



Motor Vehicle Accidents in Victoria

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Temporal factors analysis

Accidents per year

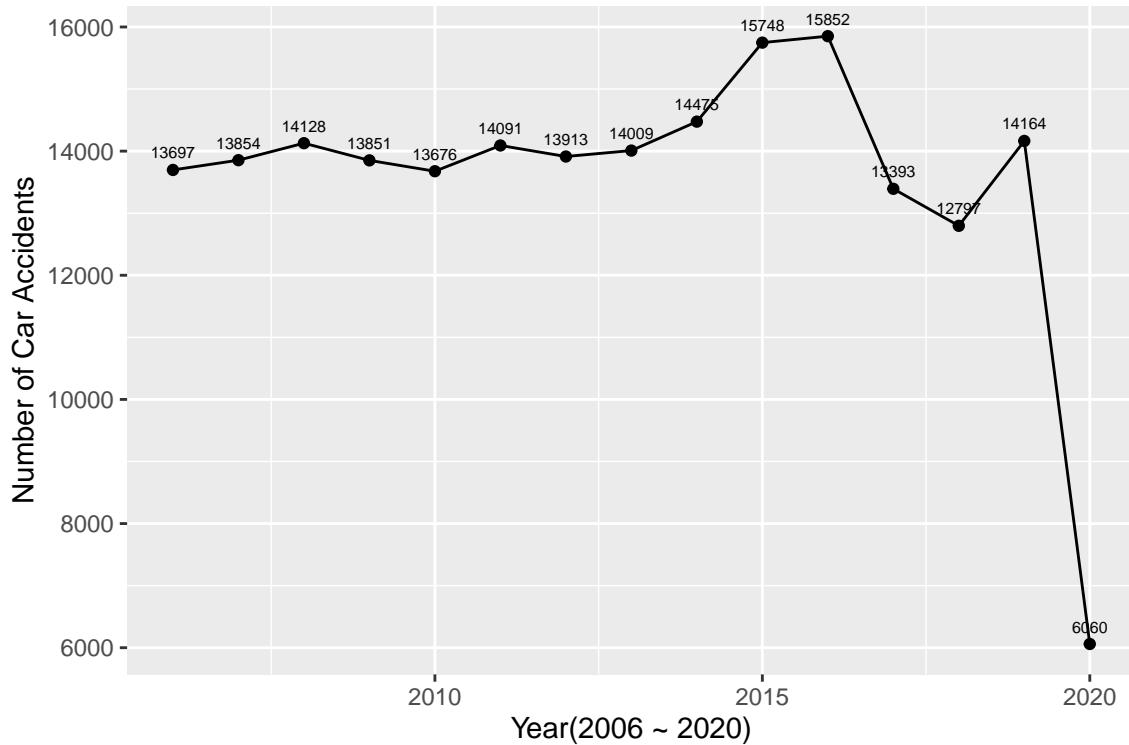


Figure 1: Car Accidents per year

According to plot 1, the increasing number of car accidents remained relatively stable from 2006 to 2014, around 14000. After 2014, the increasing speed became faster and then reached the first peak in 2015, second peak in 2016: 15852. After 2016, it started to drop. There is one outstanding change between 2019 and 2020, which it plummeted down from 14164 to 6060. The possible reason is the coming of covid 19 pandemic and the lockdown of Victoria, which made less car on roads, less accidents happened.

Accidents by weekday

Regarding to plot 2, it indicates that there is a stable increasing number of car accidents from Sunday to Friday then reach the highest number on Friday. We could understand it from the following reasons: people are getting more and more exhausted during the whole working week, and many people will choose to hang out on Friday night which increase the percentage of driving drunk or reckless.

