

The crash experience of newly licensed young drivers in South Australia

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Abstract

South Australian drivers who obtained their first provisional car licence between July 1998 and June 2001 and who were 16 to 19 years of age at the time of provisional licensure were identified. Their involvement as car drivers in crashes in South Australia that resulted in an injury or total damage of \$3,000 or greater was determined for their learner period and the five years after obtaining their first provisional car licence. Driver factors considered were: year of obtaining first provisional licence; sex of driver; age of driver; location of residence; method of licensure; and length of time on learner's permit. A rapid reduction in the average rate of crash involvement was found, especially in the first year of driving on a provisional licence and particularly for crashes involving drivers leaving the roadway or making right filter turns across traffic.

Keywords

Crash, Database, Accident, Young drivers

Introduction

Young drivers are highly over-represented in crashes. A deeper understanding of how their crash experience changes over time and in relation to their characteristics can aid in the evaluation of current countermeasures and suggest possible new countermeasures.

An extensive study was conducted for Austroads looking at the crash and offence experience of young South Australian drivers¹. This paper reports on some of the main findings related to crash experience of those drivers.

Methods

All drivers who obtained their first provisional licence between July 1998 and June 2001 were identified in the South Australian Motor Registration database.

Additionally, they were required to have obtained their licence by either the vehicle on-road test (VORT) or through competency based training and assessment (CBTA) (this excluded drivers who obtained a provisional licence for a vehicle other than a car and those who obtained a provisional licence through some form of disqualification without having obtained their original provisional licence in South Australia). Only those drivers who obtained their learner's permit in South Australia and whose sex was recorded in the South Australian Motor Registration database were retained. Drivers who apparently did not meet the full licence waiting periods in South Australia were excluded from the sample as were drivers without a known postcode of residence at the time of obtaining a provisional licence. Finally, only those drivers who were aged 16-19 years when they obtained their first provisional licence were retained. This selection process resulted in the records of 49,536 drivers being available for analysis.

The South Australian Department of Transport, Energy and Infrastructure (DTEI) obtain the raw police data on road crashes in South Australia, match multiple reports on the same crash and code variables for each crash to produce a database of crashes in South Australia.

Using the DTEI database, crashes that a particular driver was involved in as a driver were identified by searching the vehicle records for the driver's licence number (a licence number is assigned to a driver when they obtain their learner's permit and remains the same during their lifetime). Due to the DTEI

property damage limit for processing crashes being raised from \$1,000 to \$3,000 in July 2003, only crashes where there was a reported injury or where the total crash damage was reported as being \$3,000 or greater were considered.

The crash experience of each of the 49,536 drivers was determined for their learner's permit phase and for five years after they obtained their first provisional licence. The crash rate of the sample was then analysed based on selected characteristics of the drivers and the types of crashes they were involved in.

Results

Table 1 presents the number of drivers in the various groups examined.

Table 1: Number of drivers in various groups

Year of obtaining first provisional licence	
July 1998 - June 1999	17,059
July 1999 - June 2000	17,591
July 2000 - June 2001	14,886
Sex of driver	
Male	26,056
Female	23,480
Age of driver	
16	29,804
17	11,156
18	5,537
19	3,039
Location of residence	
Adelaide	20,302
Adelaide surrounds	14,862
Rural	14,372
Method of licensure	
Competency based training and assessment	37,221
Vehicle on road test	12,315
Length of time on learner's permit	
< 6 months	19,705
6-9 months	19,735
> 9 months	10,096

Figure 1 shows the percentage of drivers that were involved in at least one car crash in the given three month period after they had obtained their first provisional licence. For example, 1,603 of the 49,536 drivers in the sample (3.24%) were involved as a car driver in at least one crash in their first three month period of driving on a provisional licence. The rate is clearly much higher in the first three months of driving, declines rapidly in the first year of driving and continues to decline over the five year period examined. The error bars show the 95 per cent confidence intervals for each point (assuming a Poisson distribution) to give an idea of the uncertainty of each point.

