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EVALUATION OF PRE-DRIVER EDUCATION PROGRAM

by

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Abstract:

This report aimed to compare the effects of pre-driver education programs at rural secondary schools which have an in-car component (driving a car in an off-road environment) with the effects of pre-driver education programs which do not have this component. Thus, the study attempted to measure the net effects of the in-car component of these programs. Data was collected by mail-back questionnaire.

Respondents who had completed a pre-driver education program with an in-car component obtained their learner permits and probationary licences at lower average ages than the respondents who had not. However, the two groups did not differ in the duration that the learner permit was held or the amount of experience obtained during this period.

Completing a pre-driver education program with an in-car component led to a nonsignificant reduction in accidents and a nonsignificant increase in traffic offences. The respondents who had completed a pre-driver education program with an in-car component and those who had not did not differ significantly on most measures of driving-related attitudes and behaviours. These measures were, however, sensitive to accident and traffic offence history.

Further research is needed to examine whether there are short-term positive effects of pre-driver education with an in-car component and whether these effects justify the resources required for delivery of the in-car component.

Key Words:
young driver, driver education

Disclaimer

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EXECUTIVE SUMMARY

This report aimed to compare the effects of pre-driver education programs at rural secondary schools which have an in-car component (driving a car in an off-road environment) with the effects of pre-driver education programs which do not have this component. Thus, the study attempted to measure the net effects of the in-car component of these programs.

Questionnaires were sent to 2,000 people aged 18 to 29 in the Federal electoral divisions of Mallee and McEwen (both rural areas of Victoria). Completed questionnaires were received from 687 respondents.

The analyses showed that the respondents who had completed a pre-driver education program with an in-car component obtained their learner permits and probationary licences at lower average ages than the respondents who had not. However, the two groups did not differ in the duration that the learner permit was held or the amount of experience obtained during this period.

Completing a pre-driver education program with an in-car component led to a nonsignificant reduction in accidents and a nonsignificant increase in traffic offences. The major factors associated with having had accidents or traffic offences were driver age, sex and the amount of driving that took place in the Melbourne metropolitan area.

The respondents who had completed a pre-driver education program with an in-car component and those who had not did not differ significantly on most measures of driving-related attitudes and behaviours. These measures were, however, sensitive to accident and traffic offence history.

The results were similar whether the cases were defined as drivers who had completed the pre-driver education program at Alexandra Secondary College or CHARTSEC, or the cases were defined as all those who had completed any school-based pre-driver education program with an in-car component.

It should be noted that the analyses compared drivers who had undertaken pre-driver education programs with an in-car component (cases) with drivers who had not (controls). The controls were a mixture of drivers who had undertaken pre-driver education programs **without** an in-car component and drivers who had **not** undertaken a pre-driver education program. Thus, the finding that cases received learner permits and probationary licences earlier than controls may not have been an effect purely of the in-car component. It is possible that the more widespread completion of the classroom component by cases than controls may have also contributed to this finding.

Three potential issues which could affect the representativeness of the data were identified:

- possible differences between people who were still living at their enrolled address and those who were not

- the lack of data from people who had been killed or injured severely enough to prevent them completing the questionnaire
- possible differences in accident and infringement history between those who returned the questionnaire and those who did not

However, the effect of these three factors, separately and combined, on the results of the study is likely to have been small.

The study examined the effects of pre-driver programs with an in-car component delivered to students aged 15 or 16 years in country schools. The minimum learner permit age was 16 for most of the students. The extent to which the results can be generalised to students in city schools or older students or jurisdictions where the minimum learner permit age is different may be limited.

Like earlier, larger studies, the current study found that students assigned to the improved curriculum were licensed earlier. In contrast to some of the earlier studies, the current study found no increase in accident involvement or traffic offences for students who had completed pre-driver education with an in-car component. This may be because the earlier licensing in this study allowed accompanied driving only. Thus, pre-driver education prior to a learner permit may not be subject to the same possibility of negative effects as found in jurisdictions where there is not a learner permit system.

Further research is needed to examine whether there are short-term positive effects of pre-driver education with an in-car component and whether these effects justify the resources required for delivery of the in-car component.

1.0 INTRODUCTION

1.1 BACKGROUND

Young drivers are over-represented in crashes in Australia and throughout the world. Young people aged 15 to 24 comprise 15% of the population but account for 31% of fatalities (Triggs and Smith, 1996). While the size of the problem is well established, there is a need for more research to clearly delineate its causes and to develop effective remedies.

Much of the effort to improve young driver safety has focused on driver education - both within the school system and within the wider community. Driver education programs within the school system have become less widespread since the failure of a number of evaluation studies to show a subsequent reduction in crashes (notably the DeKalb County Study, Ray et al., 1980, cited in Lonero, Clinton, Brock, Wilde, Laurie and Black, 1995). These studies showed an association between driver education in schools and earlier licensure and greater exposure.

In Victoria, the current emphasis in schools is on Traffic Safety Education, rather than Driver Education. A small number of schools have continued Driver Education programs but with little official support and funding. This research project seeks to examine the effect of those programs on licensing ages and rates, amount of experience gained at each stage of the licensing process and crash history. While increased exposure was considered a negative factor in earlier studies, the current view is that increased experience on-road as a learner driver may be the crucial factor in learning safe driving behaviour (Cavallo and Triggs, 1996; Triggs and Smith, 1996).

Given that in-car training requires more resources (both materially and in terms of supervision of students) than classroom training alone, there is a need to examine whether there are long-term benefits of in-car training and to assess whether the benefits are sufficient to warrant the increased resources required.

1.2 OBJECTIVES

The objectives of the study were to compare the effects of pre-driver education programs at rural secondary schools which have an in-car component with the effects of pre-driver education programs which do not have an in-car component. Thus, the study attempted to measure the net effects of the in-car component of these programs.

The analyses compared drivers who had undertaken pre-driver education programs with an in-car component (cases) with drivers who had not (controls). The controls were a mixture of drivers who had undertaken pre-driver education programs **without** an in-car component and drivers who had **not** undertaken a pre-driver education program.

Given the mixed set of controls, the comparison between cases and controls does not clearly measure the net effect of the in-car component but rather the effect of the in-car component plus part of the effect of the classroom component.

The effects of the different types of programs on the following outcome measures were assessed:

1. licensing ages and rates
2. amount of experience gained at each stage of the licensing process (learner permit, probationary licence and early years of full licence)
3. crash involvement
4. traffic offences
5. driving-related attitudes and behaviours

1.3 STRUCTURE OF THE REPORT

This report commences with a review of some relevant studies in pre-driver education and training and describes the characteristics of the outcome measures chosen. Chapter Three describes the design and method of the study. The results are presented in Chapter Four and discussed in Chapter Five. Chapter Six contains the conclusions of the study.

2.0 BACKGROUND TO THE STUDY

2.1 PRE-DRIVER EDUCATION

2.1.1 Pre-driver education versus driver education

There is a need to distinguish between pre-driver education and driver education, although this has not been done well in the past. In this report, pre-driver education is used to refer to a program of instruction delivered to students who are not yet old enough to drive unaccompanied (and most of whom are not yet old enough to drive accompanied). Thus, pre-driver education is necessarily confined to classroom and off-road instruction.

The setting and content of pre-driver education and driver education may differ according to the licensing age. At lower licensing ages (such as 15 years in New Zealand and 15 or 16 in some US states), schools may be presenting driver education to students who would be undertaking pre-driver education in Victoria.

Driver education has been taught in schools in the United States since the 1950s. In 1955, Michigan was the first state to mandate a certified course of driver education. This course was offered by all public schools and students had to satisfactorily complete the course in order to obtain a licence (Smith, 1998). More recently, in any given year in the United States, over 10,000 schools teach driver education to over 2.7 million students (National Safety Council, 1995, cited in Ritzel, Shannon and Leitner, 1998). School-based driver education usually comprises an information-focused classroom component as well as an in-car supervised driving instruction component. Additional supervision by parents is desirable.

Students are often much more interested in gaining mobility than with learning how to become a safe driver (Smith, 1998). As the objective of driver education is often to pass the driver licence test, the school will usually provide the minimum instruction in order to pass the test (Green, 1998).

Given the widespread nature of school-based driver education in the United States, most of the research and activity in this area has focussed on driver education, not pre-driver education. Lonero et al. (1995) comment that "the main function of current driver education is to support mobility. New drivers need a certain level of skill in order to pass a state or provincial licensing test and satisfy the concerns of their parents or guardians. Driver education helps meet this need. However, the additional need exists to improve the safety performance of novice drivers." (pp.2-3)

2.1.2 Evaluation studies

The DeKalb County Driver Education Project was the largest experiment to measure whether driver education reduced collisions. Students were randomly assigned to an improved curriculum (Safe Performance Curriculum), a minimum curriculum or no training. The Safe Performance Curriculum included 32 hours of classroom

instruction, 16 hours of simulator instruction, 16 hours of off-road instruction, 3 hours of collision evasion instruction and 3.3 hours of on-road, behind the wheel instruction.

