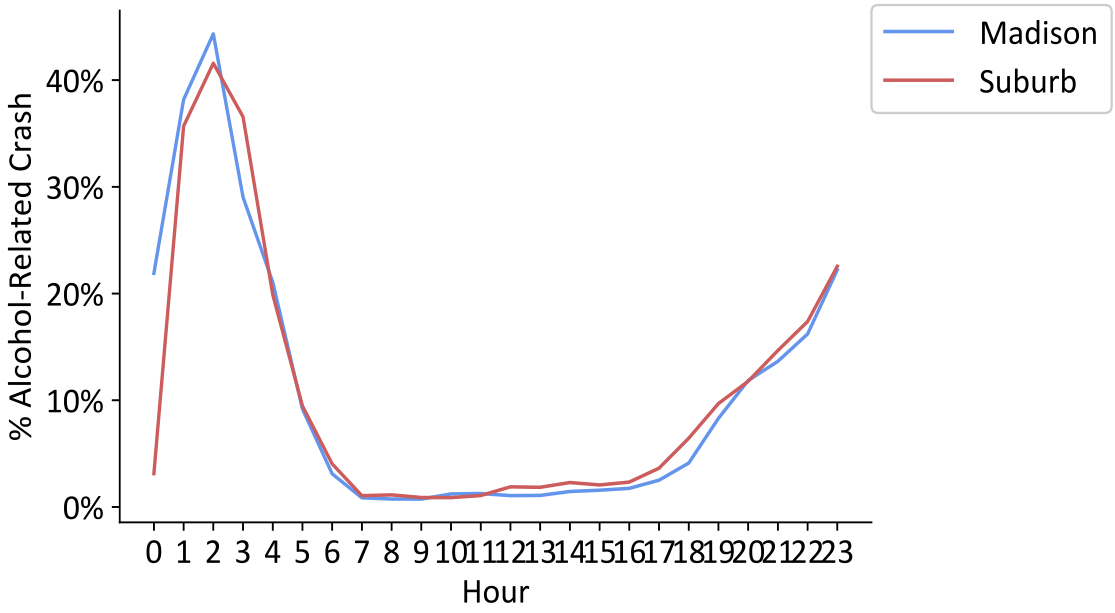

Figure 10: % Alcohol-Related Crash Distributed by Hour

3.5 Week and Hour

From Figure 11, we see that the curves work days are basically the same, while the curves on the weekend show a completely different pattern. Most of the time, the number of crashes in work days is greater than the weekend, but in the few hours after the 0:00 AM, the curves of the weekend are higher than that of the work day.

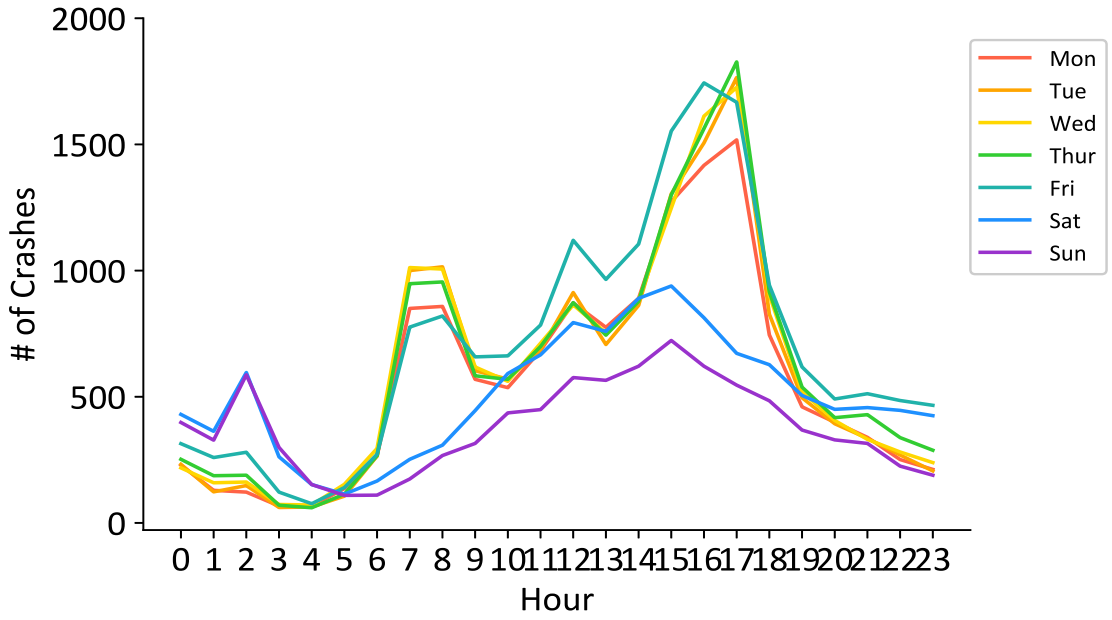

Figure 11: # of Weekly Crash Distributed by Hour in Madison

For the Surbubs, the number of crashes at 0:00 is unusually high, but the crash distribution at other times are similar to those in the City of Madison.