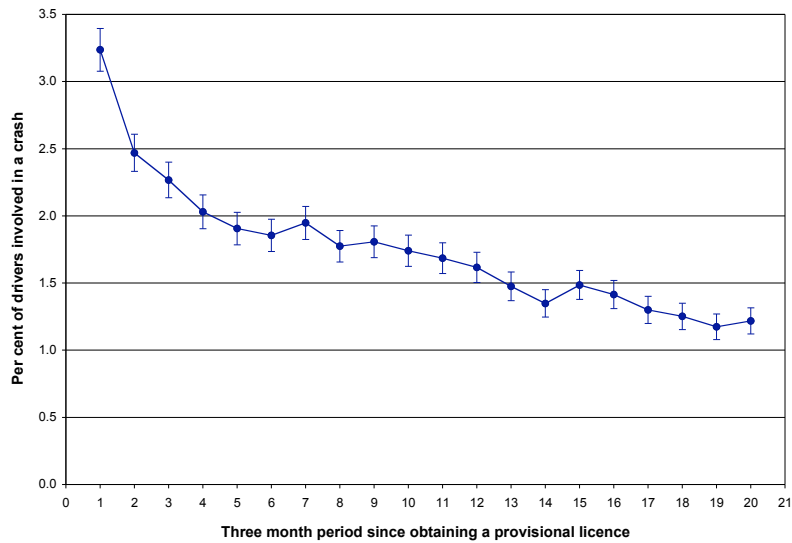


Figure 1: Per cent of drivers involved in at least one car crash in the given three month periods

It is possible that the underlying crash rates for young drivers could have changed over the years. This was checked by plotting the crash rates for each of the three years of data (Figure 2). An example interpretation of Figure 2 is that in the first three months since obtaining their first provisional licence, 537 (3.15%) of the 17,059 drivers who obtained their first provisional licence between July 1998 and June 1999 were involved in at least one crash as the driver of a car or car derivative. It is apparent that the crash rates remained relatively constant for new young drivers over the period examined. By separating out the drivers by year, it was also possible to follow the crash rates of the earlier drivers for a period of longer than five years. This is also shown in Figure 2 and the indications are that the decline in crash rate continued into the sixth and seventh year of driving.

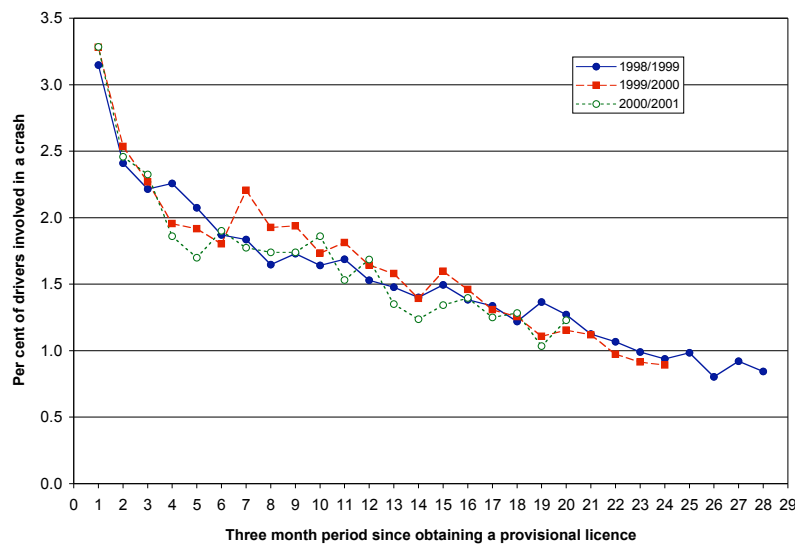


Figure 2: Per cent of drivers involved in at least one car crash in the given three month periods by year of sample

The crash experience of males and females are compared in Figure 3. Males as a group were clearly more likely than females to be involved in a crash. However, taking the ratio of the male to female crash rates over time (see Figure 4) indicated that while males continued to have a higher crash rate than females, the difference tended to decrease over time.