SPC-trained drivers showed better on-road skills and fewer collisions per licensed driver over their first six months of driving. However, this was partially offset by earlier licensing of SPC-trained drivers. After six months, there were no differences between the groups. A later reanalysis of the data included data for all the students, not just those who had become licensed (Lund et al., 1986). It showed that SPC-trained students were more likely to obtain driver licences, be in collisions and have traffic violations. In comparison, students taking the minimal curriculum, though also more likely to become licensed, were not significantly more likely to be in collisions or to have violations than control students. Lund et al. suggested that the lower skills of the minimal curriculum students led to slower licensing and more caution in driving after they had been licensed.

Following these findings, many high school driver education programs in the United States have been dropped. Lonero et al. (1995) cite TIRF (1991) who found that the percentage of New Jersey schools offering driver education dropped from 96% to 40% between 1976 and 1986. Nevertheless, driver education is still taught to a large number of US students (National Safety Council, 1995, cited in Ritzel, Shannon & Leitner, 1998).

An evaluation of the Automobile Association driver training program in New Zealand randomly assigned students to eliminate selection bias (Lonero et al., 1995). No statistically significant reductions in collisions or convictions were found for AA students. Females in the trained group reported significantly more collisions than those in the control group. Students obtained their licences earlier, again showing that driver education had its benefits in increasing mobility, rather than safety.

2.1.3 Proposed improvements to driver education

In response to the various studies which have shown that those who complete driver education courses are not safer than those who do not (Smith, 1998), many organisations have suggested modifications to driver education to make it more effective in terms of safety.

The US National Highway Traffic Safety Administration (NHTSA) has suggested that a systems approach rather than a single countermeasure is necessary when designing a course that produces safe drivers (Smith, 1998). NHTSA has suggested a course with the following characteristics:

- training would be spread over an extended period of time and would be self-paced,
- training that emphasises safe driving skills would only be given after the student has some amount of basic behind-the-wheel experience,
- novice driver training would include all types of driving situations that would be encountered by the new driver, and
- the natural risk-taking tendencies of young people would be taken into account.

Smith (1998) believes that crash reduction arises from *'the application of safe driving strategies, not from an application of basic vehicle control skills' (p.4).* In order for

safe driving strategies to be taught most effectively, Smith has proposed that basic handling skills be taught first, then, when the student has a grasp of how to drive the car, the safe driving strategies should be taught. By dividing it thus, rather than teaching the two simultaneously, the student will be able to concentrate more fully on each component. Therefore, the safe driving strategies would be more meaningful to the student.

Smith (1998) has proposed a two-tier driver education program for Michigan called the GDL. This is a summer only course, and is in two parts. Entry age for Tier 1 is 14 years and 9 months, and for Tier two is 15 years and 9 months. This is consistent with graduated licensing that is being introduced around the US. The content would comprise a minimal pre-licence course and a comprehensive stage 2 course. A parental training package would be included. This would contain a list of practice exercises to be done with parents. Parents would be encouraged to teach students the same driving practices as the course, rather than the parent's own bad driving habits. Students would learn through experience in cars as well as through traditional classroom methods. Material would be presented in a self-explanatory way so that specialised teachers would not be necessary.

It has been proposed that Tier 1 teach requirements of the graduated licensing system, basic safety concepts, basic traffic laws, occupant protection, initiating and ending a drive, accelerating, braking, stopping, turning, tracking, maintaining speed, parking, basics of communication with other road users and basic driver factors (eg influence of alcohol).

It has been proposed that Tier 2 teach decision making, risk taking, perceptual skills, vehicle factors, environmental factors, other driver factors and the social responsibilities of driving. There would be extensive end of course knowledge, attitude and driving tests.

In 1995 the American Automobile Association released the Novice Driver Education Model Curriculum Outline (Lonero et al., 1995) which outlines a new driver education program. Van Tassel (1998) has identified a number of salient issues in the report. They include the following points:

- Driver education cannot accomplish the goal of producing safe drivers on its own.
- Motivational factors are increasingly seen to be vital components of driving and need to be incorporated into driver education. Their value needs to be recognised.
- When skills such as evasive manoeuvres are taught, it is important to ensure that driver confidence does not become inappropriately high, or that parental supervision does not become inappropriately low.
- Instructor outlooks and methods must be appropriate, especially in terms of having a training rather than a teaching approach.
- Knowledge has traditionally been taught in the classroom, and skill in the car. With the advent of new technology (computers), it is now possible to teach both simultaneously. This would result in a greater integration of skills when the student is in the real world.
- It may be useful to use more adult teaching methods to impart knowledge to teenagers, such as group participation and practical rather than theoretical skill learning.

- Qualified, newly licensed drivers may be more effective teachers, as they are peers.
- It is recognised that there are many factors involved in becoming a safe driver. These include motivation, responsibility and perceptive abilities, as well as input from family, community, industry and government.

Green (1998) has suggested that it is important to include emotional and cognitive components in driver education. Educators should provide training in emergency situations and hazard perception, as these are the times drivers are most at risk of crashing. As part of driver training it may be useful to include a unit in which students hit road cones, causing inexpensive crashes. This is real-world experience which may be more effective than simulation or specially designed cars. In addition, this real-world experience is useful in order for students to realise their own shortcomings. Recent Swedish research also supports the view that providing novice drivers with experience of their own limitations may be useful in reducing overestimation of skill levels (Gregersen, 1996).

The Insurance Institute for Highway Safety (IIHS, 1994) has suggested that the introduction of graduated licensing to the US would result in safer novice drivers. This is because young drivers would be introduced to the roads more slowly due to restricted licensing. The extra time would mean their driver education, including education about safety, would be more extensive.

2.2 PRE-DRIVER EDUCATION IN VICTORIA

In Victoria, the minimum age for obtaining a probationary driver licence is 18 years. This is higher than in many other Australian states and overseas countries. This has contributed to less emphasis on pre-driver education in Victoria than in other jurisdictions where many students may be driving unaccompanied to school during the latter part of their secondary education.

Pre-driver education is now considered by the Victorian Department of Education to be a component of pre-licence education. According to its Administrative Guidelines for Traffic Safety Education (Department of Education, 1997), "pre-licence education is not about teaching students how to drive. It should be aimed at developing appropriate behaviours, attitudes and decision making skills to enable students to manage the road traffic environment in a responsible and safe way...While provision of off-road driving experience for students in school is not the preferred option, it is recognised that there are schools who choose to conduct practical driving experiences for students" (pp.18-19).

Remenyi (1997) notes that "in this context, Pre-Driver Education involving a practical component, in which students actually drive off-road, should be seen as an extension component, only one element of a broader Pre-licence Education school program" (p.5).

A relatively small number of Victorian State Secondary Colleges offer a pre-driver education program with an in-car component. Remenyi (1997) listed 82 schools who indicated that they included pre-driver education in their school curriculum in

1995/1996. Perhaps the most developed and longest-lasting pre-driver education programs with an in-car component have been conducted at Alexandra Secondary College and Charlton College. Both of these programs have strong community support and the reductions in young driver fatalities in these areas are strongly believed to have resulted from the programs.

2.2.1 Alexandra Secondary College

Alexandra Secondary College runs a traffic safety education program for Year 10 students (usually 15 or 16 years of age) on an elective basis. The program began in 1976 when Year 12 students undertook training at the Driver Education Centre of Australia (DECA) in Shepparton (with the assistance of the Rotary Club of Alexandra). Increasing costs led the school to develop a program run from the school. This began in 1993.

There are four periods of theory per week over the semester, which is equivalent to 64 hours of class. In these lessons, basic eyesight, peripheral vision and reaction times are assessed. Students discuss research findings which focus on why the 17-24 year old age group are over-represented in both casualty and death statistics. Reasons for this are discussed and include inexperience, lack of concentration, alcohol, road conditions and peer group pressure.

In the theory classes students also study the hidden costs of owning a car such as registration, insurance and running costs. The role of the TAC and the history behind the advertisements are investigated. Car safety issues are explored, looking at vehicle design and the latest safety developments in crash avoidance and occupant protection systems. Basic road law is studied, particularly intersections and potential black spots around the Alexandra area and why accidents occur there. Students complete assignments on the System of Car Control, alcohol, road law and crash ratings of cars.

Guest speakers are invited to give presentations to the students. Local police are invited and they may demonstrate the puff-bag and breathalyser in addition to speaking to the students. District Traffic Operations Group members speak about speed detection and local fatal accidents and students have the opportunity to sit in highway patrol cars. Local car accident victims talk of their injuries and rehabilitation along with Ambulance members who show the students how to do CPR. Rally drivers speak about driving attitudes and application. The Police Road Accident Awareness Unit may also come to visit.

There is an in-car component to the course in addition to the theory. Students are divided into groups of four students per car. They undertake three periods of in-car training per fortnight, which gives each student five to six hours behind the wheel, and 19 hours in the car with another student driving. The in-car component is very popular with the students.