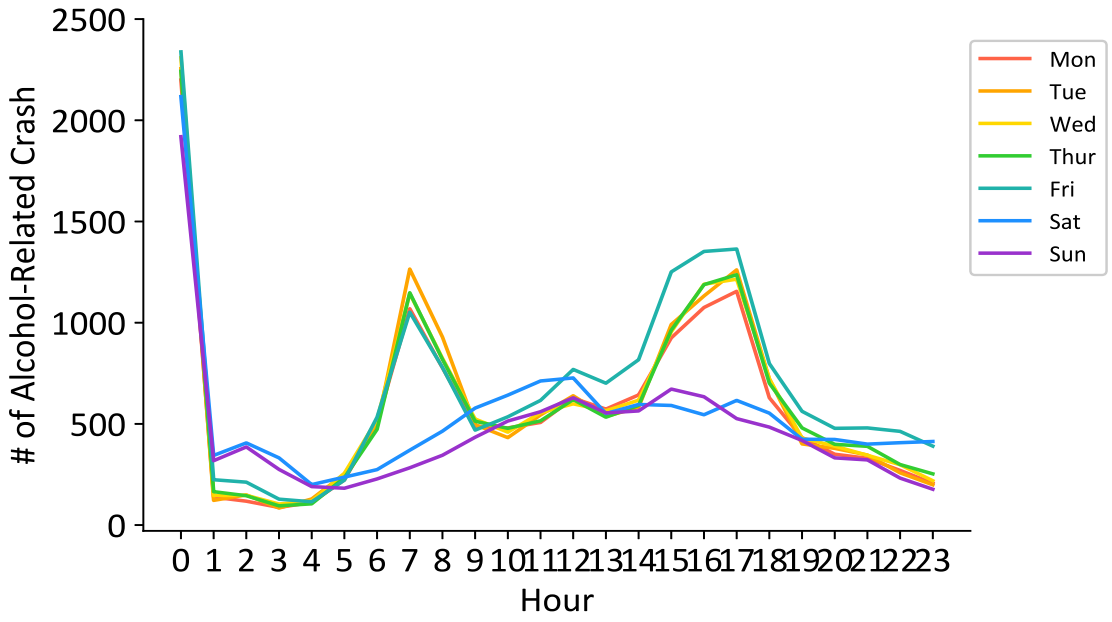

Figure 12: # of Crash Distributed by Hour in Surbub

From Figure 13, we found that the working day is similar to the weekend. We concluded that the peak hours of drunk driving are between 0:00 and 3:00 AM, regardless of which day of the week.