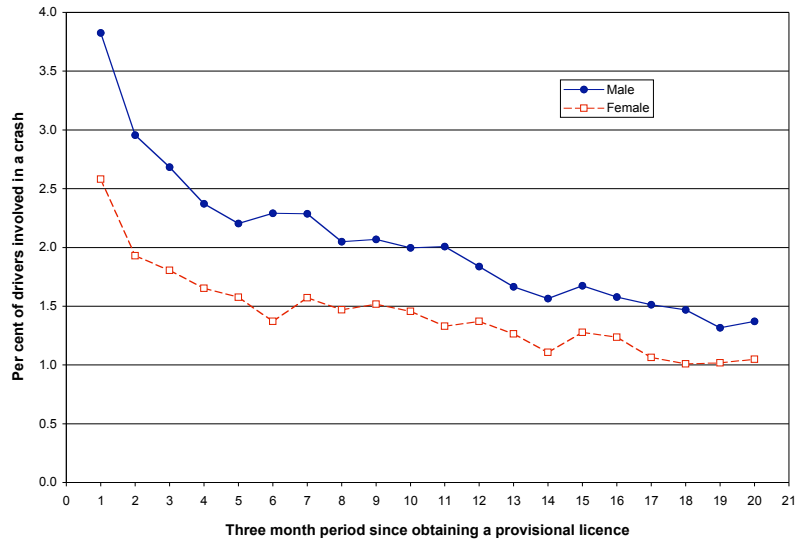


Figure 3: Per cent of drivers involved in at least one car crash in the given three month periods by sex of driver

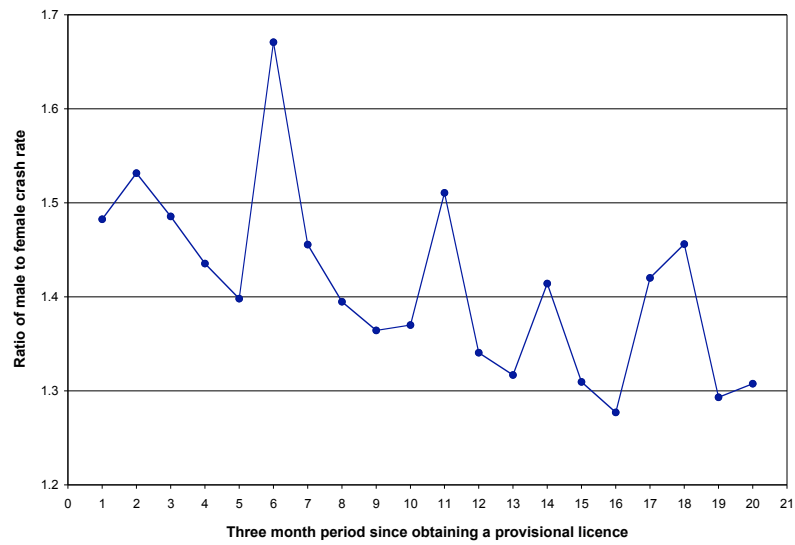


Figure 4: Ratio of male to female involvement in at least one crash in the given three month periods

The crash experience of drivers of different ages when they obtained their first provisional licence are compared in Figure 5. There are some indications that the older drivers (18-19 year olds) were less likely to be involved in a crash than the younger drivers (16-17 year olds) at least in the several years after obtaining their provisional licence.

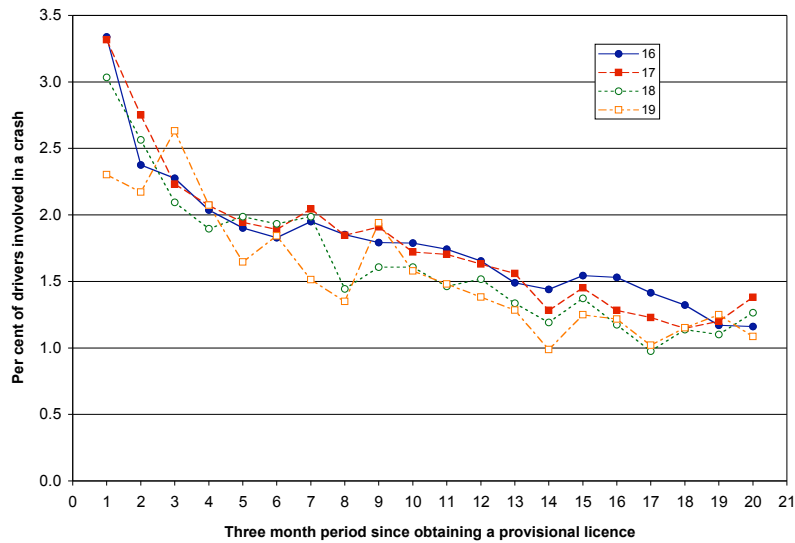


Figure 5: Per cent of drivers involved in at least one car crash in the given three month periods by age of driver when obtaining first provisional licence

The crash experience of drivers of different locations of residence when they obtained their first provisional licence are compared in Figure 6. The crash experience of Adelaide (the Adelaide plains and some built up areas of the Adelaide hills) and Adelaide surrounds (a 5-10 km belt around Adelaide) drivers were very similar while the Rural drivers were clearly less likely to be involved in crashes.

