

## YOUNG DRIVERS IN AUSTRALIA

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### ABSTRACT

*The involvement of young, inexperienced car drivers in fatal road crashes in Australia in 1984 and 1985 is examined in detail in this paper using the Federal Office of Road Safety collections of fatal crash information and the results of a survey of national travel characteristics. Major findings include:*

- . that young drivers are at high risk at night and on weekends*
- . and that young drivers have a high risk of involvement as a result of their poor development of perceptual and decision-making skills.*

*In discussing these findings, it is recommended that graduated licensing schemes, particularly involving restrictions on night driving, be encouraged, and that there should be a greater emphasis on assisting young drivers to acquire perceptual and decision-making skills in a graduated licensing context after they begin to drive on their own.*

## INTRODUCTION

There is no doubt that young, inexperienced car drivers deserve to be a major focus in reducing the consequences of road crashes. In Australia, drivers between the ages of sixteen and twenty-five represent over one-third of all car drivers involved in fatal road crashes (FORS 1988a). To include motorcycle riders would further inflate the proportion of this age group in fatal crashes.

On the basis that a single, relatively homogeneous group is involved in a large number of fatal crashes each year, it is perhaps surprising that even more road safety measures are not directed toward this group, apart from the minimal licensing and training provisions in the first years of driving. This may be because there is a lack of information about young drivers or perhaps few measures already adopted have proved to be effective in reducing risk.

The cost of road crashes is substantial and not evenly distributed over all crashes. It has been estimated that the road crashes in 1987 will cost the Australian community \$5,700 million (Steadman and Bryan 1988) and that approximately 25% of this total cost is accounted for by the small proportion of crashes which result in fatalities. For this reason and because the availability of more complete information this paper will concentrate on the involvement of young drivers in fatal crashes.

The safety of young drivers has been a major initiative of the Federal Government since 1983. The Federal Office of Road Safety (FORS) has promoted the concept of graduated licensing since the publication of the HORSCORS (1982) report and the challenging paper of Boughton, Budd and Quayle (1982). As well as promoting the graduated licensing policy, FORS has produced a number of public education campaigns targetted at young drivers, and these will be mentioned in later sections of this paper. However, it would be fair to say that the policy and public education developments, while based on the best available research, suffered from a lack of detailed knowledge on the nature of young drivers and the type of crashes in which they are involved.

With the recent release of information from both FORS Fatal File (FORS, 1988b) and the 1985-86 Travel Survey (FORS, 1988c), detailed information on young drivers became available and will be heavily relied upon in this paper. In addition, a detailed publication describing road user risks is soon to be published (FORS, 1989). It should be noted, again, that the paper is only concerned with young car drivers and their involvement in fatal road crashes. Extrapolation of the conclusions to other age groups, different road users or less severe crashes may be inappropriate.

This paper is broadly divided into two parts. The first part presents the results of a number of statistical analyses of road crashes involving young drivers. These results are based on data not previously available and represent an original contribution to knowledge in this field.

The second portion of the paper discusses in policy terms the issue of what can be done to reduce crashes involving young drivers. This discussion draws upon a number of the conclusions reached in the first part of the paper in addition to other published work in order to describe a comprehensive approach to this topic.

## PART 1 - DATA ANALYSIS

### The Fatal File

The information which describes the fatal crashes involving young drivers is derived from FORS Fatal File. This is a computer database which records information on each fatal road crash in Australia for each year. Information is available for all drivers involved in fatal crashes, regardless of whether they were killed or injured. This allows a more complete analysis of the factors involved in crashes than would be possible if only killed drivers were included.

### The Travel File

Although all road safety authorities are able to describe fatal crashes and identify common characteristics, it is relatively rare for them to have access to measures of the underlying exposure to risk. This information is crucial to the development of effective countermeasures. For example, the observed high incidence of young drivers involvement in night time crashes may simply be due to the fact that young drivers drive more at night. The resolution of this issue, which will be addressed in this paper, will influence whether measures are directed simply to reduce night driving or whether training might be effective.

Limited measures of exposure are available from other sources such as the 'Survey of Motor Vehicle Usage' from the Australian Bureau of Statistics (ABS). Unfortunately, these surveys do not meet the needs of road safety authorities when pedestrians or bicyclists are involved, or when time breakdowns are important. FORS undertook to conduct a national survey of the travel characteristics of Australians to meet a perceived need for this type of data and the results are held in the Travel File. The survey records the day-to-day travel of Australians in the financial year 1985/86.

The information in the Travel File, which is held in the same computer database as the Fatal File, provides distances travelled and the duration of trips by time of day and mode of travel. While the duration of trips is very useful in comparing the risks across different modes of travel, the distance travelled in kilometres is considered the most appropriate measure of comparison when only drivers are being described. The resulting risk measurement used in this report is expressed in terms of involvements in fatal crashes per 100 million kilometres travelled.

### Contrast Groups

The purpose of this first part of the report is to examine how young drivers are different from older, more experienced drivers. This is perhaps best accomplished by contrasting young drivers against a comparably involved group of older drivers. From the Fatal File, young drivers between 16 and 25 years of age are 35.5% of those involved in fatal crashes in 1984-85. To make the comparison as fair as possible, it was decided to select an older group with the same percentage involvement as young drivers but centered around the 40-49 age group. This age group was shown to have the lowest risk per hour of travel in Broadbent and Hampson (1988). As a result, drivers between the ages of 32 and 59 inclusive were selected to be the contrast group, called the 'Older Contrast'.