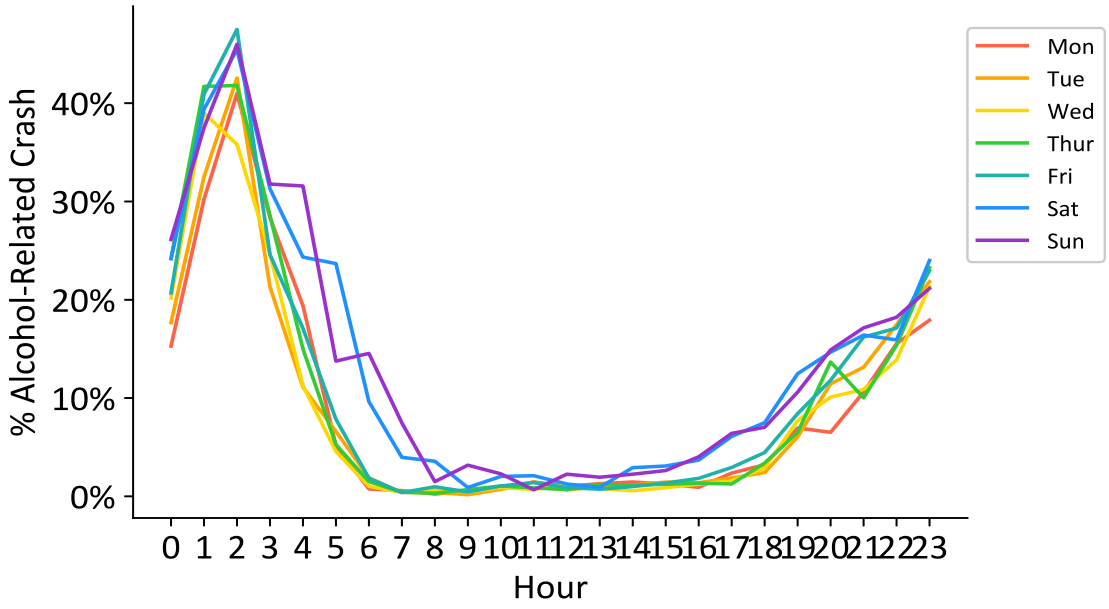

Figure 13: % Weekly Alcohol-Related Crash Distributed by Hour in Madison

For the Surbub, the above conclusion is still true.

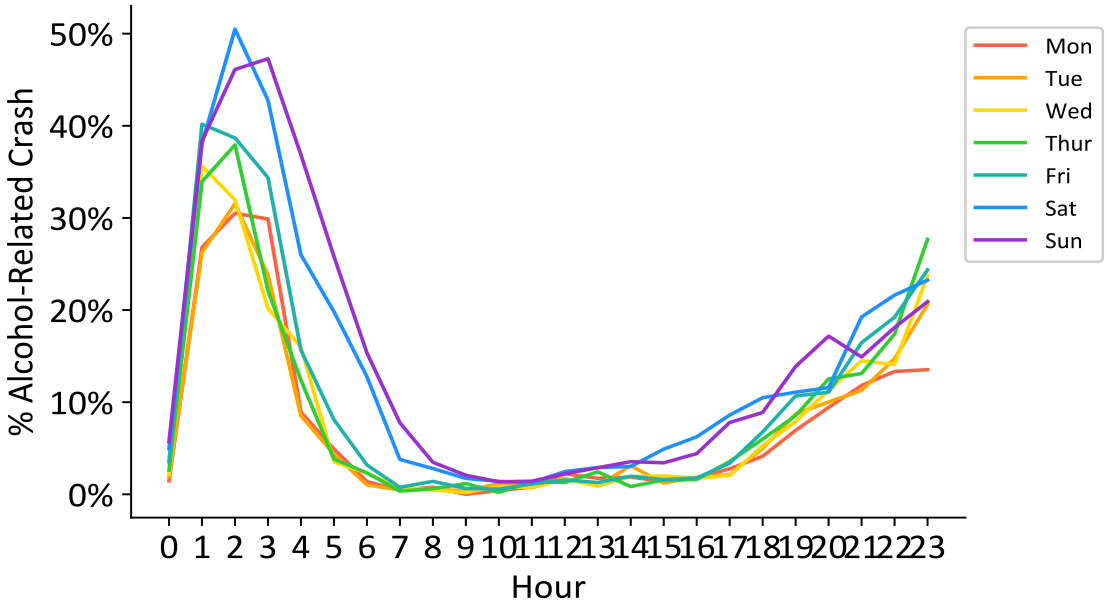

Figure 14: % Weekly Alcohol-Related Crash Distributed by Hour in Surbub

4 About the types of crash

This pie chart shows the percentage of different types of accidents that occured in Dane County.