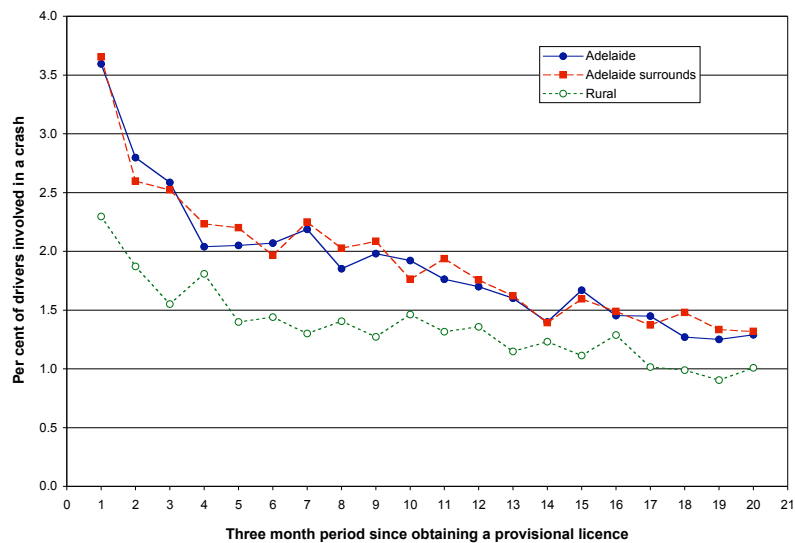


Figure 6: Per cent of drivers involved in at least one car crash in the given three month periods by location of residence when obtaining first provisional licence

The crash experience of drivers obtaining their first provisional licence via the competency based training and assessment (CBTA) method and the vehicle on road test (VORT) are compared in Figure 7. There is no clear difference between the CBTA and VORT groups although there is some indication that the VORT group may have been slightly more likely to be involved in at least one crash in the first year of driving compared to the CBTA group. Note that differences in driver characteristics between the CBTA and VORT groups (which were found) and the associated differences in crash experience for those characteristics may produce apparent differences between CBTA and VORT that are not the result of the choice of method in and of itself. The same effect may also mask real differences between the two groups.

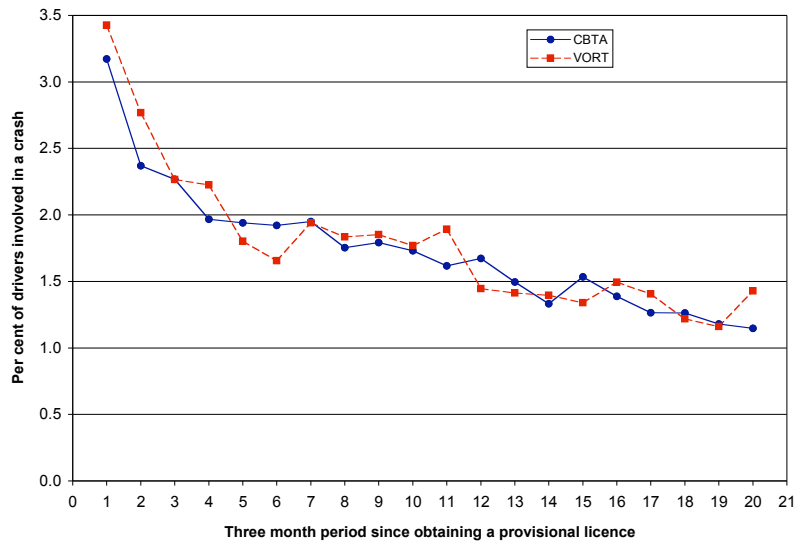


Figure 7: Per cent of drivers involved in at least one car crash in the given three month periods by method of licensure

The crash experience of drivers who spent different amounts of time on their learner’s permit before obtaining their first provisional licence are compared in Figure 8. There is some indication that drivers who spent more than 9 months between their first learner’s permit and their first provisional licence had a slightly lower involvement in crashes.