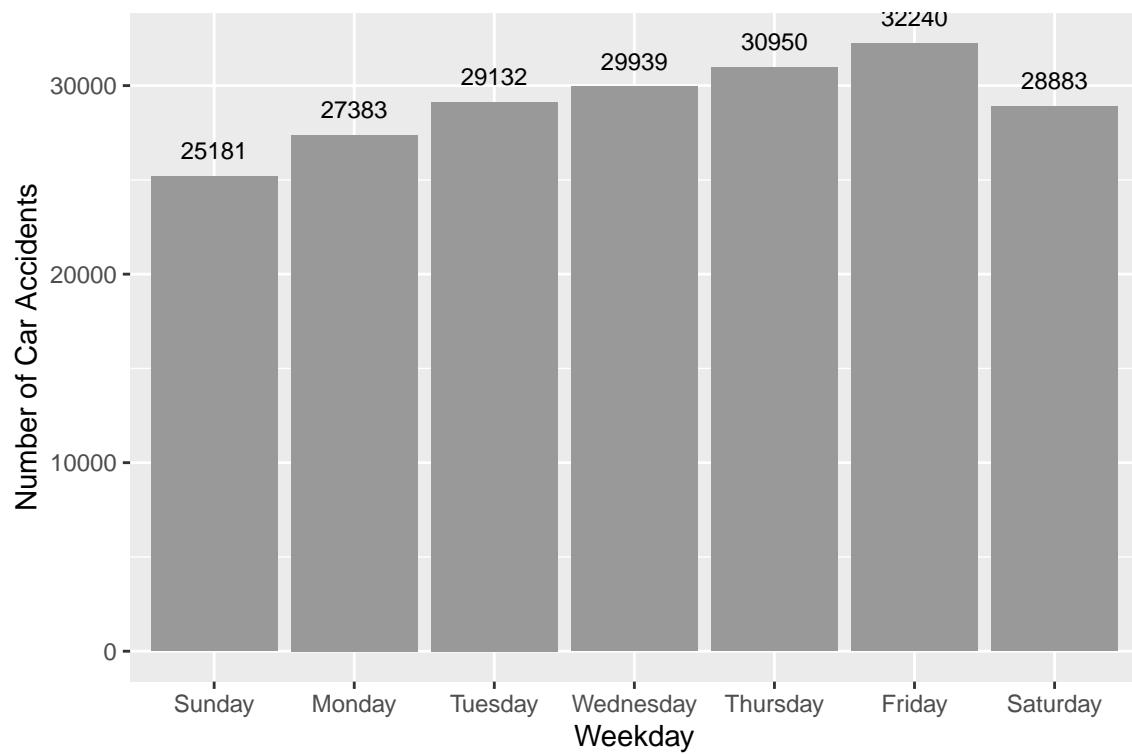


Figure 2: Car Accidents by weekday

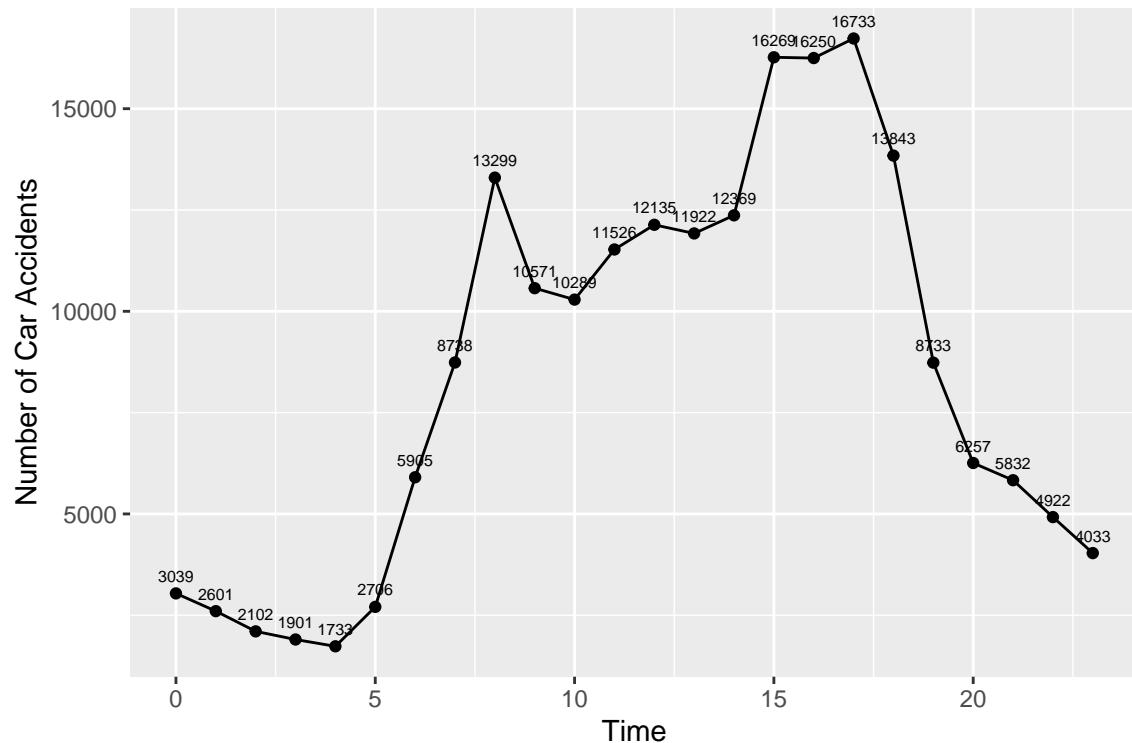
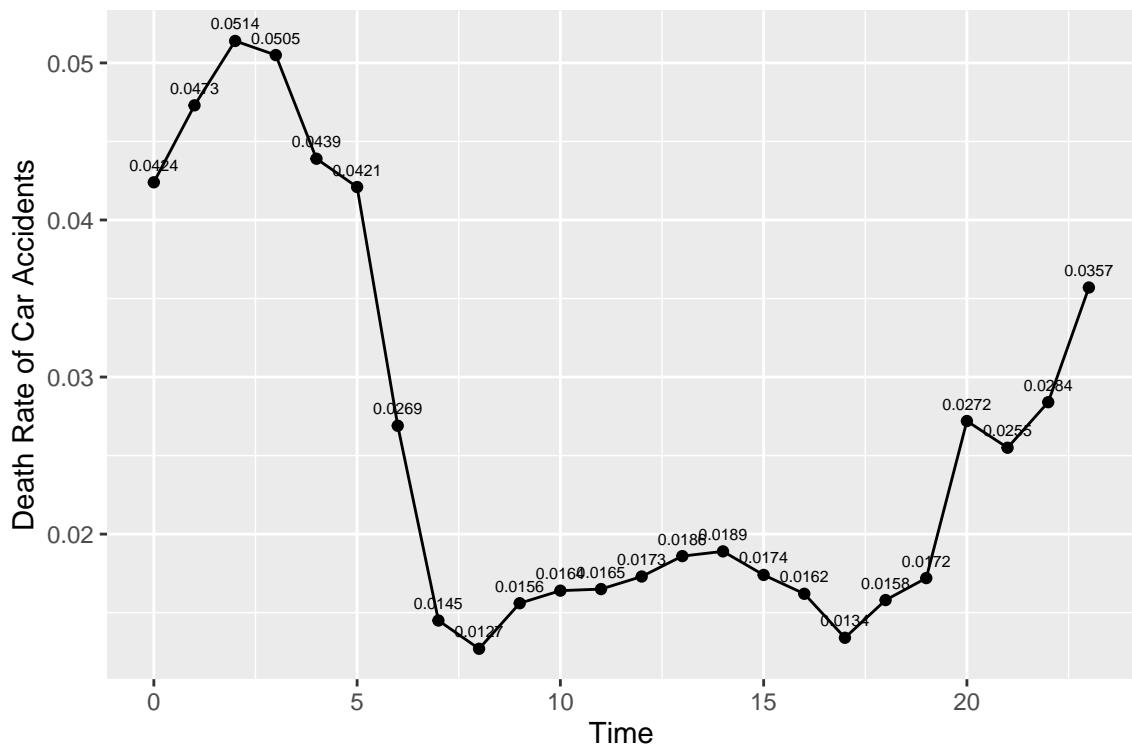


Figure 3: Car Accidents by hour

Table 1: Number of Car Accidents happened by weekday

Weekday	Accidents
Sunday	25181
Monday	27383
Tuesday	29132
Wednesday	29939
Thursday	30950
Friday	32240
Saturday	28883

**Figure 4:** Death Rate by hour

Accidents by hour and Death Rate by hour

When comparing plot 3 and plot 4, we could notice that these two trend are indicating opposite story, which is the higher number of accidents actually with lower death rate during the same specific time. For example, 8 o'clock in the morning reached the first peak of car accidents. However, the death rate of it was the lowest. And the point of 5 o'clock tells a similar story. The 4 actually shows although 2 o'clock in the midnight has almost the lowest volume of car accidents, it has the highest death rate.