This methodology allowed crash factors from the Fatal File to be examined in a straightforward manner. If there are no differences between the two groups of drivers, the distribution of their involvements will be the same and is easily checked by the use of the chi square statistic. A 1% confidence level was used throughout the report when differences are noted to be significant ( $p < 0.01$ ).

The large age spread of the Older Contrast group is important. It cannot be argued that young drivers are being unfairly compared to a minority group of ultra-safe

drivers. In effect, the Older Contrast group contains nearly all other drivers with a homogeneous level of risk. Drivers above 60 years of age have been shown to possess a higher risk (Broadbent and Hampson 1988) comparable to other drivers. The only other group of drivers excluded is a narrow buffer zone between 27 and 31 years of age, and they are excluded solely to equalise the percentage involvement.

In the early stages of this analysis, a younger group of young drivers was also examined, however, the results for the 16 to 20 years age group were not noticeably different from the 16 to 25 year age group. As a result, it was proposed to continue the analysis using the larger group only.

While the two groups are defined to differ in age, it must also be noted that they also differ greatly in terms of driving experience. For example, 98% of the Young Driver group report possessing fewer than ten years driving experience, compared to only 16% of the Older Contrast group.

## RESULTS

### Relative Crash Risk

The relative crash risk on a per population basis for car drivers is displayed in Table 1. The population figures represent all Australians in the relevant age group, not only those with licences. This is directly comparable with the deaths per 100,000 population figures common in a public health context. It can be seen from the table that while Young Drivers represent only 17% of the population in 1986 (ABS), they represent 36% of the population of drivers involved in fatal crashes in 1984-85. On the basis of involvements per 100,000 population, the Young Driver group has about twice the risk of involvement of the Older Contrast group.

TABLE 1: COMPARISON OF INVOLVEMENTS PER POPULATION

	Pop. 1986	% Pop.	Involv.	% Involv.	Risk (1)
Young Driver	2,672,098	16.7	2314	35.5	86.6
Older Contr.	5,369,671	33.5	2309	35.4	43.0
All Drivers	16,018,350		6518		40.7

(1) Fatal crash involvements per 100,000 population.

When the relative risk is calculated on the basis of kilometres travelled, a slightly different picture emerges which further emphasises the high risk of young drivers. Table 2 provides the results. It is clear from the table that on a distance travelled basis young drivers have about three times the risk of involvement in fatal crashes than the Older Contrast group. Further, female drivers of both age groups are less involved than the male drivers in the same age group. Note that where the sex of the driver is not known (about 1%), the figures are excluded from the table.

TABLE 2: COMPARISON OF INVOLVEMENTS PER DISTANCE TRAVELLED

	Travel(1)	% Travel	Involv.	% Involv.	Risk (2)
Young Driver	293.5	18.1	2314	35.5	7.9
- male	196.4	12.1	1862	28.6	9.5
- female	97.1	6.0	450	6.9	4.6
Older Contr.	881.4	54.4	2309	35.4	2.6
- male	631.2	39.0	1837	28.2	2.9
- female	250.2	15.4	469	7.2	1.9
All Drivers	1619.9	100.0	6518	100.0	4.0
- male	1135.0	70.1	5170	79.3	4.6
- female	484.9	29.9	1283	19.7	2.6

(1) Total distance travelled in two years (100 million km)

(2) Fatal crash involvements per 100 million km travelled

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As Table 2 indicates, while the age and sex of a driver are important factors in determining the involvement risk, there also appears to be an interaction between the two factors. Young male drivers appear to have about twice the risk of young female drivers, while older males have about 1.5 times the risk of older females. A report by FORS (1989) which examined the fatality risk (as opposed to involvement risk) differences for drivers using the same data sources found a significant interaction for age and sex with the fatality rate for older males approaching that of older females.

### Age and Experience

An examination of the involvement risks for each individual year age group in Australia is not simple because the licensing age differs in each State or Territory and this factor should be examined simultaneously. Table 3 provides the relative risk for each year of age and for each State or Territory, noting that the licensing age is 17 years in each State except for South Australia and Victoria where the legal driving age is 16 and 18 respectively.

In nearly all cases, the very small number of drivers involved in fatal crashes at an age younger than the legal driving age were unlicensed, and were excluded from the table. Note that the denominator may include some travel outside of the drivers home State.

**TABLE 3: RISK OF INVOLVEMENT BY AGE AND STATE**  
(PER 100 MILLION KILOMETRES TRAVELLED)

AGE	NSW	VIC	QLD	SA	WA	IAS*	ACT*	NT*	AUST
16	-	-	-	39.9	-	-	-	-	39.9
17	24.3	-	68.5	15.4	33.0	*	*	*	26.7
18	11.1	13.9	17.9	16.0	9.8	50.7	11.6	19.6	13.2
19	12.0	9.7	6.3	14.5	4.2	18.3	11.9	58.7	9.1
20	11.6	7.2	10.6	11.3	7.4	16.6	3.1	35.5	9.6
21	11.4	4.1	7.2	8.4	4.7	14.3	11.4	10.5	7.1
22	9.5	6.1	6.2	12.9	5.1	7.8	6.8	38.0	7.6
23	7.3	4.9	4.8	8.6	6.1	7.9	6.4	60.8	6.2
24	6.6	3.7	5.4	6.3	4.8	8.7	1.3	6.6	5.3
25	4.7	4.3	4.1	7.6	3.6	4.3	3.9	13.3	4.5
32-59	2.9	2.0	3.2	2.9	2.1	2.5	1.8	4.2	2.6

\* Very small numbers involved.