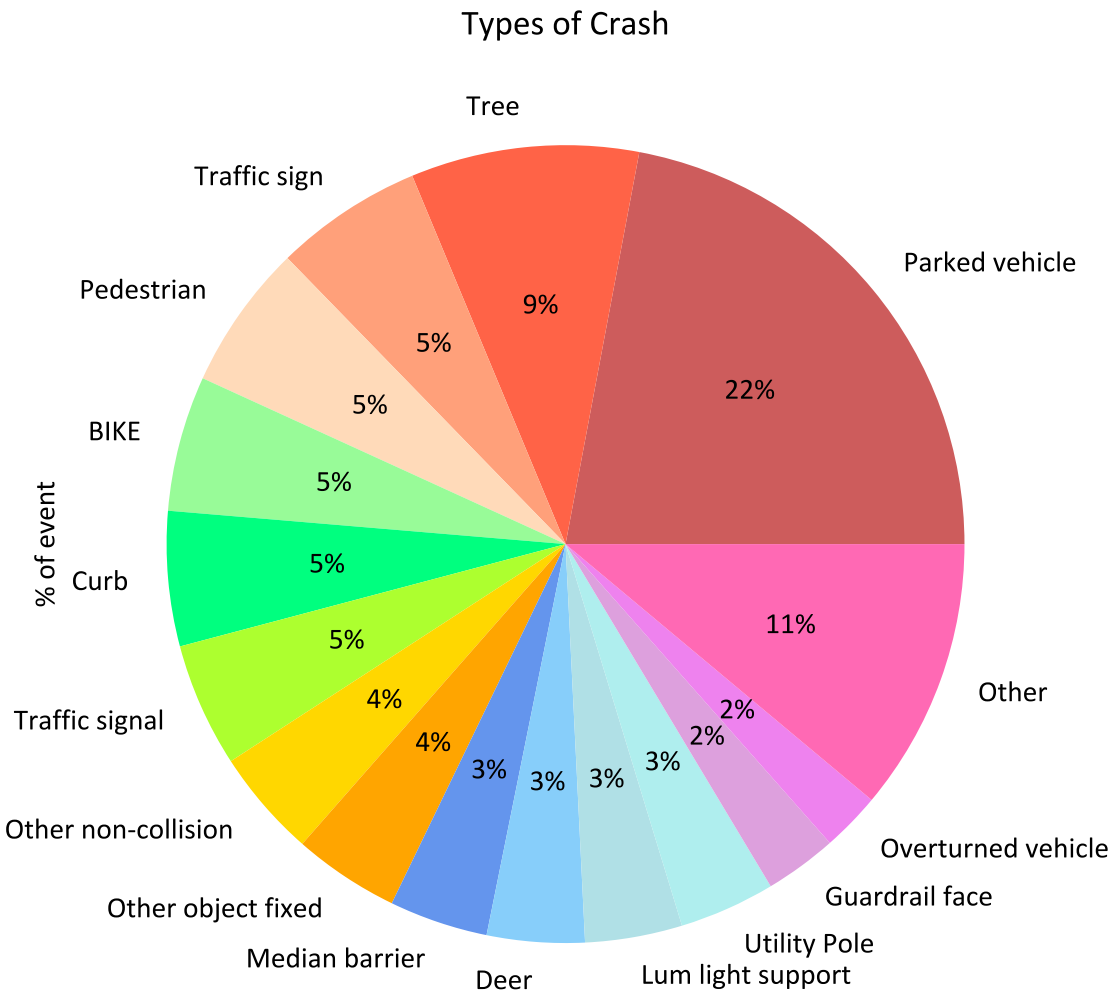

Figure 15: Types of Crash

Because a majority of crashes contains personal injuries, we next analyze the fatal accidents in the City of Madison and the suburbs. Figure 16 shows the incidence of fatal events in different crash types (ten types with the highest lethality) in the City of Madison.