The possible reasons for above results are: both 8 o'clock in the morning and 5 o'clock in the afternoon are the commuter time, which make the traffic busier and more cars on roads, so more accidents. However, most of the accidents won't be too severe due to the packed traffic. The 2 o'clock in the

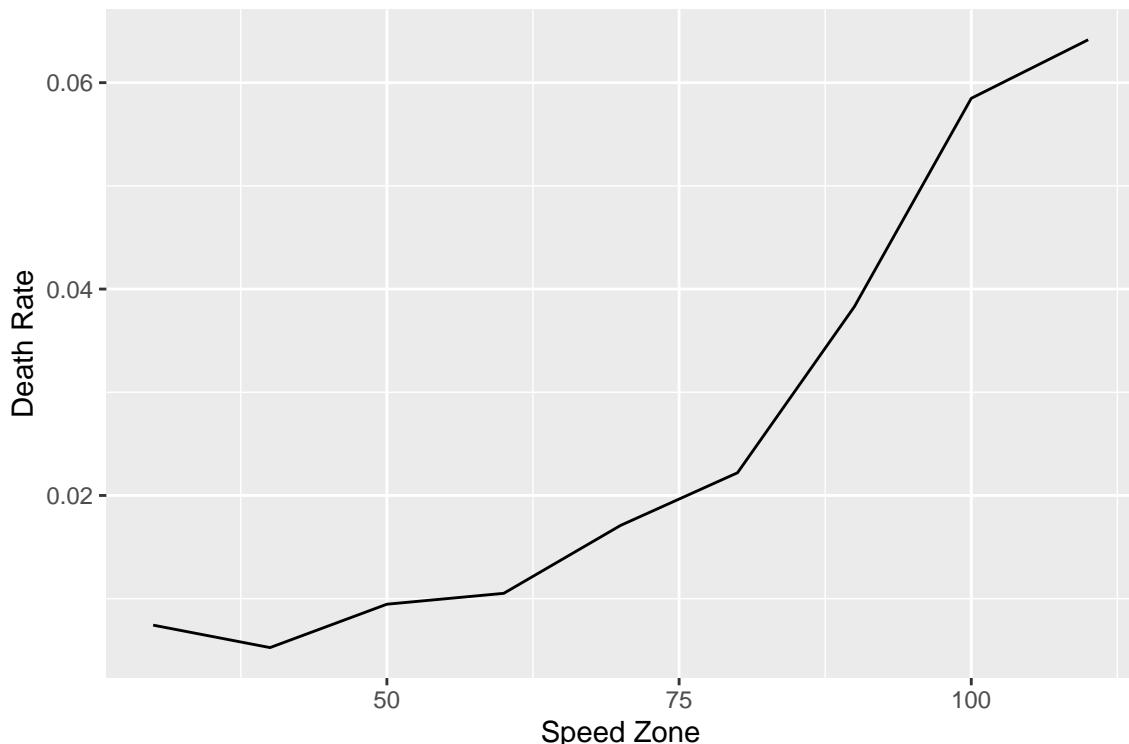
Table 2: Death Rate per Speed Zone

Speed Zone	Accidents	Deaths	Death Rate
030	269	2	0.0074349
040	8937	47	0.0052590
050	36149	342	0.0094608
060	69133	727	0.0105160
070	15145	259	0.0171014
075	62	2	0.0322581
080	27794	617	0.0221990
090	940	36	0.0382979
100	31240	1827	0.0584827
110	2151	138	0.0641562
777	249	1	0.0040161
888	930	6	0.0064516
999	10709	30	0.0028014

midnight is different. First, drivers would be more sleepy and more drivers would take the risk of drunk driving after attending parties in the night which make the accidents have a higher death rate.