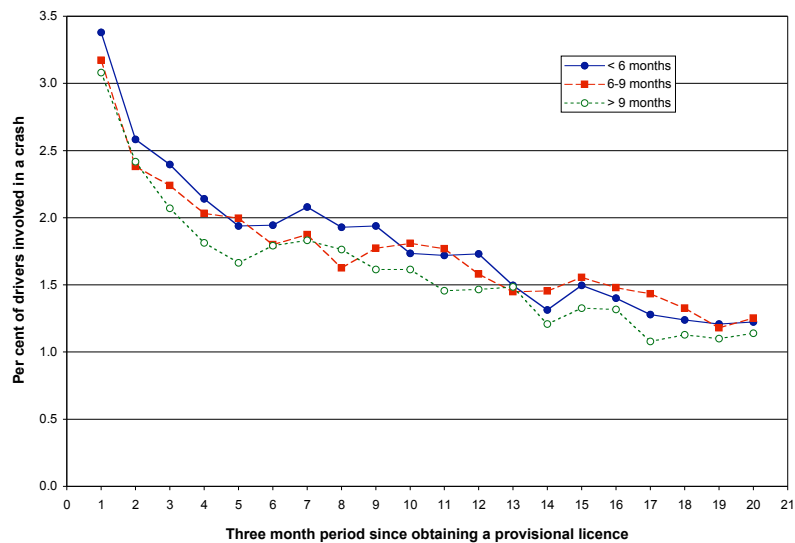


Figure 8: Per cent of drivers involved in at least one car crash in the given three month periods by length of time on learner’s permit

While examination of individual variables is instructive, dependencies between those variables can lead to observed differences that while real are primarily the result of a third factor. For example, there is a clear difference in crash rate between male and female drivers. As female drivers were more likely to choose CBTA over VORT, then any difference between CBTA and VORT crash rates could well be the result of the sex difference rather than an inherent difference between the two licensing methods.

A statistical method to deal with this is to use a logistic regression model to examine the effects of all the driver factors simultaneously. This gives the effect of all the factors independent of each other and also gives a statistical measure of how likely the observed effect could have arisen by chance.

A logistic regression was carried out for specified driver factors and crash experience and the results are shown in Table 2. Yearly data were used rather than quarterly data to give sufficient numbers of crashes for analysis. The numbers in Table 2 are odds ratios which approximate relative risks (since crashes are relatively rare).

An example interpretation of Table 2 would be that in the first year of driving, males were 1.5 times more likely to be involved in at least one crash compared to females and this result was highly statistically significant and independent of the other factors considered. Another example is that in the first year of driving the 19 year old drivers were less likely to be involved in at least one crash compared to 16 year old drivers but the difference was not statistically significant which means it could have arisen by chance alone.

It is clear from Table 2 that males were more likely to be involved in a crash compared to females although the difference tended to decrease over time. It is also clear that drivers who resided in rural areas were less likely to be involved in a crash than their Adelaide counterparts although again the difference tended to decrease over time.

It appears that drivers getting their licence via VORT were more likely to be involved in a crash than drivers getting their licence via CBTA in the first year after obtaining their first provisional licence. However, this difference became inconsistent in direction and failed to be statistically significant after the first year.

The 18 and 19 year old drivers were consistently less likely to be involved in a crash compared to the 16 and 17 year old drivers although only a few of the comparisons were statistically significant.

It should be noted that the standard logistic regression model used in this study is based on the Poisson distribution which is known to underestimate variability in crash numbers. There is consequently some danger of spuriously identifying some effects as being significant. The use of 5 separate logistic regression models (one for each year) also compounds this problem. Future work could use some regression method incorporating extra variability and allow all five years to be examined at once. For the current purposes, care should be taken in attributing meaning to any borderline statistically significant results.