Except for those States which are highly variable due to the small numbers involved, (Tasmania, A.C.T., and Northern Territory) the highest involvement rates per 100 million kilometres travelled occurs in the age group which are in their first year of legal driving. This may be because of the age or experience of drivers in the first year or it may be that the highest risk drivers are among the first to obtain their licences when they reach the correct age. It is likely that the answer will involve a combination of these factors.

### Time of Crash

The first crash factor to be examined is whether the Young Driver group has a different time distribution to the Older Contrast group. Analysis indicates that there are no differences in either the season or the month of involvement in a fatal crash. Both chi-square statistics are not significant at the 1% level.

The risk, in terms of involvements per 100 million kilometres travelled on that day, is higher for young drivers for each day of the week, but there is an interaction such that the risk is much greater on weekend days.

Because of the strong effect of the day of the week on involvement risk, a simple examination of time of day would be inappropriate. For this reason, ten different time periods in the week have been defined and examined according to a scheme developed by McLean, Holubowycz and Sandow (1980). These time periods exhibit different characteristics of alcohol involvement, traffic flow and trip purpose. They have also been used by other researchers such as those at the Traffic Authority of New South Wales (1987) to examine time of day and day of week effects.

Results indicated that the highest risks for both groups occur in the 9 pm to 3 am periods of all days of the week with a higher risk on weekends. The Young Driver group have an unusually high risk during the 3 am to 9 am period on weekends. Overall, the Young Driver group have a higher risk in every time period, although this varies from twice to eight times the risk of the Older Contrast group.

#### Crash Location

The Fatal File contains information which makes it easy to assign a crash location to an urban or rural area by the type of road where the crash occurs. It is comparatively difficult to assign information on the amount of travel to an urban or rural area, often because a trip may involve travel in both areas. Some indication of the extent of travel in each area is possible by making two assumptions. First, that the majority of travel recorded in the survey would take place within the same area as the place of residence. Second, that the amount of travel associated with residence in a capital city is a relatively unbiased under-estimate of the amount of travel in urban areas. Accepting these assumptions allows some measure of risk related to geographic area to be calculated. In examining the results, it should be noted that the rural risk is under-estimated and the urban risk is over-estimated by virtue of the restriction of urban exposure information to capital cities only.

The results, as presented in Table 4, show that the involvement risk is over twice as high in rural areas. The Young Driver group remains at about three times the risk of the Older Contrast group regardless of geographic location.

TABLE 4: RISK OF INVOLVEMENT IN URBAN AND RURAL AREAS  
(PER 100 MILLION KILOMETRES)

	YOUNG DRIVERS	OLDER CONTRAST
URBAN	5.8	1.8
RURAL	13.6	4.5

When the type of road on which the crash occurs is examined more closely, as in Figure 1, the involvement of the two groups is similar with the exception of higher involvement of the younger group in crashes on major and local urban roads. This difference is significant ( $p < 0.01$ ). The Older Contrast group were more likely to be involved in crashes on major rural roads. Note that the extent of travel on the different types of roads is not known, so the relative risk can not be calculated.

Other aspects of location contribute little to an understanding of the higher risk of young drivers. There are no significant difference in involvement between the two groups with respect to the crash location relative to an intersection, the horizontal alignment of the road at the crash location, or the vertical alignment. The Young Driver group has a higher involvement in crashes where the prevailing speed limit is less than 80 km/h. This significant result (Figure 2) is probably related to the greater involvement of the younger group in crashes in local urban roads, although

the results for speed limits between 60 and 80 km/h would appear to contradict, to some extent, the results for major urban roads.

FIGURE 1: NUMBER OF CRASH INVOLVEMENTS BY ROAD TYPE

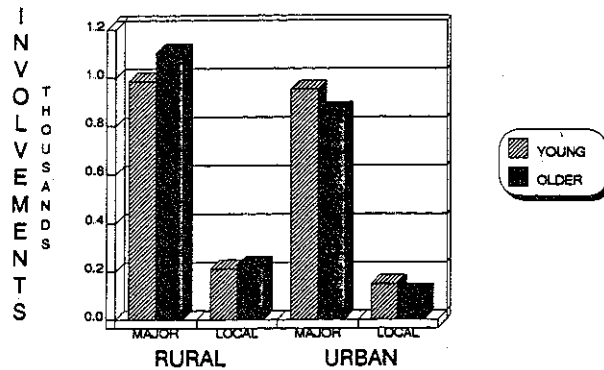
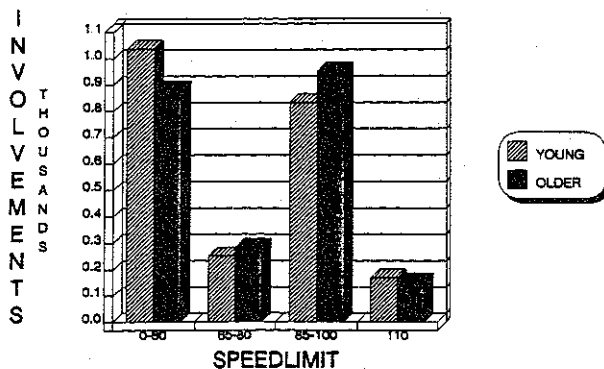


FIGURE 2: NUMBER OF CRASH INVOLVEMENTS BY SPEED LIMIT



## Crash Type

The Fatal File records the type of crash in a number of different ways but one of the most informative is the use of Road User Movement (RUM) codes. These unique codes record the movement of vehicles immediately before the first collision by assigning a number between 1 and 99 in ten different categories.