Effect of speed and vehicle age on death rate

Death rate by speed zone

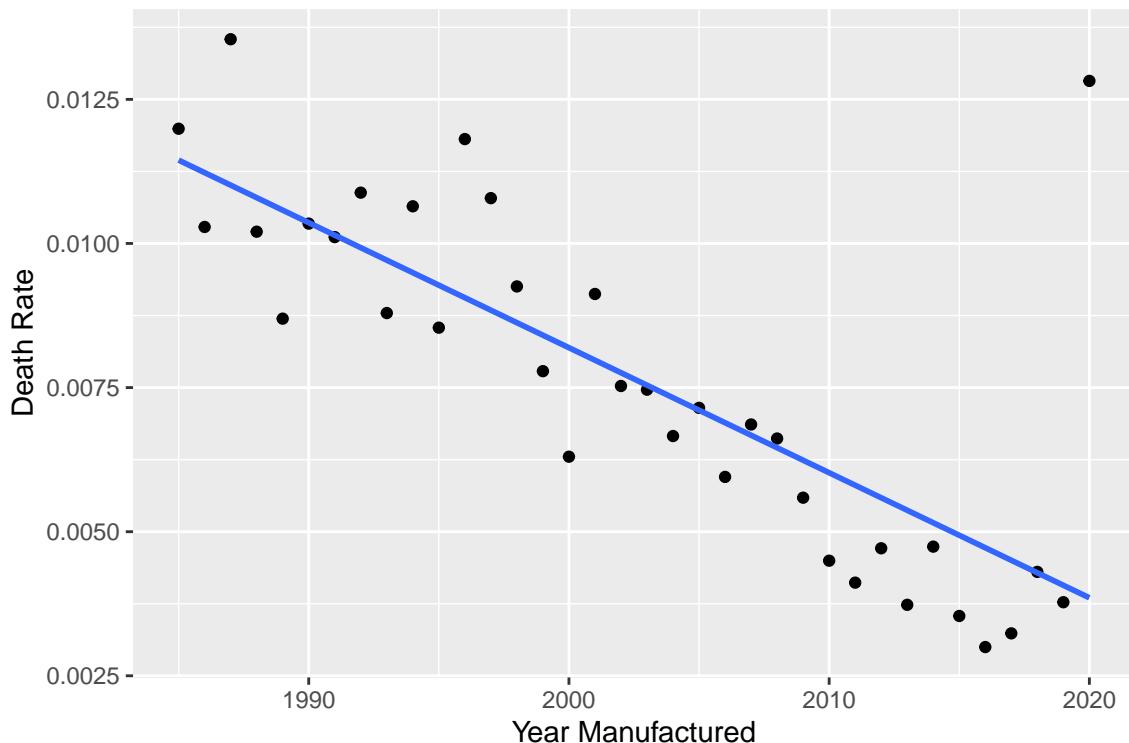


For this question, the variable Death Rate is defined as the number of deaths in a given speed zone over the time period analysed, divided by the number of accidents. All of these figures can be seen in the table.

The analysis for this question works on the reasonable assumption that accidents that occur in higher speed zones occur at higher speeds. The analysis shows that there is a very strong association between the level of speed permitted in a certain zone, and the likelihood of dying in an accident in that zone. As the level of speed permitted increases, the probability of dying in an accident rises sharply. The death rate from accidents in 40km/h zones is around 0.005, where as in 110km/h zones, the death rate is around 0.064; that is, you are nearly 13 times more likely to be killed in an accident in a 110km/h zone, as opposed to a 40km/h zone.

The reason for this difference in the death rate is fairly obvious; higher speeds contribute greatly to the severity of accidents. A person's car may be lightly to moderately damaged in a low-speed collision, but is much more likely to suffer massive damage in a high speed collision. This in turn drastically increases the risk of serious injury or death for the occupants.