Table 2: Logistic regression odds ratios for driver factors effects on crash involvement

Factor (reference category)	Year 1	Year 2	Year 3	Year 4	Year 5
Year of sample (1998/1999)	-	-	-	*	-
1999/2000	1.00 (0.93,1.07)	1.05 (0.97,1.14)	1.11 (1.02,1.21)	1.05 (0.96,1.15)	0.91 (0.83,1.01)
2000/2001	0.98 (0.91,1.05)	0.95 (0.87,1.04)	1.04 (0.95,1.14)	0.92 (0.84,1.02)	0.91 (0.82,1.01)
Sex of driver (Female)	***	***	***	***	***
Male	1.50 (1.41,1.60)	1.49 (1.39,1.60)	1.39 (1.29,1.50)	1.31 (1.21,1.42)	1.37 (1.26,1.49)
Age of driver (16)	-	-	-	**	-
17	1.05 (0.97,1.13)	1.02 (0.93,1.12)	1.02 (0.93,1.12)	0.90 (0.81,1.00)	1.03 (0.92,1.15)
18	0.95 (0.85,1.05)	0.95 (0.85,1.08)	0.91 (0.80,1.03)	0.83 (0.72,0.95)	0.91 (0.79,1.06)
19	0.90 (0.78,1.03)	0.85 (0.72,1.00)	0.91 (0.77,1.08)	0.78 (0.65,0.93)	0.93 (0.77,1.13)
Residential address (Adelaide)	***	***	***	***	***
Adelaide surrounds	1.00 (0.94,1.08)	1.02 (0.95,1.11)	1.03 (0.95,1.12)	0.98 (0.90,1.08)	1.08 (0.98,1.19)
Rural	0.65 (0.60,0.71)	0.66 (0.61,0.72)	0.72 (0.66,0.79)	0.75 (0.68,0.82)	0.73 (0.66,0.82)
Method of licensure (CBTA)	**	-	-	-	-
VORT	1.10 (1.03,1.18)	0.97 (0.89,1.05)	1.04 (0.96,1.13)	0.98 (0.89,1.07)	1.09 (0.99,1.20)
Time on L-plate (< 6 months)	-	-	-	-	-
6-9 months	0.94 (0.88,1.01)	0.94 (0.87,1.01)	1.00 (0.92,1.08)	1.03 (0.94,1.12)	1.07 (0.98,1.18)
> 9 months	0.91 (0.83,1.00)	0.96 (0.87,1.06)	0.91 (0.82,1.02)	1.02 (0.91,1.15)	0.93 (0.82,1.05)

* p < 0.05, ** p < 0.01, *** p < 0.001

Stars indicate a statistically significance difference overall for that factor

Each category is compared to the reference category for that factor with statistically significant results in bold type

Numbers in brackets represent the 95% confidence intervals for the odds ratios

Examination of the crash experience of the drivers during the period between when they obtained their first learner's permit and when they obtained their first provisional licence was complicated by the fact that drivers spent different amounts of time on a learner's permit. Just looking at the total numbers of crashes in the periods prior to obtaining a provisional licence would primarily show that the further back in time, the fewer drivers there would be driving and hence crashing.

A method was developed to correct for the different amounts of time spent on a learner's permit by different drivers. For example, to calculate the crash rate of drivers in the three month period before they obtained their first provisional licence: the numerator was calculated by counting the number of drivers who had at least one crash that occurred in this period and occurred on or after the date that they obtained their learner's permit; the denominator was calculated by adding the proportions of this period that each driver held a learner's permit for (ie a driver who got their learner's permit half way through the period would only count as 0.5 of a driver); the numerator was then divided by the denominator and converted to a percentage by multiplying by 100 to give a corrected crash rate. For periods after the drivers had obtained their first provisional licence, the same numbers are produced as previously in this paper. For periods before the drivers had obtained their provisional licence we are only looking at the rate for relevant drivers (ie those that held a learner's permit).

Figure 9 shows the car crash (casualty or property damage of \$3,000 or more) experience of drivers in the two years prior to obtaining their first provisional licence and five years after using the above method (where period 0 is the three months before obtaining a provisional licence, period -1 is the three month period before that etc). The bars show the 95 per cent statistical confidence intervals for the individual points. It is clear that very few drivers crashed during the learner period with the crash rate increasing nearly 14 fold from the three months prior to obtaining a provisional licence to the three months after.