The in-car practical sessions include car inspection and maintenance (including tyre changing), correct driving positions, road craft, road observation and scanning for potential hazards. Driving skills covered include lane changes, U-turns, safe and evasive braking, steering, reversing, parallel parking and 3-point turns.

The vehicle is funded by support from Rotary and other local sponsors. The Alexandra Speedway grounds are used for off-road training, together with the town's helipad. Students pay $25 for the course.

2.2.2 Charlton College

The Charlton Traffic Safety Education Centre (CHARTSEC) was established in 1988. The pre-driver education program was modelled on the course delivered by DECA at Shepparton. The program is most commonly offered over four days (three days in 1994 and 1995 because of staffing restrictions). The total cost is $125.

CHARTSEC have conducted the pre-driver education program with a range of schools in the north, west and central areas of Victoria. The program is generally a mandatory subject for Year 10 students in the participating schools. In 1996, 450 students completed the program, the estimated number was 400 in 1997. The name of the facility was changed to the North West Driver Education Centre in 1998.

The CHARTSEC grounds were developed by the local community and contain 1 km of track, including sealed and unsealed sections, traffic lights, pedestrian lights/crossings, hook turn facilities, parallel and angle parking bays, a hill crest and a variety of intersections, both signed and unsigned. All cars at CHARTSEC are less than 2 years old.

The aims of the course are for students to:

i) be educated into the responsibilities that belong to all road users and the reasons behind these responsibilities
ii) realise the dangers of unsuitable behaviour or risk taking
iii) investigate and discuss the effects peer pressure can have on safe deriving practices
iv) gain experience driving in a controlled condition and progress towards near real-life situations
v) be made aware of the safety issues that are paramount in controlling a vehicle and the laws governing its use.

Half of the sessions that students are theory based, and half are practical. Both components are assessed by a test at the end and students receive a certificate on successful completion of the course.

As part of the theory component of the course students are taught about a wide variety of issues. Broadly, they are taught about road safety, positive driving attitudes, peer pressure, road laws and driving skills. More specifically, students are taught about the following issues: the responsibilities of a driver, peer pressure and desirable behaviour, reasons for traffic regulations, alcohol and its effects, the System of Car Control, signs and signals, lane positioning during turns and roundabouts, physical and mental requirements of a driver, vehicle control within the natural laws, cornering and overtaking and changing a wheel. In addition, students' views and attitudes are explored and they have a chance to justify their opinions.

The practical component of the course is made up of sessions focusing on the following areas: vehicle inspection and pre-start checks, moving off and pulling in,

changing gears, pull push steering through cones, application of the System, driving down a straight, around a corner and into a manoeuvres area, lane positioning during turns (with cars going both ways on the track), road observation, reversing (figure of 8 and straight), various manoeuvres, 3-point and U- turns, parallel and angle parking, parking and hill starts, cornering lines, overtaking and changing a wheel. If students are confident, they experience a drive at night. There is a ratio of 1 staff member to 3 students when the students are driving the cars.

2.3 IMPORTANCE OF THE OUTCOME MEASURES

2.3.1 Licensing ages and rates

A number of US evaluations of pre-driver education programs found that they resulted in earlier licensing and higher licensing rates, with a consequent increase in exposure and therefore the number of crashes in which young drivers were involved (Lonero et al., 1998).

2.3.2 Amount of experience gained at each stage of the licensing process

The amount of experience gained at each stage of the licensing process (learner permit, probationary licence and early years of full licence) will be assessed in this study. While increased exposure was considered a negative factor in earlier studies, the current view is that increased experience may be the crucial factor in learning safe driving behaviour (Cavallo and Triggs, 1996; Triggs and Smith, 1996).

2.3.3 Crash involvement

While crash involvement is often considered to be the ultimate measure of the safety of the individual driver, there are a number of reasons why this cannot and should not be the only measure. Firstly, it is affected by both the extent and quality of exposure – it confuses how safely the driver drives with how far he or she drives and under what circumstances. Second, we often do not know the role played in the crash by the young driver – whether he or she was at fault.

The practical problem is that crashes are fortunately rare events at the level of the individual driver and so statistical comparisons are not likely to result in significant differences. Diamantopoulou, Cameron, Dyte and Harrison (1997) found that among a weighted population of Victorian drivers, 0.8% were involved in a casualty crash during the two year period 1993-1994 (0.68% of female drivers and 0.89% of male drivers). Only 1.3% of *crash-involved* drivers were involved in two or more casualty crashes in this time period. Among drivers aged 0 to 17, the involvement rate was 0.99%. For drivers aged 18 to 21, the involvement rate was 1.75%. For 22 to 25 year olds the rate was 1.24%. Even if young drivers are involved in twice as many casualty crashes as older drivers, then still less than 2% of young drivers were involved in casualty crashes in that two-year period.

The same report shows that casualty crash involvement of drivers of all ages was lower for drivers resident in country Victoria (0.69%) than those resident in metropolitan Melbourne (0.84%).

Thus, very large samples of drivers would be needed to demonstrate that pre-driver education programs with in-car components had an effect on crash involvement. Even then, the effect would have to be examined carefully before conclusions about the mechanism underlying the effect could be drawn.

2.3.4 Traffic offences

The tendency to commit traffic violations has been associated with increased crash risk in a number of studies (Forsyth, Maycock and Sexton, 1995; Williams and O'Neill, 1974).

Deery, Kowadlo, Westphal-Wedding and Fildes (1998) asked drivers taking their learner permit and probationary licence tests "How many fines have you received as a driver (excluding parking fines)?" Their study showed that novice drivers in two deviant groups had significantly more traffic violations than drivers in the other three groups, even though interviewing occurred very early in their driving history.

Diamantopoulou et al. (1997) found that addition of a driver's prior offence data (in some form) improved the ability of a model to predict subsequent casualty crash involvement. In this study, the base model for predicting crash involvement included driver age, driver sex, driver location and endorsement of licence as well as the driver's reported casualty crash and serious injury involvements and total traffic convictions during 1991-1992. A traffic conviction was defined to be a licence cancellation, licence suspension or licence disqualification. To this model the driver's prior offence data (in various forms) was added to find the model which best predicted the driver's crash involvements in 1993-1994. The offences were only those that incur demerit points (e.g. exceeding speed limit, running a red light) and did not include other offences such as drink-driving offences. Models which classified offences by category of offence or demerit point level were significantly better than models which included "total offences" or "total demerit points". Demerit points alone could be used to predict a driver's subsequent crash involvement, but an even better model could be produced by including prior casualty crash involvement as well.

Diamantopoulou et al. (1997) found that the proportion of drivers involved in at least one casualty crash during 1993-1994 generally increased with increasing number of offences during 1991-1992. For example, only 0.67% of drivers with no offences in 1991-1992 were involved in casualty crashes in 1993-1994, compared with more than 4.00% of drivers with more than five offences in 1991-1992. For each type of offence, drivers who committed one or more offences were more likely to be involved in crashes in 1993-1994.

However, it should be noted that a previous study has shown that drivers are not very accurate at reporting how many demerit points that they have lost in the past 12 months (Haworth, Vulcan, Bowland and Pronk, 1997). Since the current study is based on self-report, rather than the VicRoads database, asking about the number of offences was considered more appropriate than asking about loss of demerit points.

Violations are also more frequent than casualty crashes, so some of the statistical analysis problems are less. For example, while only 0.68% of Victorian drivers were involved in one or more casualty crashes in 1991-1992, 19.9% were detected exceeding the speed limit by less than 30 km/h during the same period (Diamantopoulou et al., 1997, see Table 2.1).

Table 2.1. Frequency of Victorian drivers who had committed particular offences during 1991-1992. From Diamantopoulou et al. (1997).

Offence	Number of drivers	Percent of drivers
Exceed speed limit by <30 km/h	696,090	19.9
Exceed speed limit by >=30 km/h	23,590	0.7
Stop/Give Way offences	11,295	0.3
Unsafe action offences	32,145	0.9
Headlight/defect notices	7,454	0.2
Restraint and helmet offences	62,811	1.8
Signal offences	67,977	1.9

2.3.5 Driving-related attitudes and behaviours

Prior psychological and social characteristics have been identified as predictive of young drivers' crash involvement (Beirness and Simpson, 1991). Sensation seeking, impulsiveness and risky lifestyle have been related to risk taking and accident involvement (Elander, West and French, 1993, Gregersen, 1996, Mayhew and Simpson, 1995). In addition, external locus of control has been found to be associated with crash involvement (McMillen, Smith and Wells-Parker, 1987).

Deery et al. (1998) found that young novice drivers in the most deviant clusters scored higher on "competitive speed" and "tension reduction" (and drivers in his Cluster 5 also scored higher on "aggression"). As well as having more traffic violations, drivers in the more deviant clusters were more likely to be male, to smoke tobacco or use other drugs and drank more alcohol and more frequently.

Many pre-driver education programs attempt to modify young people's attitudes to driving with the aim of making them safer drivers (changing behaviour). The driving attitudes of drivers who have completed pre-driver education programs with an in-car component and those who have not will be compared in this study, to assess whether there was any effect on attitudes to driving.