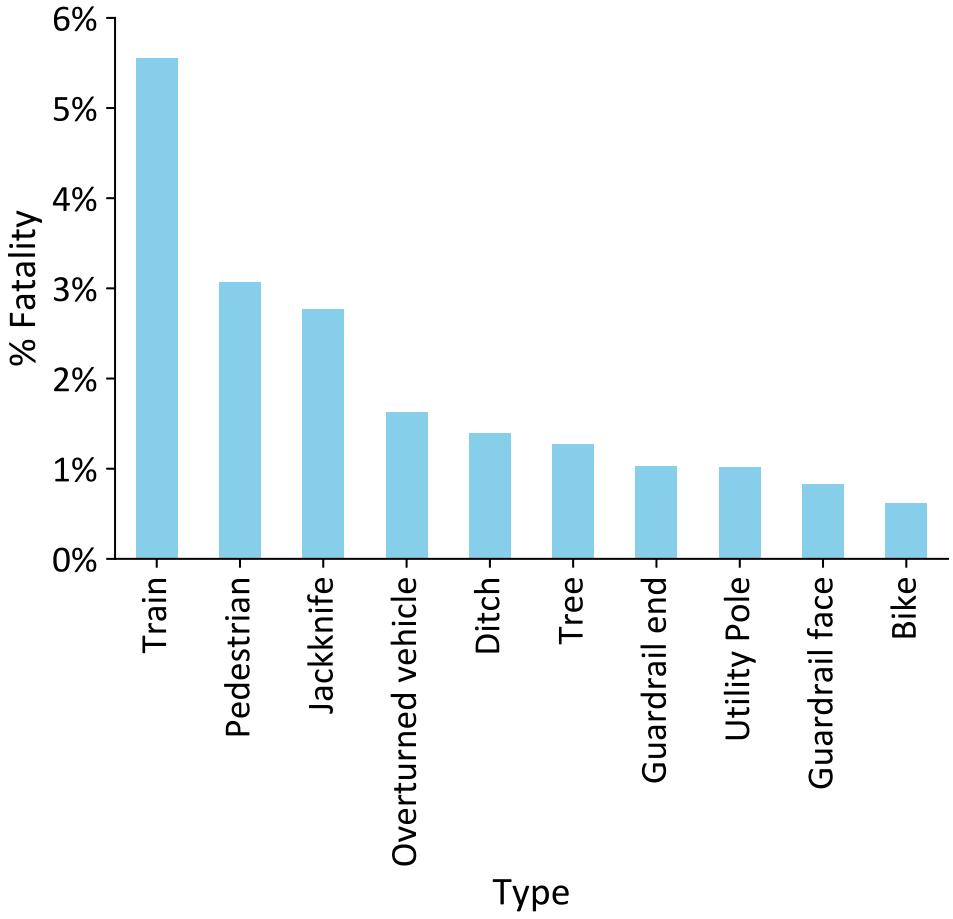

Figure 16: % Fatality Distributed by Type in Madison

Figure 17 shows the incidence of fatal events in different crash types (ten types with the highest lethality) in the Suburbs. We can see the difference between the two regions, which shows that different approaches must be adopted for fatal accidents in these two regions.

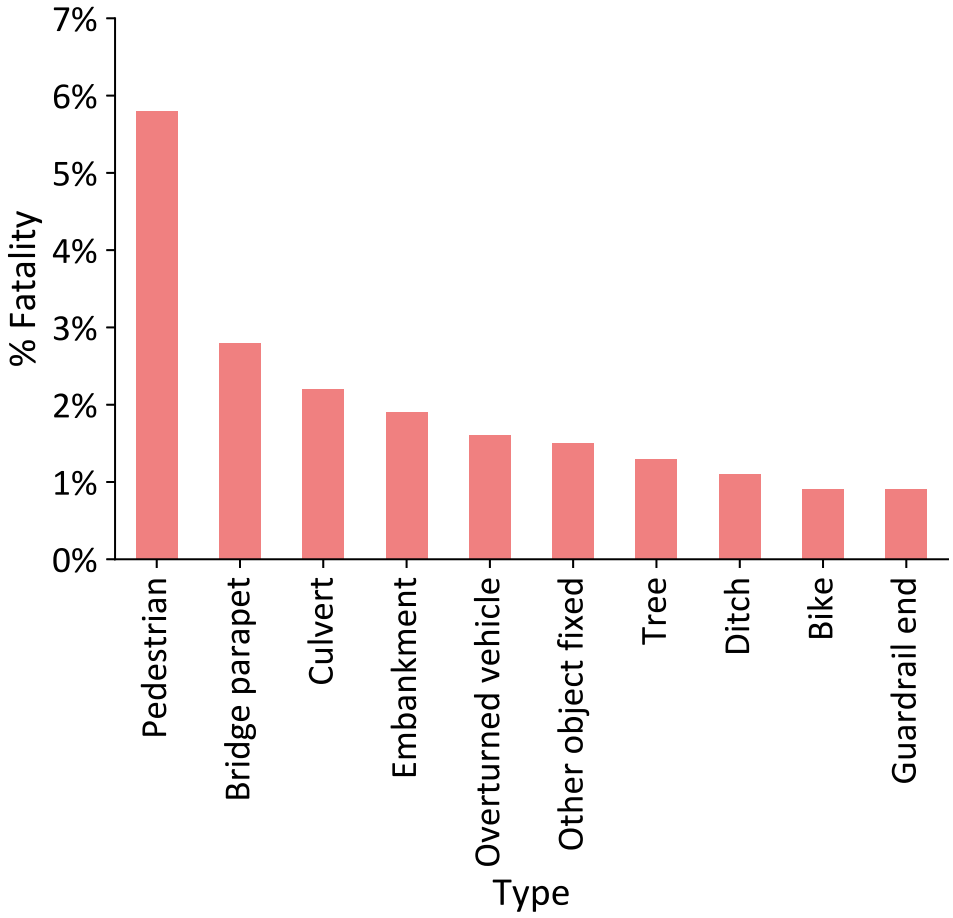

Figure 17: % Fatality Distributed by Type in Suburbs

5 Severity

5.1 Speed

Table 1 shows the probability of crashes of different severity at different speed limits.

Table 1: Add caption

Speed	Fatal		Incapacitating		Non-incapacitating		Unknown		Total
	#	%	#	%	#	%	#	%	#
0-25	37	0.12%	557	1.81%	2991	9.73%	27140	88.33%	30725
30-40	59	0.16%	588	1.64%	3422	9.55%	31753	88.64%	35822
45-55	34	0.34%	196	1.94%	960	9.50%	8912	88.22%	10102
60+	13	0.35%	69	1.87%	336	9.11%	3271	88.67%	3689

Figure 18 shows the number of crashes in different speed limits at three different severity levels. We can see that for fatal accidents, the higher the speed limit, the greater the number. For minor injuries that are non-incapacitating, the lower the speed limit, the greater the number. For incapacitating accidents, there is no significant difference in the amount of occurrence between different speed limits.