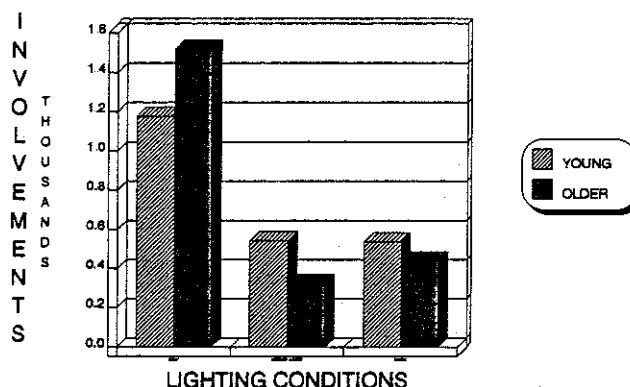
The results indicate that young drivers are more likely to be involved in crashes with pedestrians and bicyclists, and are more likely to lose control while cornering. The Older Contrast group are more likely to be involved in intersection crashes, while manoeuvring, rear-end and overtaking crashes. A closer examination within each category reveals that the Young Driver group is more likely to be involved in crashes where the pedestrian is emerging from behind a vehicle, crossing from the far side, walking with the traffic or crossing at an intersection. The younger group is more likely to strike a bicyclist from behind. They are also more likely to lose control when cornering or travelling along a straight section of road without colliding into another vehicle. In effect, their involvement in 'single vehicle' crashes is higher, although this is not a specific RUM category.

The Older Contrast group are more likely to collide with cross traffic at an intersection, run into the back of another vehicle, be involved in head-on and side-swipes while overtaking, be involved in head-on crashes on the wrong side of the road and level crossing crashes.

#### Lighting and Weather Conditions

The Young Driver group is more involved in crashes at night, both in dark and street lighting conditions (Figure 3) than the Older Contrast group. This has already been noticed in the time of day results. There are no significant differences between the involvement of the two groups under different weather conditions, and it should be noted that over 85% of crashes occur in fine weather conditions with a dry road surface.

FIGURE 3: NUMBER OF CRASH INVOLVEMENTS  
BY LIGHTING CONDITIONS



#### Restraint Use

There are no significant differences between younger and older drivers with both groups recording a wearing rate of just over 80%, leaving out the relatively high proportion of 'not noted'.

#### Blood Alcohol Content

The best and most reliable information on blood alcohol content is available for drivers or riders killed in fatal crashes, and this is the type of information published regularly by the State road safety authorities and FORS. Information on drivers who are involved in fatal crashes but not killed is less reliable but is still capable of interpretation. Table 5 shows that the Young Driver group is more likely to have blood alcohol contents above 0.05 g/100ml. This is a significant result at the 1% level.

TABLE 5: COMPARISON OF BLOOD ALCOHOL CONTENT (g/100ml)

BLOOD ALCOHOL	YOUNG DRIVERS	OLDER CONTRAST
ZERO-0.05	1290	1450



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0.05-0.10	103	49
0.10-GREATER	406	273
NOT KNOWN	515	537

The table shows that where the blood alcohol content is known, 28% of the Young Driver group are over 0.05 compared to 18% for the Older Contrast group.

When alcohol involvement was examined by time of day it was found that the older group recorded higher alcohol involvement during the 3 pm to 9 pm weekday periods. The alcohol involvement of the Young Driver group was much higher than the Older Contrast group during the weekend time periods between 3 pm and 9pm, 9 pm and 3 am and 3 am to 9 am. The groups were similar in the 9 pm to 3 am weekday period but the level of alcohol involvement was high (between 35-36%).

### Skills of Young Drivers

The safe driving of a car requires many different skills at different levels of complexity. Brown(1986) has proposed that there are three levels of skill acquisition. The simplest skills involve the control of the vehicle; steering, braking, changing gears, choosing the correct 'line', coping with adverse driving conditions and performing complicated manoeuvres. These skills are commonly referred to as 'carcraft'.

At the next level, the skills involve perception of other road users, vehicles and the environment and the identification of potential hazards. The perceptual skills often involve developing an efficient pattern of eye movements to reduce the mental load during high-demand periods of driving such as heavy traffic or intersections. At the highest level, there are the decision-making or cognitive skills which determine when and where to drive, at what speed and level of acceptable risk. Drivers with highly developed decision-making skills make informed and logical decisions combining all relevant factors, although that is not to say that they may not drive hazardously if they choose to do so. Both the perceptual and decision-making skills are often referred to as 'roadcraft'.