3.0 DESIGN AND METHOD

3.1 ISSUES IN THE RESEARCH DESIGN

The objectives of the study were to compare the effects of pre-driver education programs at rural secondary schools which have an in-car component with the effects of pre-driver education programs which do not have an in-car component. Thus, the study attempted to measure the net effects of the in-car component of these programs.

The first issue was the identification of appropriate groups to compare. The two locations with a long history of pre-driver education with an in-car component were identified as Alexandra Secondary College and CHARTSEC (now North West Driver Education Centre). Thus, it was decided to select cases from among drivers who had completed one of these programs.

There was then a need to select a control group that was unbiased and appropriate. This required that the control group was selected using the same method used to select the cases. Many earlier evaluations of driver education and training programs were flawed because of the selection of the control group. In particular, if a large or representative sample of the trained group would be compared with a control group comprising more interested (and probably safer) drivers, then the likelihood of demonstrating a positive effect of the training program would be reduced.

Most students who had attended these schools had completed the program, so there were insufficient other students at these schools to serve as controls. Given the rural nature and particular topography of these areas, it was decided to recruit controls who had attended schools in the same geographical area as Alexandra and the area covered by CHARTSEC.

The next issue was how to contact and collect information from these groups.

Discussions with staff at Alexandra Secondary College and CHARTSEC made it clear that collating names and addresses of students who had been in Year 10 between 1992 and 1996 would be very time-consuming. While they were willing to undertake this task, they indicated that there would be major difficulties in obtaining the full support and cooperation of principals from schools that had not participated in the programs. In addition, the timing of these tasks was difficult for the schools, given other demands at that time of year.

Therefore it was decided that it was necessary to devise another method for gathering the names and addresses of both past students who had undertaken the programs and control students who had attended schools which had not participated in the programs.

The most efficient approach appeared to be the use of electoral roll data. The Federal electoral divisions of Mallee (which includes Charlton) and McEwen (which includes Alexandra) were selected as the bases for both the “case” and “control” students.

It should be noted that some members of the Project Advisory Committee did not agree with this approach.

The number of questionnaires which could be sent out was constrained by the study budget to a maximum of 2,000. With one mail follow-up, it was estimated that the likely response rate would be between 30% and 40%. The power calculations showed that a significant result would be found under the following conditions:

- 40% response rate, 50% accident rate, 20% reduction in accidents resulting from undertaking the program (i.e. reduction in accident rate to 40%)

- 40% response rate, 50% accident rate, 10% reduction in accidents resulting from undertaking the program (i.e. reduction in accident rate to 45%)

- 30% response rate, 50% accident rate, 20% reduction in accidents resulting from undertaking the program (i.e. reduction in accident rate to 40%)

Similar values would apply to traffic offences as a measure of the effect of the programs.

It was recognised that previous studies with larger sample sizes had shown no positive effects of school-based programs (Lonero et al., 1995). Based on previous reports in the literature, it was considered unlikely that this study would find any statistically significant positive effects.

3.2 SAMPLE DESIGN

As noted in the previous section, cases were recruited from among drivers who had completed one of the pre-driver programs at Alexandra Secondary College and CHARTSEC (now North West Driver Education Centre).

The Australian Electoral Commission provided the names and addresses of persons aged 18 to 29 in the Federal electoral divisions of Mallee (which includes Charlton) and McEwen (which includes Alexandra). The age range was specified by legislation relating to the use of electoral data for research purposes. Maps of these electoral divisions are presented in Appendix 1. These lists provided sufficient names and addresses for both the "case" and "control" students.

Whether electors had completed one of the pre-driver programs was unknown until the completed questionnaire was returned. Respondents were classified as cases if they answered "yes" to Item 54 of the questionnaire:

Did you attend a driver education course **arranged by your secondary college** that involved driving a car?

Respondents were classed as controls if they responded "no" to this item.

A number of steps were taken to ensure roughly equivalent numbers of cases and controls in the two electorates. Townships were divided into those where students

were more likely to have attended one of the pre-driver courses ("probable case" areas) and townships where students were unlikely to have attended one of the courses ("probable control" areas). Questionnaires were sent to electors from both groups of townships.

3.3 METHOD

3.3.1 First mailing

The first mailing comprised 1200 questionnaires sent on 6 August 1998. Of these, 300 were sent to probable cases and 300 to probable controls in each of the study areas.

3.3.1.1 Mallee electorate

The Australian Electoral Commission supplied a file of 14,283 names and addresses of electors aged 18 to 29 enrolled in the Federal Electoral Division of Mallee. A frequency list of the number of electors in each township was compiled.

Selection of probable cases

All of the electors whose enrolled address was in Charlton (n=139) were selected as probable cases. Electors resident in Charlton were over-sampled because it was expected that they were more likely to have undertaken the course than electors resident in other towns.

Names and addresses of electors living in towns in which the schools that had sent students to the CHARTSEC pre-driver program, as well as all other areas with the same postcodes as these towns, were placed into a separate file. This was termed the case pool. The names and addresses in this pool were sorted alphabetically by town name and then surname.

The remaining 161 probable cases were chosen by selecting electors at an even interval rate from the case pool (approximately one in eleven). In this way, the number of subjects chosen from each town was proportional to number of electors enrolled in each town.

Selection of probable controls

Controls were selected from townships where the school had not attended (or had infrequently attended) the CHARTSEC pre-driver program.

The bulk of the control pool consisted of electors resident in Horsham, Mildura and Swan Hill. It was considered that driving patterns might be somewhat different in these cities than in other towns and so an attempt was made to reduce their contribution to the control sample.

The names and addresses of electors from Horsham, Mildura and Swan Hill were placed into a separate file. Fifty electors from each of these towns were selected at

equal intervals from the pool of electors in each of these towns. The sampling rates were as follows: Horsham: approximately 1 in 40, Mildura: approximately 1 in 70, and Swan Hill: approximately 1 in 28.

The remaining 150 probable controls were selected at even intervals from the remaining pool of subjects which was sorted in alphabetical order by town name and surname. Again, the number of electors selected was proportional to the number of electors enrolled in each town (approximately 1 in 37).

3.3.1.2 McEwen electorate

The Australian Electoral Commission supplied a file of 15,796 names and addresses of electors aged 18 to 29 enrolled in the Federal Electoral Division of McEwen. A frequency list of the number of electors in each township was compiled.

Selection of probable cases

The names and addresses of electors whose enrolled address was in one of the towns from which students attend Alexandra Secondary College (Alexandra, Acheron, Buxton, Eildon, Marysville, Molesworth, Narbethong, Rubicon, Taggerty, Thornton and Yarck) were put into a separate file. From this case pool, 300 electors were selected at even intervals (approximately one in two).

Selection of probable controls

The Division of McEwen was found to contain parts of the outer northern suburbs of Melbourne. To avoid contamination of the study by metropolitan-rural driving differences, townships with postcodes beginning with 30xx and the township of Warrandyte were removed from the list of eligible controls. This reduced the control pool to 9,353. The data was sorted in alphabetical order by town name and by surname. From this pool, 300 electors were selected at even intervals (approximately 1 in 32).

3.3.2 Reminder letters

Reminder letters were sent to potential cases and potential controls who had not returned the questionnaire, and where the questionnaire was not returned to sender, on Thursday 27 August 1998. This group comprised approximately 850 of the original 1200 in the first mailing.

3.3.3 Second mailing

A second mailing was sent on Thursday 27 August 1998. The results of the first mail-out showed that there were relatively fewer case questionnaires from Mallee returned than cases from McEwen or controls from either electorate. Therefore, of the 800 questionnaires sent in the second mail-out, 260 were sent to probable cases in Mallee, 180 were sent to probable controls in Mallee, 180 were sent to probable cases in McEwen, and 180 were sent to probable controls in McEwen.

Subject pools for the second mailing were created by eliminating the names of those who had been selected in the first mailing from the original pools of subjects. This created new, slightly smaller subject pools. All subject pools were sorted by town name and surname. Thus, when subjects were selected at even intervals from these pools, the number of subjects used was proportional to the number of electors enrolled in each town.

3.3.3.1 Mallee electorate

Selection of probable cases

A total of 260 subjects were chosen at equal intervals from the available pool (approximately one in six). None of these subjects were from Charlton because all possible subjects from Charlton were sent a survey in the first mailing.

Selection of probable controls

Thirty subjects each from Horsham, Mildura and Swan Hill were selected at equal intervals from the pool of each of these towns (Horsham: approximately 1 in 65, Mildura: approximately 1 in 115, and Swan Hill: approximately 1 in 43). The remaining 90 control subjects were selected at even intervals from the remaining pool of subjects (approximately 1 in 59).

3.3.3.2 McEwen electorate

Selection of probable cases

A total of 180 subjects were selected at even intervals from the case pool (approximately two in three).

Selection of probable controls

A total of 180 subjects were selected at even intervals from the control pool (approximately 1 in 50).