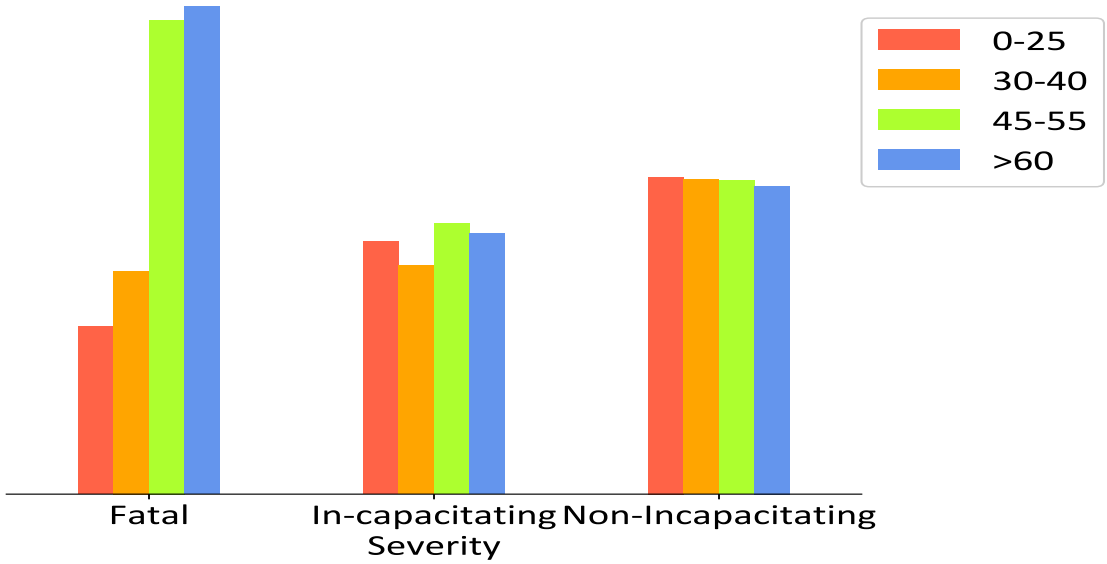

Figure 18: The Correlation between Speed Limit and Severity

5.2 Age

We can see that the percentage of minor injuries and disabilities between different age groups fluctuates very little.