Brown suggested that because the skills required for safe driving are acquired at different rates, young drivers might be more or less deficient in any particular skill. For example, the carcraft skills might be acquired relatively quickly and contribute little to the observed higher risk of young drivers. It should be possible to characterise the types of crashes and the surrounding conditions to match the skill deficiency associated with the crash involvement for young drivers. This would then enable the skill deficiencies that contribute most to the high risk of young drivers to be identified.

Unfortunately, assigning crash types and conditions to categories associated with the failure of particular levels of skill is a subjective process with many unstated assumptions. Any two road safety researchers would most probably arrive at a different categorisation. This lack of precision arises because there is no generally accepted model of the driving task and will remain until one is developed. However, it is still useful to carry out the exercise and an attempt will be made to justify and qualify the categorisations to be used.

**MANIPULATIVE SKILLS** - A deficiency in these skills might manifest itself in manoeuvring crashes and those involving simple loss of control at normal speeds. Examples would include wet weather crashes and rural and highway crashes on demanding roads. An association with crashes while cornering might also be expected.

**PERCEPTUAL SKILLS** - In this area, it might be expected that crashes would occur in poor or demanding perceptual environments. For example, in dark conditions, at intersections, on higher order roads with heavier traffic and in peak

traffic periods. It might also be expected that there would be a greater involvement in pedestrian and bicyclist crashes because the avoidance of these crashes is highly reliant on perceptual skills in recognising the hazard that unexpected actions of pedestrians and bicyclists represent.

**DECISION-MAKING SKILLS** - When these skills are under-developed, a higher involvement in crashes resulting from gross errors of judgement might be expected. For example, accepting the risk of driving while affected by alcohol, at higher than normal speeds and overtaking. Also, because driving is essentially a self-paced task, a higher involvement in crashes during periods of low demand, such as low traffic times and in local roads, may suggest gross errors in judgement.

Figure 4 presents the summary of the above categorisation and also records the findings of the previous analysis in these categories. A star is placed to indicate an observed higher involvement of the Young Driver group. The results may be taken to indicate that in the area of skill deficiencies, the high risk of young drivers is mostly due to a lack of well-developed decision-making skills and perceptual skills. Their acceptance of alcohol and the demands they place on themselves in low-demand conditions are major factors. Young drivers seem to demonstrate vehicle handling skills of the same order as older drivers.

**FIGURE 4: SKILLS**

FACTOR	RESULT
<b>MANIPULATIVE SKILLS</b>	
WET WEATHER	
MANOEUVRING	
CORNERING	
MAJOR RURAL ROADS	
<b>PERCEPTUAL SKILLS</b>	
DARK	*
INTERSECTIONS	
MAJOR ROADS	
PEAK TRAFFIC TIMES	
PEDESTRIANS/BICYCLISTS	*
<b>DECISION-MAKING SKILLS</b>	
ALCOHOL	*
OVERTAKING	
LOCAL ROADS	*
LOW TRAFFIC TIMES	*
SINGLE VEHICLE CRASHES	*

## DISCUSSION

The methodology adopted in this report allows a straightforward comparison of young drivers against a group of older drivers. The observed differences form a consistent pattern. The Young Driver group are involved in a greater proportion of single vehicle fatal crashes both while cornering and driving on straight roads. These crashes tend to occur during the late night and early morning periods of low demand from other traffic. Alcohol is more often involved. In urban areas, the Young Driver group is more involved in crashes in local urban streets and in pedestrian and bicycle fatalities.

One possible interpretation of these results is that Young Drivers have well developed vehicle-handling skills and reasonably good perceptual skills (although less aware of the unpredictability and hazard presented by bicyclists and pedestrians) but have poorly developed decision-making skills.

## PART 2 - REDUCING THE YOUNG DRIVER RISK

### Graduated Licensing

One approach to reducing the risk of young drivers is to selectively reduce their driving during the times and situations of greatest risk. This approach, called 'Graduated Licensing', is more closely targetted to the needs of young drivers than the 'broad brush' approach of raising the licensing age.

In essence, graduated licensing as proposed by FORS (1983) allows young drivers to travel independently and gain driving experience before a full licence is granted, but only during the safest times and without the worst influences. The general concept allows young drivers to learn to drive with a parent or instructor during the 'permit' period in much the same way as is currently operated in Australia. They are not allowed to drive by themselves until they have reached a level of competency after a period of supervised practice.

In the next stage, young drivers are allowed to drive solo, but only under conditions of minimum risk. For example, no alcohol at all is allowed, late night/early morning driving is restricted and the number of passengers is restricted. As experience and maturity is gained over the next two or three years these restrictions are gradually lifted, until they are fully licensed.

The findings presented in this paper provide further clarification of the least safe times and situations. Late night/early morning driving displays risks which are among the highest found in the study (48 involvements per 100 million kilometres travelled) and some 4-8 times higher than the Older Contrast group. The influence of passengers is unclear as yet. Although Drummond, Cave and Healy (1986) showed no greater number of people killed in fatal crashes involving young drivers, this result does not preclude young drivers being greater influenced by the presence of passengers to engage in risky driving.

The suggestion that alcohol is a particular problem of young drivers has been raised often and a special international symposium on this topic was held in 1986 (Benjamin 1986). The symposium concluded (among others) that:

"An increase in the risk of accident involvement occurs in a substantial proportion of young drivers at lower concentrations of alcohol than is the case with older and more experienced drivers. Legislation enforcing a lower statutory limit for young or novice drivers has proved effective in reducing accidents in some countries."