3.3.4 Reminder letters

Reminder letters were sent to those who did not return the questionnaire and the questionnaire was not returned to sender for the second mailing on Wednesday 16 September 1998.

3.4 QUESTIONNAIRE

A written questionnaire seeking information about driver education background, licensing, exposure, accidents, traffic infringements and driving-related attitudes and behaviours was developed (see Appendix Two).

The driving-related attitude and behaviour items comprised 31 true-false questions. They were taken from those used by Deery et al. (1998) which was based on an

extensive self-report questionnaire developed by Donovan and Marlatt (1982). The scales measured competitive speed, aggression, perceived responsibility for accidents, the extent to which driving is used to reduce tension or increase feelings of personal efficacy and power and driving inhibition.

The questionnaire was presented as an eight-sided A5 stapled booklet. It was accompanied by a covering letter (see Appendix Two). The covering letter explained the purpose of the study and asked for the cooperation of the drivers. The letter explained that the names and addresses were supplied by the Australian Electoral Commission and that the responses would remain anonymous and confidential. To comply with Monash University requirements, the letter also contained contact details of the University's Standing Committee on Ethics in Research on Humans if the person wished to make any complaint about the study.

Pre-testing showed that the questionnaire required approximately seven to ten minutes to complete.

A reply-paid envelope was provided to post completed questionnaires to MUARC.

3.5 ETHICS APPROVAL

Ethical approval for the study was granted by the Monash University Standing Committee on Ethics in Research on Humans at its meeting on 23 June 1998.

3.6 CALCULATION AND INTERPRETATION OF ODDS RATIOS

Odds ratios were calculated in this study to provide a measure of the change in risk of involvement in an accident (or a traffic offence) associated with particular factors. The odds of an event occurring is equal to the probability of the event occurring divided by the probability of it not occurring. For example, the odds of drawing a diamond from a pack of cards is one-third (commonly expressed as 3:1 against).

Case-control studies, such as the current study, cannot estimate the odds of an event occurring but can estimate the relative odds ratio, that is the odds relative to the odds of another event. The calculated odds ratio is a measure of the risk of an event occurring when that factor is present, relative to when it is absent. When the odds ratio is one, the factor has no effect on the risk of the event occurring. If the odds ratio is greater than one, the presence of the variable increases the risk of the event occurring. If the odds ratio is less than one, the presence of the variable decreases the risk of the event occurring.

The 95% confidence interval (CI) is presented for each of the odds ratios. If the confidence interval stretches from less than one to greater than one, the calculated odds ratio is not significantly different from one. Given the small number of cases analysed, many of the odds ratios are not statistically significant.

An odds ratio which describes the relationship of one variable to the risk of the outcome is termed an unadjusted odds ratio. If the unadjusted odds ratio is

significant, then there is a significant association between the variable and the outcome. Yet the association may occur when the variable has no direct relationship with the outcome but the variable is strongly correlated with another variable which has a direct relationship with the outcome (the confounding variable).

In this study, the main factor of interest is whether drivers have completed a pre-driver education course with an in-car component. The outcomes of interest are involvement in an accident or traffic offences. It is likely that these outcomes will be more likely for older members of the sample (because they have driven for longer) and for males. Other variables which may be potential confounders are region where the driver lives (McEwen or Mallee electorate) and how much driving is done in the Melbourne metropolitan area. These variables are included in the analysis to adjust for their effect on the relationship between completing a pre-driver program with an in-car component or not and the outcome.

The odds ratios were calculated by using multiple logistic regression. In logistic regression terminology, this relationship can be expressed as

$$\text{Prob(accident-involved)} = 1/1+e^{-z}$$

where Z is the linear combination of predictor variables

$$Z = B_0 + B_1X_1 + B_2X_2 + ... + B_pX_p$$

and B_0, B_1,....,B_p are coefficients estimated from the data; X_1,X_2,...,X_p are the independent predictor variables (e.g. sex, distance driven), and e is the base of the natural logarithms, approximately 2.718.

3.7 ANALYSIS DESIGN

As noted in Section 3.2, respondents were classified as cases if they indicated that they attended a driver education course arranged by their secondary college that involved driving a car. Respondents were classified as controls if they answered "no" to this item. This resulted in the cases including some drivers who had completed courses at locations other than Alexandra Secondary College and CHARTSEC. Thus, the analyses assessed the effect of a range of pre-driver education courses with in-car components, rather than the specific courses presented at Alexandra Secondary College and CHARTSEC.

To address the effects of the specific courses at the two locations, an additional set of analyses of accident and traffic offence data was undertaken. In these analyses, cases who had undertaken courses at other locations were excluded.

The controls were a mixture of drivers who had undertaken pre-driver education programs **without** an in-car component and drivers who had **not** undertaken a pre-driver education program. Given the mixed set of controls, the comparison between cases and controls does not clearly measure the net effect of the in-car component but rather the effect of the in-car component plus part of the effect of the classroom component.

4.0 RESULTS

This section summarises the characteristics of the sample of respondents and its relevance to the interpretation of the results, and compares the respondents who had completed a pre-driver education component with an in-car component to those who had not, in terms of

- licensing rates
- driver experience
- training
- accident involvement
- infringements, and
- driving-related attitudes and behaviours.

4.1 CHARACTERISTICS OF THE SAMPLE

4.1.1 Response rates

Table 4.1 summarises the overall response to the survey. Of the 2000 questionnaires mailed out, 715 completed questionnaires were received. Of these questionnaires, 28 contained insufficient information to be analysed. About 6% of the questionnaires that were mailed were returned to sender not known at the address on the electoral roll. This may reflect the high level of mobility of persons aged 18 to 29. Overall, completed questionnaires were returned by 38% of those who received questionnaires. The response rate was somewhat higher for the Mallee electorate (42%) than the McEwen electorate (34%).

The total number of cases was the same in the Mallee and McEwen electorates. However, the number of controls was somewhat larger in the Mallee than the McEwen electorate.

It is unknown whether the return rates were similar for cases and controls because the nature of the design meant that the numbers of questionnaires sent to cases and controls were unknown.

The choice of townships for probable cases and probable controls appeared to be reasonably effective. While the number of controls was greater than the number of cases among both probable cases and probable controls, the ratio of cases to controls was much higher in the probable cases areas.

Table 4.1. Summary of overall response to the survey.

	Mallee electoral division	McEwen electoral division	Total
Probable cases			
Cases	96	63	159
Controls	131	91	222
Incomplete	9	7	16
Returned to sender	18	13	31
Not returned	306	306	612
Total	560	480	1040
Probable controls			
Cases	21	54	75
Controls	134	97	231
Incomplete	3	9	12
Returned to sender	74	16	90
Not returned	248	304	552
Total	480	480	960
Total cases	117	117	234
Total controls	265	188	453
Total respondents	382	305	687

4.1.2 Examination for possible bias

Overall, 55% of respondents were female. While the proportion of those to whom questionnaires were mailed who were female was not known, it is assumed that this would be 50%. Thus, it is likely that there is somewhat of a bias towards over-representation of females in the completed questionnaire sample. However, the proportion who were female did not differ between cases and controls ($\chi^2(1)=0.43$, $p>.20$) or between electoral divisions ($\chi^2(1)=0.00$, $p>.20$). Therefore it was considered that the over-representation of females would not bias the analysis of the effect of pre-driver education programs with an in-car component.

Respondents whose age was 30 or more were removed from further analysis, because in these cases the questionnaire appeared to have been completed by a parent or another member of the family.

The mean age of cases was significantly lower than that of controls (22.8 versus 24.7, $t(675)=-6.68$, $p<.01$). Age was included as an adjustment factor in the logistic regression analyses to remove this bias.

4.2 LICENSING AGES AND RATES

The ages at which cases and controls obtained their learner permits and probationary licences and the intervening duration are summarised in Table 4.2.

Table 4.2. Summary of licensing information.

	Cases		Controls	
	All	Learner permit after 1 July 1990	All	Learner permit after 1 July 1990
Age (at 1/8/98)	22.8		24.7	
Age when obtained learner permit	16.7	16.6	17.0	17.1
Age when obtained probationary licence	18.3	18.3	18.5	18.7
Duration held learner permit (years)	1.64	1.74	1.50	1.68

On 1 July 1990, the minimum age for obtaining a learner permit in Victoria was reduced from 17 years to 16 years. The data show that before 1 July 1990, the mean age at which a learner permit was obtained was 16.8 years for cases and 16.9 years for controls. Several reasons have been identified why the mean age at which a learner permit was obtained was less than the legal minimum age in Victoria at the time.

First, a relatively small number of respondents attended schools in states or countries where the minimum learner permit and licensing age were lower than in Victoria at the time (most commonly New South Wales and South Australia). For some other respondents, they may not have correctly recalled the month and year that they obtained their permit (or licence).