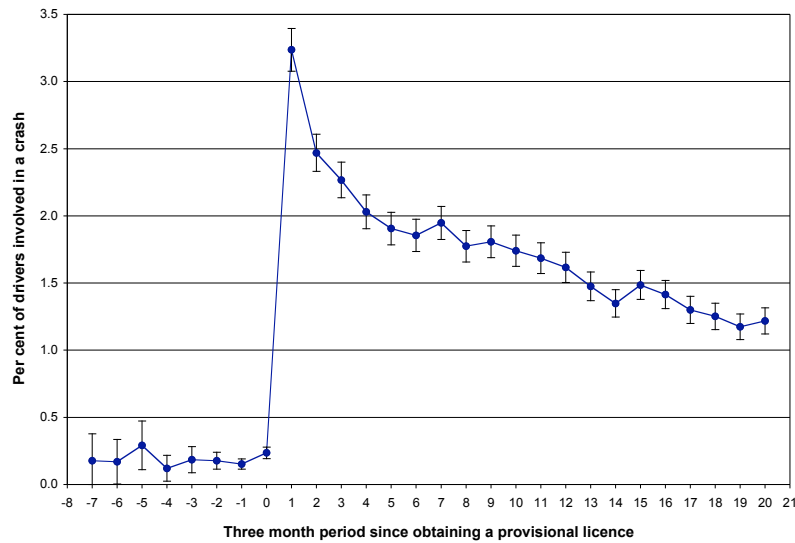


Figure 9: Per cent of drivers involved in at least one car crash in the given three month periods

When a crash is recorded in South Australia, the crash is classified by the police into one of fourteen crash types. Figure 10 shows the crash experience of the complete sample of drivers for various crash types. Most of the crash types had very small numbers leading to large random variations, so they have been grouped together into “other”. An example interpretation of Figure 10 is that in the first three months since obtaining their first provisional licence, 459 (0.92%) of the 49,536 drivers were involved in at least one “hit fixed object” crash as the driver of a car or car derivative.

All crash types showed a trend of reductions over time since the drivers obtained their first provisional licence. It is apparent that the frequency of crashes of all types reduced at roughly the same rate with the exception of rear end crashes (which reduced at a slower rate) and “hit fixed object” crashes which showed a large rate of reduction in the first six months.

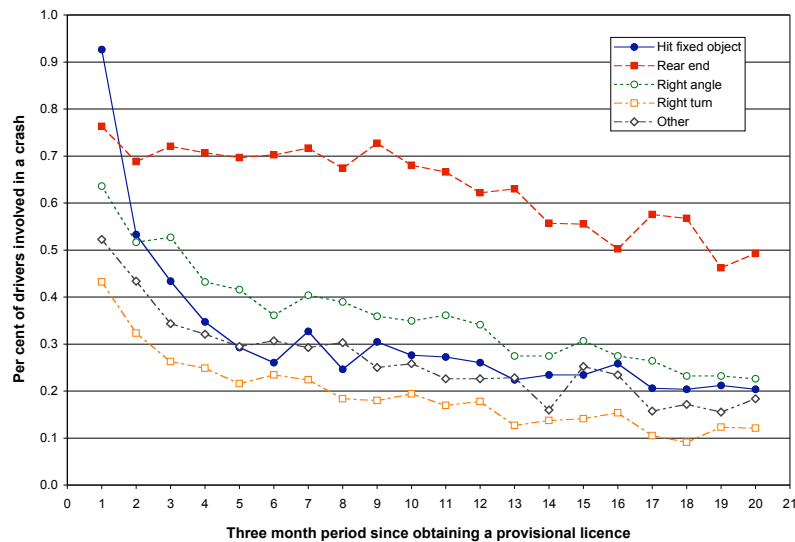


Figure 10: Per cent of drivers involved in at least one car crash in the given three month periods by crash type

Figure 11 shows the right turn crash experience of the complete sample of drivers for crashes in which drivers were turning right and crashes in which the driver was travelling straight ahead. The majority of

these crashes involved a driver facing oncoming traffic and attempting to do a filter turn across the traffic stream.

An example interpretation of Figure 11 is that in the first three months since obtaining their first provisional licence, 165 (0.33%) of the 49,536 drivers were involved in at least one right turn crash where they were turning right as the driver of a car or car derivative while 45 (0.09%) of the 49,536 drivers were involved in at least one right turn crash where they were travelling straight ahead as the driver of a car or car derivative.

It is apparent that the newly licensed drivers had a particular problem with turning right across oncoming traffic during their first year after obtaining a provisional licence.