All States in Australia and one of the two Territories, have legislation for zero or near-zero blood alcohol content for drivers in their first year of solo driving. Two States, Victoria and Queensland, have extended this restriction to later years as well. The results of the introduction of this legislation seem promising but it is as yet too early to establish the effectiveness definitively (Drummond et al 1986).

The presence of alcohol is also an important factor in the high risk in late nights and early mornings. However, alcohol does not explain all of the increased risk. The results indicate that the late night/early morning risk of young drivers is 4-8 times the risk of older drivers, yet the involvement of alcohol in the same periods is less than twice that of the older group. Other factors are involved and the following are considered to be possible examples:

- the greater amount of social and discretionary driving,
- the reduced perceptual environment which relies on moving points of light to identify other road users and vehicles rather than whole bodies,

- the lack of other drivers in low traffic conditions to disapprove of deviant driving which can lead to showing-off in front of passengers and testing of one's abilities when solo,
- the low physiological arousal of the body which leads to sleepiness and over-enthusiastic spirits to attempt to remain alert

The high risk associated with night driving is an area of research complete within itself. The little relevant research has focused mainly on alcohol and fatigue. Much more is needed because other factors such as those identified above are probably involved. On the positive side, the effectiveness of late night driving restrictions on young drivers has been demonstrated in the United States (Preusser, Williams, Zador and Blomberg 1984). Significant reductions of between 25 and 69 per cent in crash involvement have been reported and most students knew about, and reported complying with, the night curfews in those States that have them (Williams, Lund and Preusser 1985).

No Australian State or Territory has introduced any restrictions on late night driving or passengers, although New Zealand introduced a graduated licensing scheme in 1987, which prohibits novice drivers from driving at night unless accompanied by an experienced driver (White 1988). The results are awaited with interest.

Much of the resistance in Australia to night-time driving restrictions centres on the effect that such restrictions would have on employment and study prospects, particularly in rural areas dependent on private transport. Certainly, surveys of community attitudes report that 82% of the population do not agree with late night driving restrictions for young drivers (AGB:McNair 1988). However, many of these concerns could be reduced by having a restriction that begins sufficiently late to allow study or sport to be completed, and relaxes the restrictions for workers or rural youth when necessary. The high risk is associated with the social or discretionary period of travel.

It should also be remembered that any legislation would mirror a common practice of parents in requiring young drivers to be home by a certain time, particularly in the case of first year drivers. The legislation, in effect, would reinforce this practice by making community expectations more explicit and perhaps encouraging parents who may have been reluctant to impose a restriction in the past.

The imposition of a curfew would also serve an educational purpose in highlighting to young drivers that late night driving is a hazardous occupation. Hopefully, this level of perceived risk would remain high until confirmed by experience at some later time. The importance of making community expectations explicit in this regard should not be under-estimated.

The enforcement of a graduated licensing scheme is often raised in discussions as a mitigating factor against success. That is, that young drivers could effectively disregard any restrictions because enforcement would be so difficult. However, it should be noted that with all States and Territories having introduced random breath testing, which is particularly active at night, the enforcement difficulties are reduced. Young drivers would have the perception that they could be stopped at any time and checked for the presence of alcohol, or driving in a restricted period with illegal passengers. This perception could be reinforced by an appropriate campaign if necessary. Even if the risk of detection is ignored, the evidence suggests that drivers who are driving illegally may exhibit safer driving so as to avoid the attention of the police (Robinson 1977).

### Skills Acquisition

There is a weight of evidence that drivers change between the time when they first start to drive and their mid-twenties. This suggests that risk could be reduced by

finding ways of accelerating the skill acquisition process which apparently occurs during those years.

The following sections comment on skill acquisition issues using Brown's tripartite model of classification.

### Driver Training

#### Vehicle-Handling Skills

The first question that must be asked is why devote scarce resources to teaching driving skills that are easily and quickly acquired, and appear to play only a small role in the increased risk of involvement of young drivers. This question has been asked many times in recent years as described in the introduction. A related question is why continue funding driver training programs when the only demonstrable result is increased exposure to risk due to early licensing

Both the above questions are a reaction to the tremendous amount of resources devoted to the teaching of the vehicle-handling skills to young drivers, with little, if any, road safety benefit. The DeKalb County study (Weaver 1982), a definitive study in this area involving the random assignment of 18,000 driving students to various methods of driving instruction failed to detect any benefit of training in vehicle-handling skills. This is not to argue that vehicle-handling skills should not be taught as they are now in a relatively low-key way, only that there can be no expectation of significantly reducing the risks of young drivers by devoting resources to improving the acquisition of these skills.

#### Perceptual Skills

The evidence presented in this paper also casts some doubt over the priority to be afforded to accelerating the acquisition of perceptual skills. Only in areas such as local streets where pedestrians and bicyclists are present and in the particular problems of night time driving and major urban roads are the perceptual skills of young drivers shown to be deficient. In the more obvious areas such as intersection crashes, where the perceptual environment is demanding, the Young Driver group appear to be less likely to be involved in fatal crashes than the Older Contrast drivers. However, there is also presumed to be a benefit in accelerating the acquisition of perceptual skills which leads to an earlier acquisition of decision-making skills.