For a large majority of the respondents whose age at learner permit issue or probationary licence issue was below the legal minimum, the difference between their age and the minimum was very small (about 0.1 of a year). This discrepancy was an artifact stemming from the ways in which date of birth and date of obtaining the permit (or licence) were coded. Respondents were asked to write down their complete date of birth (day, month and year) but were only asked to record the month and year that they had obtained their permit (or licence). To subtract these dates, it was assumed that the permit (or licence) was obtained on the first of the month. For those respondents who obtained their permit (or licence) on the month of their birthday (and their birthday was after the first of the month), the subtraction gave the result that they were less than the minimum age.

The errors in measurement of age at learner permit and at probationary licence would not have affected the outcomes of any comparisons between cases and controls and so do not affect the results of the study.

One option to rectify this problem is to add .083 to the age of all of the respondents. This is equivalent to assuming that the permit or licence was obtained on the last day

of the month (instead of the first). This would largely remove the discrepancy that the mean ages for some groups are below the minimum age. It should be noted that this does not in any sense improve the real accuracy of the data.

4.2.1 Learner permit

The age at which the learner permit was obtained was available for 641 respondents. Of the 38 respondents for which this information was missing, 5 had not yet obtained their learner permit and 33 did not complete this item but provided other information that showed they had obtained a learner permit. The respondents who had not yet obtained their learner permit were 2 males and 3 females aged between 18.5 and 25. Two were cases and three were controls.

The mean age at which cases obtained their learner permit was significantly lower than that for controls (16.7 versus 17.0, $t(637)=-3.61$, $p<.001$). This remained true when the analysis was restricted to those respondents who obtained their learner permit on or after 1 July 1990 (the date when the minimum age dropped from 17 to 16), (16.6 versus 17.1, $t(374)=-3.48$, $p<.01$).

4.2.2 Probationary licence

The age at which the probationary licence was obtained was available for 639 respondents. Of the 40 respondents for which this information was missing, 29 had not yet obtained their probationary licence and 11 did not complete this item. The respondents who had not yet obtained their probationary licence were 9 males and 20 females aged between 18 and 28. Eight were cases and 21 were controls.

Of those respondents aged under 20, 87% of cases and 87% of controls had obtained their probationary licence.

The mean age at which cases obtained their probationary licence was significantly lower than that for controls (18.3 versus 18.5, $t(635)=-2.05$, $p<.05$). This remained true when only those who obtained their learner permit on or after 1 July 1990 were included, (18.3 versus 18.7, $t(354)=-3.18$, $p<.01$).

There was no difference between cases and controls in the duration that the learner permit was held. Respondents who obtained a learner permit before 1 July 1990 held it for 1.7 years on average (both cases and controls) ($t(258)=0.33$, $p>.20$). Respondents who obtained a learner permit after this date held it for 1.4 years (cases) and 1.3 years (controls) ($t(258)=0.80$, $p>.20$).

4.3 EXPERIENCE

4.3.1 Prior to learner permit

Table 4.3 summarises the numbers of hours of on- and off-road driving before a learner permit was obtained. There was no difference between cases and controls in the numbers of hours they had driven on the road before they obtained their learner

permit (all subjects: $\chi^2(3)=4.11$, $p>.20$, learner permit on and after 1 July 1990: $\chi^2(3)=2.98$, $p>.20$).

However, cases appeared to have driven more hours off the road before they had obtained their learner permit than controls (all subjects: $\chi^2(3)=42.89$, $p<.01$, on and after 1 July 1990: $\chi^2(3)=24.09$, $p<.01$). This may have been because they counted the pre-driver education course as part of their off-road driving.

Table 4.3. Hours driven on and off the road before learner permit.

Hours	Cases		Controls	
	All	Learner permit after 1 July 1990	All	Learner permit after 1 July 1990
On the road				
None	84	58	177	84
1-10	61	40	86	38
11-20	18	16	39	16
More than 20	69	50	137	70
Total	232	164	439	208
Off the road				
None	9	6	100	42
1-10	60	45	110	59
11-20	29	19	32	16
More than 20	134	94	198	92
Total	232	164	440	209

4.3.2 While holding learner permit

There were no differences between cases and controls in the total number of hours driving while holding their learner permit (all subjects: $\chi^2(3)=2.44$, $p>.20$, on and after 1 July 1990: $\chi^2(3)=1.74$, $p>.20$, see Table 4.4).

4.3.3 Since obtaining probationary licence

There were no differences between cases and controls in the total number of hours driven since obtaining a probationary licence (all subjects: $\chi^2(3)=3.47$, $p>.20$, on and after 1 July 1990: $\chi^2(3)=1.04$, $p>.20$, see Table 4.5).

Table 4.4. Hours driven while holding learner permit.

Hours	Cases		Controls	
	All	Learner permit after 1 July 1990	All	Learner permit after 1 July 1990
Less than 10	10	6	20	9
10-49	76	55	165	82
50-99	58	41	108	47
More than 100	86	62	138	69
Total	230	164	431	207

Table 4.5. Total hours driven since obtaining probationary licence.

Hours	Cases		Controls	
	All	Learner permit after 1 July 1990	All	Learner permit after 1 July 1990
Less than 100	15	12	17	14
100-199	14	12	26	21
200-299	20	16	28	20
300 or more	176	119	350	142
Total	225	159	421	197

Table 4.6 summarises the total distance driven since obtaining a probationary licence (including any distance driven as a fully-licensed driver) for cases and controls. The total distance driven since was greater for controls than cases (all subjects: $\chi^2(4)=9.53$, $p<.05$, on and after 1 July 1990: $\chi^2(4)=7.30$, $p=.12$). This resulted from controls being older on average than cases. When the analysis is restricted to only those drivers who had held a probationary licence less than two years, there is no difference between cases and controls ($\chi^2(4)=2.13$, $p>.20$).

Table 4.6. Total distance driven since obtaining probationary licence.

Distance (km)	Cases		Controls	
	All	Learner permit after 1 July 1990	All	Learner permit after 1 July 1990
Less than 200	5	4	7	5
200-999	6	4	17	11
1,000-9,999	27	23	53	42
10,000-24,999	47	40	51	33
25,000 or more	140	87	291	105
Total	225	158	419	196

4.3.4 Rural and metropolitan driving

Cases and controls differed according to the proportion of their driving that occurred in the Melbourne metropolitan area ($\chi^2(2)=6.60$, $p<.05$). The data in Table 4.7 suggest that cases were less likely to have driven "almost none" of the time and more likely to have driven "some but less than half" of the time in the Melbourne metropolitan area than were controls.

4.4 TRAINING

4.4.1 Learning to drive

The information about how the respondents learnt to drive is summarised in Table 4.8. There were no differences in the percentages of cases and controls who received lessons from a professional driving instructor (all subjects: $\chi^2(2)=4.10$, $p=.13$; on or after 1 July 1990: $\chi^2(2)=2.14$, $p=.14$) or in who else accompanied the learner driver (all subjects: $\chi^2(2)=0.03$, $p>.20$: on or after 1 July 1990: $\chi^2(2)=0.93$, $p>.20$).

Table 4.7. Proportion of driving that has been in the Melbourne metropolitan area.

Proportion	Cases		Controls	
	Number	Percent	Number	Percent
Almost none	67	29	164	38
Some but less than half	106	46	159	37
Half or more	58	25	111	26
Total	231		434	

Table 4.8. Summary of learning to drive information.

	Cases		Controls	
	All	Learner permit after 1 July 1990	All	Learner permit after 1 July 1990
Professional driving instruction	61.9%	64.8%	63.3%	71.9%
Hours of lessons				
1-3	53	47	90	55
4-10	67	50	122	53
more than 10	23	10	69	43
Accompanied by				
mostly parent	165	121	309	150
mostly older friend or sibling	17	8	32	15
sometimes parent, sometimes older friend or sibling	46	33	89	39

For all respondents, there was no difference between cases and controls in the number of hours of professional lessons received ($\chi^2(2)=4.10$, $p=.13$) but among respondents who obtained their learner permit on or after 1 July 1990, relatively fewer cases than controls had more than 10 hours of lessons ($\chi^2(2)=14.17$, $p<.01$).

4.4.2 Other driving courses

Similar numbers of cases and controls had completed other driver training courses (18% versus 19%, $\chi^2(1)=0.02$, $p>.20$) and the mix of locations (on-road, off-road and both) did not differ between cases and controls ($\chi^2(2)=0.11$, $p>.20$).

4.5 ACCIDENT INVOLVEMENT

4.5.1 Overall number of accidents

Table 4.9 summarises the numbers of accidents recorded by cases and controls. Case drivers were somewhat less likely than control drivers to report having had at least one accident ($\chi^2(1)=3.50$, $p=.06$).

Table 4.9. Summary of numbers of accidents recorded by cases and controls.

Number of accidents	Cases		Controls	
	Number	Percent	Number	Percent
0	130	66	228	58
1	43	22	101	26
2	10	5	37	9
3	11	6	18	5
4	1	<1	6	2
5	2	1	2	1
10	0	0	1	<1
Total with any accidents	67	34	165	42
Accidents/100 drivers	56		69	

Male drivers were more likely to record having had accidents than female drivers. Overall, 39% of male cases and 49% of male controls recorded some accidents compared with 30% of female cases and 36% of female controls.