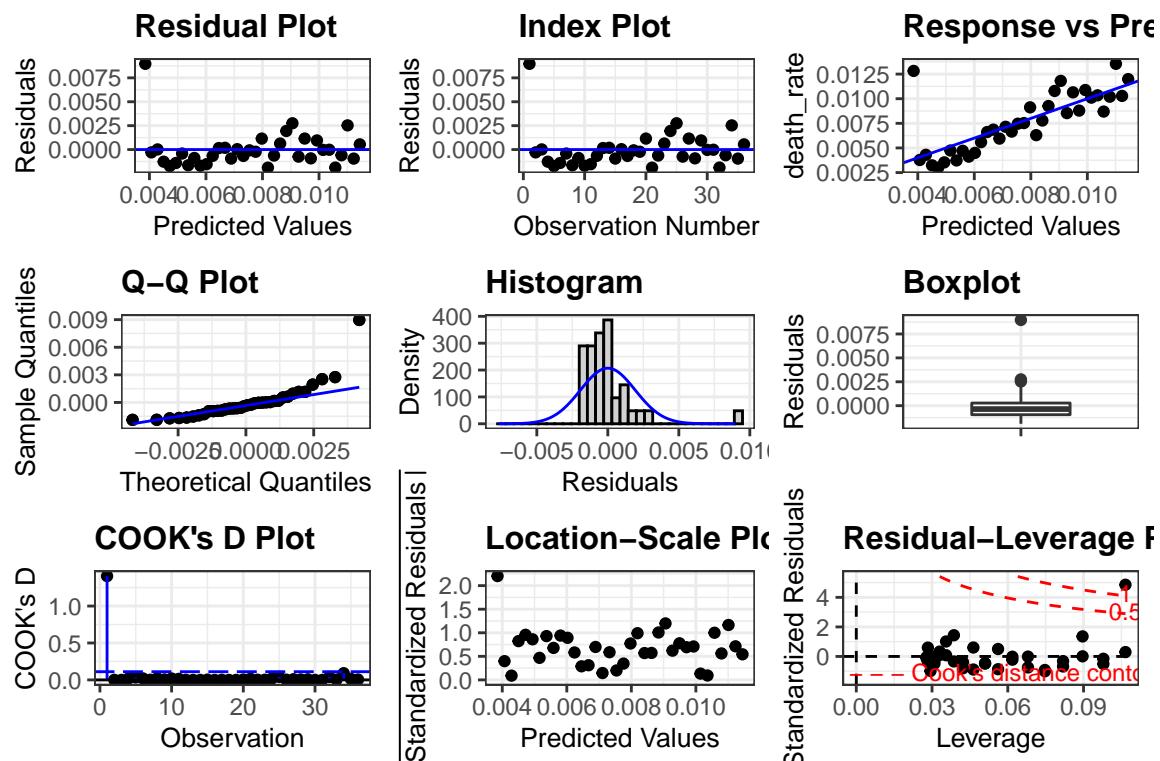
Death rate by year of vehicle manufacture



term	estimate	std.error	statistic	p.value
(Intercept)	0.4420226	0.0627854	7.040211	0e+00
vehicle_year_manuf	-0.0002169	0.0000314	-6.918470	1e-07

r.squared	adj.r.squared	sigma	statistic	p.value	df	logLik	AIC	BIC	dev
0.5846833	0.5724681	0.0019542	47.86523	1e-07	1	174.5064	-343.0127	-338.2622	0.000

Regression model residual panel



Goodness of fit tables

For this question, the variable Death Rate is defined as the number of deaths in accidents involving cars from a particular year of manufacture, divided by the number of accidents.

The analysis of the death rate by year of vehicle manufacture shows that there is a relatively strong negative correlation between the recentness of the year of manufacture of a vehicle, and the likelihood that a vehicle manufactured in that year will be involved in a fatal accident. The graph shows that a person is more than twice as likely to be killed in an accident if they are in a car manufactured in the late 1980s, as opposed to a car manufactured in the last 5 years.

In the linear model which was fitted to the data, for every year older a car is, the death rate increases by around 0.0002 deaths per accident. This linear model fits the data quite well; the R-squared is around 0.6, and the residuals are fairly evenly spaced around 0.

The reason for the decline in the death rate associated with more recently manufactured vehicles is improved safety standards. Cars built today contain far more structural features designed to protect occupants in the event of an accident. They also possess better braking capability, as well as extensive electronic systems that warn drivers of impending hazards.