#### Decision-Making Skills

It is clear from the results presented and in the discussion so far that there needs to be a much greater emphasis on accelerating the development of decision-making skills in young drivers. It appears that a large proportion of the increased risk of young drivers is due to their undeveloped decision-making skills, including over-confidence. The greatest gains in reducing the risk due to inexperience will be in the decision-making skills. This area should be given the highest priority in terms of research and educational efforts.

Certainly, there is great potential for the development of educational programs for drivers which provide knowledge crucial to making informed decisions. Examples include alcohol education programs, fatigue information, factors involved in speed selection, common crash causes and how to avoid them, hazards of night driving and resisting the influence of peer groups. Most road safety authorities have developed programs in these areas. The FORS video, "Big Gig" specifically provides information on the effects of alcohol, late night driving and peer group pressure to young drivers.

Over-confidence is another aspect of decision-making skill which deserves special attention. In an earlier section, the arguments of Brown (1986) describing the high

contribution of over-confidence to the risk of young drivers were summarised. It should be possible, theoretically, to reduce the over-confidence of young drivers by providing information that puts their level of skill development in the correct perspective. Instead of each dramatic near-miss confirming the high level of vehicle-handling skills, the young driver could be educated to interpret these incidents as a lack of perceptual skills. An attempt has been made in this area by FORS through the development of a video "The Road Worrier" which highlights the dangers of over-confidence and provides information on how long it takes a young driver to develop safe driving skills. The information in the video is based on the little available known research in this area, but has been well received by young drivers. Further clarification of the information and a more extensive educational effort in all areas of driver education may pay dividends to safety.

Brown (1986) has suggested that driver training should be directed at reducing the mismatch between drivers' level of skill, rather than on some ideal criterion of skill. He suggests that this type of training might best be accomplished by the use of simulators or the use of 'adaptive teaching' involving feedback and rectification of mismatches on an individual basis. The results of such approaches are awaited with interest.

### Integration

Safe drivers possess the complete range of driving skills discussed in this report; vehicle-handling, perception, decision-making and a realistic view of their own level of skill. It is important that while the above discussion has discussed each separately, there must be an integrated approach to the training of young drivers.

### Teaching Methods

Traditional methods of driving instruction involve high school driver education and in-car instruction by family members (particularly parents), friends or a professional trainer. As mentioned previously, when they focus on the development of vehicle-handling skills, these methods appear to contribute little to reducing the risks of young drivers. However, as discussed above, the range of skills to be acquired for safe driving is much wider than the simple vehicle-handling skills and far more innovative methods of teaching the more complex skills will need to be developed; possibly involving classroom instruction for drivers who have been driving for a year or more, audio-visual programs on perceptual skills and simulations of crash situations. Other areas of education have already introduced role playing and other innovative methods in attempting to influence smoking and drug abuse in the young.

It may even be more efficient to utilise the professional approach of the driver trainers in teaching the more difficult skills of perception or decision-making, leaving the easier and less safety relevant vehicle-handling skills to parents and friends. Boughton, Budd, and Quayle (1984) cite evidence that neither parents or driving instructors are to be preferred in teaching the simple skills. It is likely that more sophisticated methods of instruction will be required of driver trainers in the future and the move towards tertiary level training for driving instructors in Australia is to be welcomed, provided the relevance of what is being taught keeps pace with research developments.

### A National Framework

At the Driver Trainers and Licensers Workshop in 1986, there was a general recognition that driver training in Australia must change to more effectively meet the needs of young drivers. Specifically, there must be greater emphasis on the development of perceptual and decision-making skills.

As a result, FORS established a working party of driver trainers, licensers and researchers to develop a national framework for driver training. The purpose of the framework is to identify the knowledge, skills and appropriate teaching methods for each of the following stages of development for young drivers:

- Pre-permit - childhood and early adolescent before driving
- Permit - immediately before being issued with a permit
- Supervised Instruction - driving with a supervisor present
- Inexperienced Solo Driving - first years of solo driving.

The framework identifies in more detail the specific knowledge and skills within the three skill levels discussed in this report as well as attitudes associated with road use and safety. It is not restricted to the 'learning to drive' period and considers the development of appropriate skills in younger ages as a pedestrian and bicyclist.

It is anticipated that no single organisation or person would teach the whole range of knowledge and skills identified in the framework. The skills are different in nature, require different teaching methods and are spaced over many years. There are roles for school teachers, parents, driving instructors, health counsellors and advertising campaigns to all contribute to reducing the risks of young drivers. Importantly the framework, which can be developed into a number of detailed teaching manuals by those mentioned above, encourages a higher priority to the most safety-relevant skills, delivers the training to the young drivers when they need it most, and reduces the overlap of information directed at young drivers.

### Licensing and Testing

At present, in order to obtain a driver's licence it is only necessary to demonstrate a level of competency in knowledge of road laws and in the vehicle-handling skills.

It would seem to be more effective to closely link the driving tests to the desired educational goals at each stage of development. This would encourage the appropriate learning. Licensing authorities agree with this approach as signified by their comments at the 1986 Workshop that the standard of driver training could only improve if the licence tests required a higher standard and were closely aligned with the educational goals.