Both case and control drivers in the McEwen electorate were more likely to report having had at least one accident than case and control drivers in the Mallee electorate.

The number of accidents recorded varied according to the proportion of driving that had been in the Melbourne metropolitan area (see Table 4.10). Among cases, there was no statistically significant difference in whether any accidents were recorded according to proportion of the time driving in the Melbourne metropolitan area ($\chi^2(2)=3.13$, $p>.20$). However, the proportion of controls who recorded that they had been involved in an accident increased with the amount of driving which was in the Melbourne metropolitan area ($\chi^2(2)=29.52$, $p<.01$).

Table 4.10. Accidents according to proportion of driving that has been in the Melbourne metropolitan area.

	Proportion of driving in Melbourne metropolitan area			
	almost none	some but less than half	half or more	Total
Cases				
some accidents	15	34	18	67
no accidents	45	56	29	130
Controls				
some accidents	34	71	57	162
no accidents	106	72	45	223

Logistic regression analyses

A series of logistic regression analyses was conducted to examine whether having completed a pre-driver education program with an in-car component significantly

affected the risk of involvement in at least one accident. The results are summarised in Table 4.11.

Table 4.11. Summary of logistic regression analyses for accident involvement. Statistically significant odds ratios are bolded. OR=odds ratio, CI=95% confidence interval for the odds ratio

Variable	Entire sample			Cases completing courses at Alexandra, CHARTSEC only		
	OR	lower CI	upper CI	OR	lower CI	upper CI
Any accidents						
Completed course	0.71	0.50	1.02	**0.57**	0.36	0.91
Completed course	0.79	0.54	1.17	0.74	0.44	1.22
Age	**1.09**	1.04	1.15	**1.11**	1.04	1.17
Sex	**1.47**	1.03	2.09	1.32	0.90	1.95
Region	**1.48**	1.01	2.18	1.47	0.96	2.24
Some in Melbourne	**2.00**	1.29	3.11	**1.90**	1.17	3.07
Most in Melbourne	**2.35**	1.41	3.92	**2.49**	1.43	4.34
Any injury accidents						
Completed course	0.94	0.53	1.67	0.69	0.31	1.53
Completed course	0.94	0.51	1.74	0.78	0.33	1.85
Age	1.07	0.98	1.17	1.04	0.95	1.15
Sex	**2.06**	1.16	3.68	1.67	0.89	3.16
Region	1.08	0.58	2.01	1.45	0.73	2.91
Some in Melbourne	**2.36**	1.05	5.32	2.36	0.97	5.70
Most in Melbourne	**3.26**	1.32	8.04	**4.02**	1.53	10.56
Any single vehicle accident						
Completed course	**0.62**	0.40	0.96	**0.47**	0.26	0.86
Completed course	0.70	0.44	1.12	0.64	0.33	1.23
Age	**1.10**	1.04	1.17	**1.09**	1.02	1.17
Sex	**2.20**	1.44	3.37	**2.35**	1.47	3.74
Region	**1.60**	1.01	2.55	1.62	0.98	2.68
Some in Melbourne	1.63	0.94	2.84	1.53	0.84	2.80
Most in Melbourne	1.86	0.99	3.49	**2.13**	1.09	4.16

The unadjusted analysis showed that the risk of having had at least one accident was almost 30% lower for drivers who had completed a pre-driver education program with an in-car component, than for other drivers, but this difference just failed to reach statistical significance.

Adjustment for other potential confounding variables showed that being older, being male, living in the McEwen electorate (compared to the Mallee electorate) and driving more in the Melbourne metropolitan area were significantly associated with

increased risk of having had at least one accident. However, the reduction in crash risk associated with completing a pre-driver education program with an in-car component fell to 20% after these factors were taken into consideration and this difference was not statistically significant.

The separate analyses of the data from the two electorates, with adjustment for age, showed no significant effect of pre-driver education with an in-car component in either electorate (Mallee: OR=0.89, 95% CI 0.51-1.56, McEwen: OR=0.73, 95% CI 0.43-1.22).

When the analyses were repeated with an adjustment for time lapsed since obtaining a learner permit, instead of age, the pattern of results was the same.

When the cases were confined to drivers who had completed the pre-driver courses at Alexandra and Charlton only, the unadjusted risk of having had at least one accident was more than 40% lower for drivers who had completed these programs but this difference was not statistically significant.

Adjustment for other potential confounding variables showed that being older and driving more in the Melbourne metropolitan area were significantly associated with increased risk of having had at least one accident. The reduction in crash risk associated with completing the Alexandra or CHARTSEC programs fell to 26% after these factors were taken into consideration and this difference was not statistically significant.

4.5.2 Accidents by severity

Table 4.12 shows that the distribution of severity levels was similar for the accidents involving case and control drivers. The unadjusted risk of having had at least one injury accident was 6% lower for drivers who had completed a pre-driver education program with an in-car component, than for other drivers, but this difference was not statistically significant.

Adjustment for other potential confounding variables showed that none of the factors were significantly associated with increased risk of having had at least one injury accident. The reduction in crash risk associated with completing a pre-driver education program with an in-car component remained at 6% after these factors were taken into consideration and this difference was not statistically significant.

Table 4.12. The severity of accidents involving case and control drivers.

Severity	Cases		Controls	
	Number	Percent	Number	Percent
Killed	1	1	1	<1
Admitted to hospital	9	8	14	6
Treated at hospital, not admitted	10	9	11	4
Received medical treatment or first aid	5	4	20	10
Not injured	87	78	204	82
Total	112		250	

When the cases were confined to drivers who had completed the pre-driver courses at Alexandra and Charlton only, the unadjusted risk of having had at least one injury accident was about 30% lower for drivers who had completed these programs but this difference was not statistically significant.

Adjustment for other potential confounding variables showed that driving mostly in Melbourne was significantly associated with increased risk of having had at least one injury accident. The reduction in crash risk associated with completing a pre-driver education program with an in-car component fell to about 20% and this difference was not statistically significant.

4.5.3 Single vehicle accidents

In 37% of accidents reported by case drivers and 45% of accidents reported by control drivers, their vehicle was the only vehicle involved in the accident.

The unadjusted risk of having had at least one single vehicle accident (compared to no accidents or multiple vehicle accidents only) was almost 40% lower for drivers who had completed a pre-driver education program with an in-car component, than for other drivers, which was statistically significant.

Adjustment for other potential confounding variables showed that being older, being male and living in the McEwen electorate (compared to the Mallee electorate) were associated with increased risk of having had at least one single vehicle accident. Having completed a pre-driver education program with an in-car component was associated with a 30% reduction in risk of having had at least one single vehicle accident but this was not statistically significant.

Further adjustment for age at which a learner permit was obtained had little effect on the odds ratio for having completed a pre-driver education program with an in-car component (OR=0.69, 95% CI 0.43-1.12).

When the cases were confined to drivers who had completed the pre-driver courses at Alexandra and Charlton only, the unadjusted risk of having had at least one single vehicle accident was over 50% lower for drivers who had completed these programs and this difference was statistically significant.

Adjustment for other potential confounding variables showed that being older, being male and driving mostly in Melbourne were significantly associated with increased risk of having had at least one single vehicle accident. The reduction in crash risk associated with completing a pre-driver education program with an in-car component fell to about 35% and this difference was not statistically significant.

4.5.4 Reporting accidents to Police

Overall, 38% of accidents involving case drivers and 39% of accidents involving control drivers were reported to Police. For crashes in which someone was injured, these figures rose to 75% and 78%, respectively.

4.6 INFRINGEMENTS

4.6.1 Speeding

The proportions of cases and controls who had any speeding offences did not differ (41% versus 46%, $\chi^2(1)=1.42$, $p>.20$, see Table 4.13).

There was a tendency for drivers who spent more of their time driving in the Melbourne metropolitan area to have more speeding offences (see Table 4.14). While this was not statistically significant for cases ($\chi^2(2)=4.57$, $p=.10$), it was significant for controls ($\chi^2(2)=34.77$, $p<.0001$).

Table 4.13. Summary of numbers of speeding offences recorded by cases and controls.

Number of speeding offences	Cases		Controls	
	Number	Percent	Number	Percent
0	126	59	228	54
1	46	21	99	23
2	23	11	50	12
3	6	3	22	5
4	5	2	10	2
5	1	<1	7	2
6	0	0	4	1
7	2	1	0	0
8	1	<1	3	1
9	0	0	0	0
10	4	2	2	<1
11	0	0	0	0
12	1	<1	0	0
Total with any speeding offences	89	41	197	46
Total with more than one speeding offence	43	20	98	23
Speeding offences/100 drivers	92		96	

Table 4.14. Speeding offences according to proportion of driving that has been in the Melbourne metropolitan area.

	Proportion of driving in Melbourne metropolitan area			
	almost none	some but less than half	half or more	Total
Cases				
some offences	22	39	28	89
no offences	41	60	24	125
Controls				
some offences	46	86	65	197
no offences	112	69	39	220

A series of logistic regression analyses were conducted to examine whether having completed a pre-driver education program with an in-car component significantly affected the risk of having at least one speeding offence (see Table 4.15). The unadjusted risk of having at least one speeding offence was not significantly affected by having completed such a program.