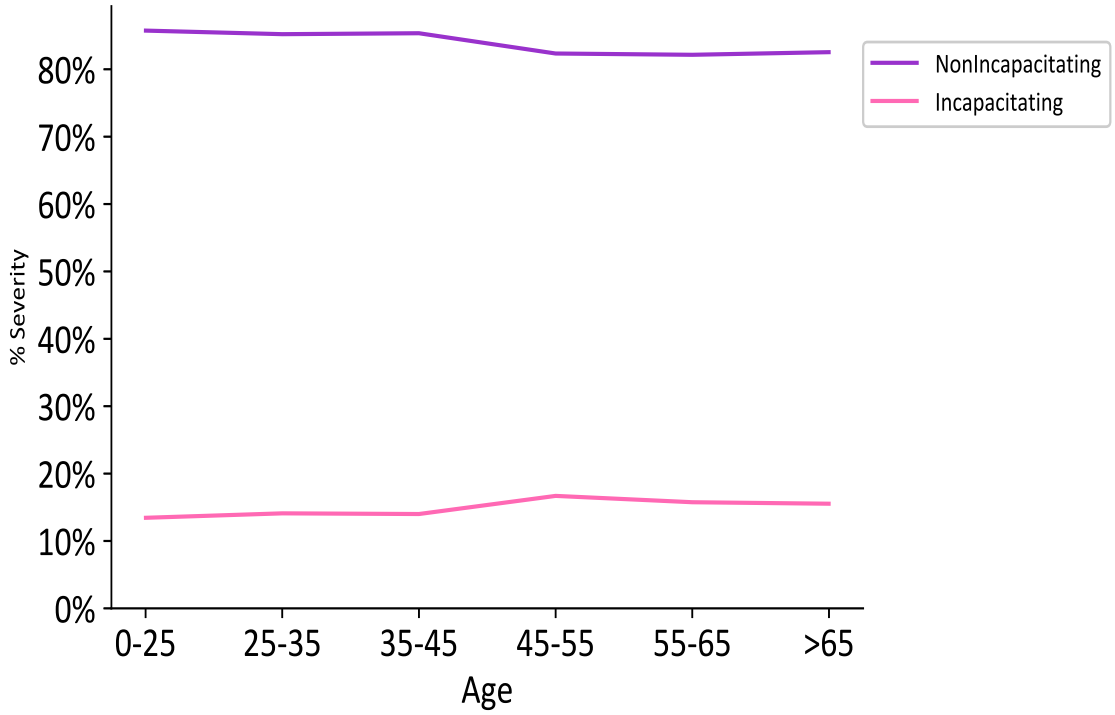

Figure 19: % Severity Distributed by Age

From Figure 20, we can see that the percentage of incapacitating accidents in the drunk driving is higher than the above picture (all crahes) and the percentage of non-incapacitating accidents is lower than Figure 19 (all crahes), so we conclude that drunk driving accidents will cause more serious harm to the driver.

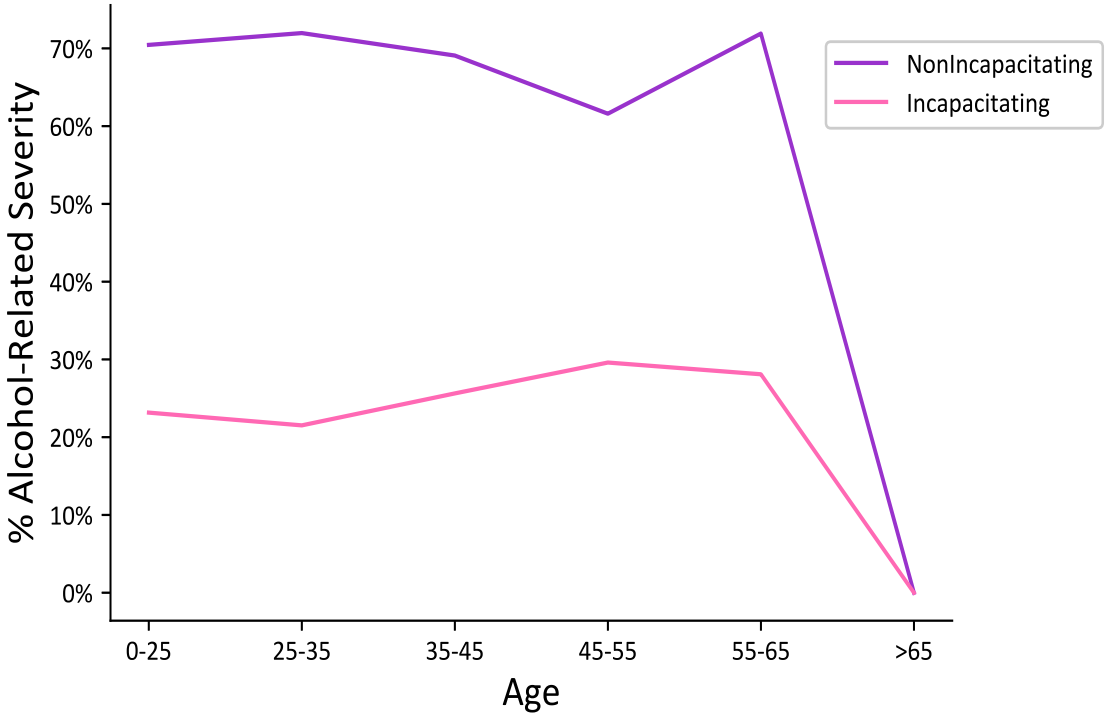

Figure 20: % Alcohol-Related Severity Distributed by Age

From figure 21, we can see that among all accidents, crashes involving drivers aged 45-55 have the lowest fatality rates.