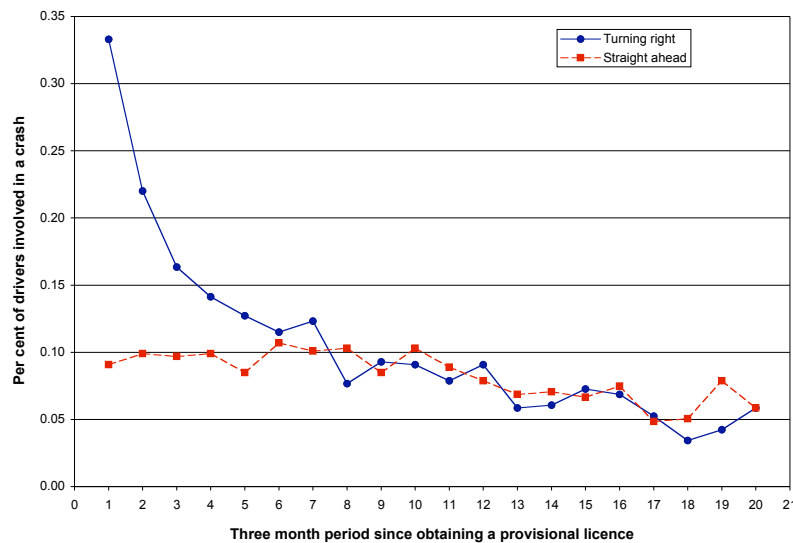


Figure 11: Per cent of drivers involved in at least one right turn car crash in the given three month periods by vehicle movement

Discussion

The crash rate of the newly licensed car drivers was at its peak when they first obtained their provisional licence and fell rapidly during the first year of driving and more slowly in the following years. This effect was consistent across all the sub groups of drivers considered. Driver crash rates during the learner's permit period were much lower than during the provisional licence period.

Males were more likely than females to be involved in a crash, however, the difference tended to decrease over time. There were some indications that the older drivers (18-19 year olds) were less likely to be involved in a crash than the younger drivers (16-17 year olds). Rural drivers were clearly less likely to be involved in crashes than their metropolitan counterparts. There was no clear indication that method of licensure was related to crash rate apart from a small effect in the first year of driving. A slight trend indicated that drivers who spent a longer time on their learner's permit had a lower crash rate particularly in their first year of driving on a provisional licence.

While these findings represent the actual crash experience of the groups of drivers examined, care needs to be taken when attributing reasons for any observed changes and difference between groups. Differences in the exposure of drivers, both in terms of kilometres driven and types of roadways driven on, are unknown and could potentially explain some of the observed differences. For example, the higher crash rates of males compared to females could be primarily a result of male drivers driving more than females. Similarly, self selection can play a role. For example it may be that drivers who are older when they choose to obtain their provisional licence are also a group of drivers who travel less once they obtain their licence.

Another confounding factor is that only crashes in South Australia are considered. If certain groups of drivers moved out of South Australia, moved between country and metropolitan areas within South Australia or were unable to drive in South Australia through injury or loss of licence, this could potentially explain some of the observed effects (although these factors are considered to be minimal).

The limited data that could be found on exposure suggests that young drivers tend to travel more as they get older. So the rapid fall in crash rate is likely to be a real effect of increased competency gained through driving experience.

Consideration of the whole group of drivers and their crash types is not subject to self selection into groups and so is somewhat more robust in terms of attributing reasons.

The most common crash type in the first three months of driving was hitting a fixed object. This is also the crash type where the rate reduced most rapidly during the first year of driving. It appears that the newly licensed drivers had a particular problem with keeping their vehicle on the roadway especially in the very early stages of driving.

The newly licensed drivers had particularly high rates of right turn crashes as the turning vehicle in the first year of driving and especially in the first six months. This may reflect the difficulty of determining a safe gap and making a filtered turn through oncoming traffic, a skill that is learned slowly through experience. Supervised practice of this manoeuvre may be beneficial during the learner phase. Changing signalised intersections to fully control right turns would greatly reduce the need for this manoeuvre against oncoming traffic.

Further analysis of crash experience and examination of driver offences over time and in relation to crashes, can be found in the full Austroads report¹.

References

1. Austroads (2008) The Crash and Offence Experience of Newly Licensed Young Drivers, Sydney, 145pp, AP-R331/08.