It is required that driver tests are reliable, valid and just. Macdonald (1988) in analysing the currently available tests could not identify tests which fulfil these criteria in the areas of perceptual and decision-making skills. It is clear that appropriate tests will need to be developed to meet these needs. While this seems to be an almost impossible task in isolation, if the tests are developed in conjunction with the development of appropriate teaching methods, the task is in the reach of current technology. For example, if video presentations are used to train the perceptual skills involved in identifying potential hazards, then it is likely that an appropriate video test could be developed. Although the validity may be less than driving in traffic, it at least has the advantage of focusing the young driver's attention on the acquisition of perceptual skills.

There is one major and obvious problem with the above concept of structuring a close relationship between driving tests and the educational goals of young drivers. It is that the current licensing system ceases to exert any influence on young drivers when they are given a licence to drive and before the majority of their learning occurs.

One solution to this problem is to adopt a graduated licensing system as proposed earlier.



Graduated licensing can combine the encouragement to acquire safe driving skills, the gaining of experience and protection of the young driver from the most hazardous situations. It is the only known way to address the paradox of young drivers that they must gain experience to be safe yet are at high risk while gaining that experience. It is clear that the licensing system, like driver training, must change to meet the needs of young drivers, and graduated licensing provides the most obvious direction.

There would also be benefits if the licensing age and testing procedures were standardised across Australia through graduated licensing. This would, at least, remove the currently confusing and inconsistent situation confronting young drivers who move interstate.

## Other Measures

Measures which aim to reduce the general incidence of road crashes also impact on young drivers who, as mentioned, represent over a third of the drivers involved in fatal crashes. All of the major countermeasures introduced have significantly reduced the risks faced by young drivers. For example, the introduction of compulsory seatbelt wearing legislation and the introduction of random breath testing have had dramatic effects on the number of road deaths, both bringing about 20% reductions, and the proportion of young drivers has remained about the same. No doubt the improvement in vehicle design brought about by the Australian Design Rules is also passed on to young drivers even if there is a possibility that they drive slightly older vehicles.

The standard and design of roads has also improved dramatically in Australia over the last two decades and this will have reduced the risks faced by all drivers, including the young. However, the findings in this paper also indicate areas of improvement in road design that would have more specific impact on young drivers. For example, because of the higher involvement of young drivers in crashes in local urban streets and those involving pedestrians or bicyclists, the extension of Local Area Traffic Management (LATM) to more urban areas would seem an effective measure. Similarly, their higher involvement in single vehicle crashes suggests that the removal or protection of road side objects should be given a higher priority. Research such as that by Johnston (1983) also suggests that improvements in night time delineation of roads would reduce crashes involving alcohol and, again, this would be predicted to have a significant impact on young drivers.

## SUGGESTIONS FOR FURTHER RESEARCH

### Young Drivers

The influence of age and time of licensing could be investigated by seeking additional information on the time a licence is held in a survey of travel characteristics such as the Travel File. This would allow the calculation of the relative risks on a time since licensing basis using similar information in the Fatal File.

FORS has already begun research into the acquisition of skills by young drivers, but perhaps more emphasis should be directed to eye movement studies and the framework of anticipatory and delayed responses provided by Fuller (1984). A longitudinal study, tracking a group of young drivers from before licensing until age 25, may be worthy of consideration.

The complex nature of the high risks associated with night-time driving should be the subject of a discrete area of research.



The possibility of effective judgement training should continue to be investigated with particular emphasis on developing more effective training for continuous decision-making in areas such as speed selection.

Research on the nature and prevention of over-confidence in young drivers should be pursued, particularly in evaluations of educational measures.

The results of the New Zealand graduated licensing scheme should be scientifically and rigorously evaluated in the hope of encouraging the transfer of best practice to Australian States and Territories.

### CONCLUSIONS

Young drivers have twice the risk of older drivers on a per population basis, and three times the risk per distance travelled.

Young drivers with the highest risk are those in their first year of licensed driving.

Young drivers have a higher than expected risk between 9 pm and 9 am and on weekends.

The risk of both younger and older drivers is more than twice as high in rural areas than urban areas.

Young drivers are more involved in fatal crashes on urban roads and where the speed limit is less than 80 km/h.

Young drivers are more likely to be involved in pedestrian and bicycle crashes and are more likely to lose control on corners or straight sections. They are less likely to be involved in intersection, rear-end and overtaking crashes.

Young drivers have a higher involvement of alcohol, especially on weekends.

Young drivers may have well-developed vehicle-handling skills, but their perceptual and decision-making skills may be less developed and contribute to their higher risk of involvement in fatal crashes.

Over-confidence in young drivers may result from the different rates that safe driving skills are acquired, and may be a significant factor in the high risk of young drivers.

### RECOMMENDATIONS

A graduated licensing policy, particularly with an emphasis on the implementation of restrictions on night and weekend driving, should continue to be pursued as the most effective way to reduce the influence of age-inherent factors.

Continued efforts to reduce alcohol consumption and abuse in young people should be supported by road safety authorities.

Higher priority in both research and educational efforts should be given to assisting young drivers to acquire the safety-relevant perceptual and decision-making skills, and to reduce over-confidence in young drivers.

An integrated approach to driver education and training should be encouraged, based around the National Framework and utilising the most effective and appropriate teaching methods.

Licensing and testing systems should be modified to reflect the educational aims of the National Framework, and testing should be extended to drivers in their first years of solo driving through a graduated licensing scheme.

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