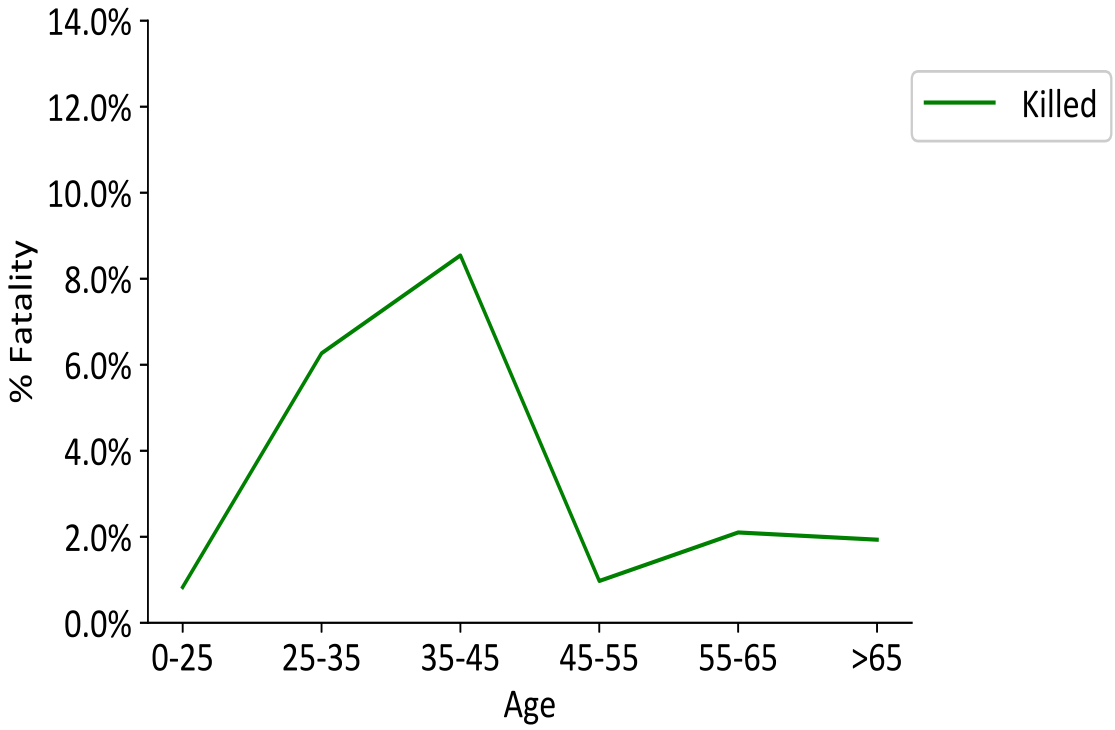

Figure 21: % Fatality Distributed by Age

But in the case of drunk driving, crashes involving drivers aged 45-55 have the highest fatality rates.

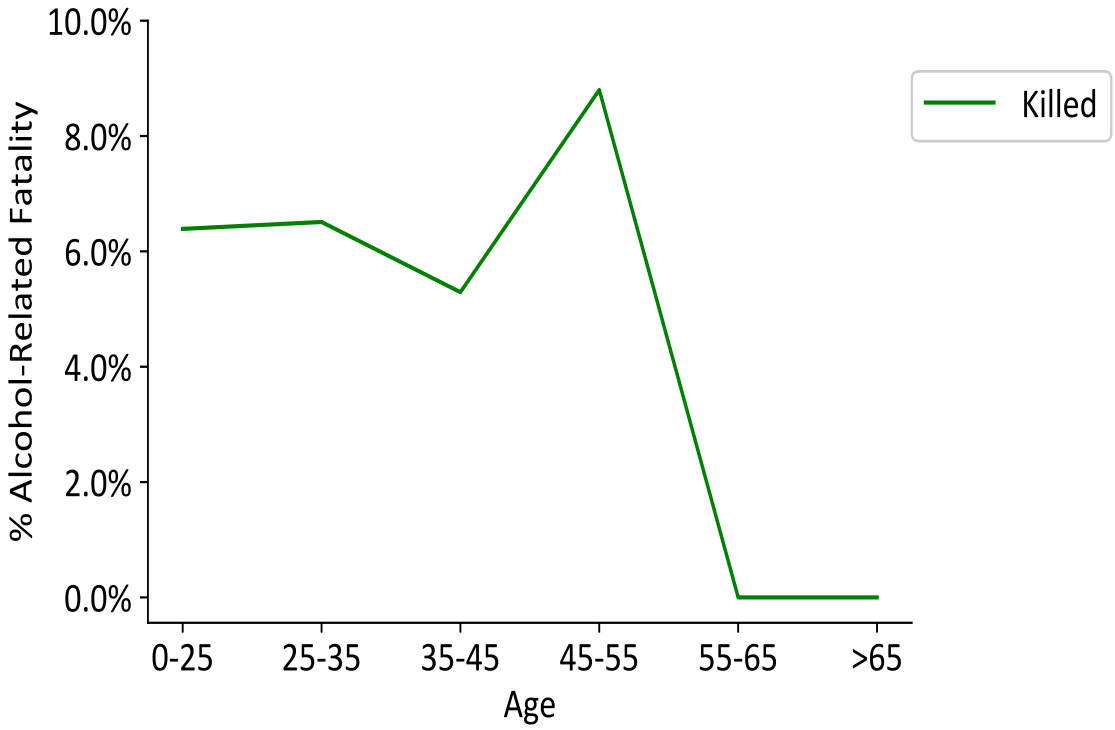

Figure 22: % Alcohol-Related Fatality Distributed by Age