Table 4.15. Summary of logistic regression analyses for speeding offences. Statistically significant odds ratios are bolded. OR=odds ratio, CI=95% confidence interval for the odds ratio

Variable	Entire sample			Cases completing courses at Alexandra, CHARTSEC only		
	OR	lower CI	upper CI	OR	lower CI	upper CI
Any speeding offences						
Completed course	0.82	0.59	1.14	**0.63**	0.41	0.95
Completed course	1.12	0.76	1.65	0.99	0.61	1.60
Age	**1.23**	1.16	1.29	**1.22**	1.14	1.29
Sex	**2.69**	1.88	3.86	**2.52**	1.70	3.73
Region	1.04	0.70	1.54	1.23	0.80	1.91
Some in Melbourne	**1.62**	1.05	2.49	**1.82**	1.14	2.91
Most in Melbourne	**3.06**	1.83	5.13	**4.03**	2.29	7.10
More than one speeding offence						
Completed course	0.84	0.56	1.25	**0.51**	0.29	0.91
Completed course	1.28	0.80	2.05	0.90	0.47	1.75
Age	**1.26**	1.18	1.35	**1.23**	1.14	1.33
Sex	**3.88**	2.48	6.08	**4.07**	2.45	6.76
Region	1.25	0.78	2.00	1.64	0.96	2.80
Some in Melbourne	**2.59**	1.44	4.68	**2.68**	1.40	5.11
Most in Melbourne	**5.47**	2.81	10.66	**6.52**	3.13	13.55

Adjustment for other potential confounding variables showed that being older, being male and driving more in the Melbourne metropolitan area were associated with an increased risk of having one or more speeding offences. However, there was no significant effect of having completed a pre-driver education program with an in-car component.

Given the possibility that multiple speeding offences might be a better predictor of subsequent crash history than one speeding offence only, logistic regression analyses were carried out to compare drivers with more than one speeding offence with those with no speeding offences or only one speeding offence. The pattern of results was the same as that found for the earlier analysis of any speeding offences – no significant effects of having completed a pre-driver program with an in-car component.

When the cases were confined to drivers who had completed the pre-driver courses at Alexandra and Charlton only, the unadjusted risk of having at least one speeding offence was about 35% lower for drivers who had completed these programs and this difference was statistically significant.

Adjustment for other potential confounding variables showed that being older, being male and driving mostly in Melbourne were significantly associated with an increased risk of having at least one speeding offence. The reduction in crash risk associated with completing one of the programs was not statistically significant.

Similar results were found when the odds of having more than one speeding offence were analysed.

4.6.2 Other traffic offences

The proportions of cases and controls who had any other traffic offences did not differ (19% versus 20%, $\chi^2(1)=0.60$, $p>.20$, see Table 4.16).

There was a tendency for drivers who spent more of their time driving in the Melbourne metropolitan area to have more other traffic offences. While this was not statistically significant for cases ($\chi^2(2)=1.31$, $p>.20$), it was significant for controls ($\chi^2(2)=10.89$, $p<.005$).

Table 4.16. Summary of numbers of other traffic offences recorded by cases and controls.

Number of other traffic offences	Cases		Controls	
	Number	Percent	Number	Percent
0	161	81	305	80
1	24	12	58	15
2	9	5	11	3
3	3	2	3	1
4	2	1	1	<1
5	0	0	2	1
6	0	0	1	<1
7	0	0	0	0
8	0	0	1	<1
Total with any other offences	38	19	75	20
Total with more than one other offence	14	7	19	5
Other offences/100 drivers	30		31	

A series of logistic regression analyses were conducted to examine whether having completed a pre-driver education with an in-car component significantly affected the risk of having at least one other traffic offence (summarised in Table 4.17). The

unadjusted risk of having at least one other traffic offence was not significantly affected by having completed such a program.

Adjustment for other potential confounding variables showed that being older and being male were associated with increased risk of having at least one other traffic offence but there was no significant effect of having completed a pre-driver education program with an in-car component.

Table 4.17. Summary of logistic regression analyses for other traffic offences. Statistically significant odds ratios are bolded. OR=odds ratio, CI=95% confidence interval for the odds ratio

Variable	Entire sample			Cases completing courses at Alexandra, CHARTSEC only		
	OR	lower CI	upper CI	OR	lower CI	upper CI
Any other traffic offences						
Completed course	0.95	0.61	1.46	1.00	0.60	1.69
Completed course	1.19	0.74	1.92	1.61	0.88	2.94
Age	**1.14**	1.07	1.21	**1.16**	1.08	1.26
Sex	**2.94**	1.87	4.62	**2.42**	1.49	3.93
Region	0.77	0.47	1.26	1.42	0.84	2.40
Some in Melbourne	1.36	0.78	2.37	1.75	0.95	3.24
Most in Melbourne	1.68	0.87	3.27	**2.16**	1.05	4.43
More than one other traffic offence						
Completed course	1.51	0.73	3.09	0.90	0.33	2.49
Completed course	2.03	0.93	4.43	1.26	0.41	3.91
Age	**1.13**	1.01	1.26	1.08	0.94	1.23
Sex	**7.60**	2.84	20.36	**5.95**	1.92	18.43
Region	0.74	0.31	1.75	1.41	0.53	3.79
Some in Melbourne	0.98	0.37	2.64	1.58	0.47	5.39
Most in Melbourne	1.56	0.49	4.95	2.24	0.55	9.15

Given the possibility that multiple other traffic offences might be a better predictor of subsequent crash history than one other traffic offence only, logistic regression analyses were carried out to compare drivers with more than one other traffic offence with those with no other traffic offences or only one other traffic offence.

The unadjusted odds ratio for having more than one other traffic offence was not significantly affected by having completed a pre-driver education program with an in-car component.

Adjustment for other potential confounding variables showed that being older and being male were associated with increased risk of having more than one other traffic offence but there was no significant effect of having completed a pre-driver education program with an in-car component.

When the cases were confined to drivers who had completed the pre-driver courses at Alexandra and Charlton only, the unadjusted odds ratio for having at least one other traffic offence was not statistically significant.

Adjustment for other potential confounding variables showed that being older, being male and driving mostly in Melbourne were significantly associated with increased risk of having at least one other traffic offence. The increase in crash risk associated with completing one of the programs was not statistically significant.

The unadjusted odds of having more than one other traffic offence were not significantly associated with completing one of the programs. The adjusted odds ratios showed that males were more likely to have more than one other traffic offence but there was no significant association between these offences and having completed one of the programs.

4.7 DRIVING-RELATED ATTITUDES AND BEHAVIOURS

4.7.1 Data completeness

Some respondents did not complete some of the items of the attitude scales. Unfortunately, scale scores can only be calculated if all of the items are completed. The percentage of subjects who answered all of the items is shown for each scale in Table 4.18. Chi-square analyses showed that the completeness of the data did not differ between cases and controls for any of the scales.

Table 4.18. Percentages of cases and controls who answered all items of each of the driver attitude and behaviour scales.

Scale	Percent complete		
	Cases	Controls	Total
Competitive speed	95.7	93.2	94.1
Tension reduction	97.4	94.8	95.7
Aggression	95.3	94.6	94.8
Inhibition	97.4	95.0	95.9
External locus of control	93.6	92.6	92.9
Internal locus of control	97.4	95.7	96.3

4.7.2 Scale scores

For those respondents who had completed all the items of a scale, the number of positive responses from each item was added to form a total for each scale. The maximum value varied according to the number of items on each scale (see Table 4.19). The only scale for which mean scores differed between cases and controls was

tension reduction, where the value for cases was greater than that for controls ($t(646)=2.0$, $p<.05$).

Table 4.19. Mean scores on driver attitude and behaviour scales for cases and controls.

Scale	Mean scale score		
	Cases	Controls	Possible range
Competitive speed	1.20	1.32	0-6
Tension reduction	0.98	0.79	0-4
Aggression	2.85	2.81	0-12
Inhibition	1.89	1.71	0-3
External locus of control	0.32	0.35	0-3
Internal locus of control	2.79	2.73	0-3

The driver attitude scales were sensitive to accident and infringement history, however. Table 4.20 demonstrates that respondents who had been involved in at least one accident had significantly higher scores on competitive speed ($t(558)=3.42$, $p<.01$), aggression ($t(561)=2.34$, $p<.05$) and external locus of control ($t(547)=1.93$, $p=.05$) and lower scores on inhibition ($t(565)=-2.00$, $p<.05$). Similarly, Table 4.21 shows that respondents with one or more speeding offences had higher scores on competitive speed ($t(599)=5.77$, $p<.01$), tension reduction ($t(607)=2.61$, $p<.05$) and aggression ($t(600)=5.06$, $p<.01$) and lower scores on inhibition ($t(609)=-3.61$, $p<.01$).

Table 4.20. Mean scores on driver attitude and behaviour scales for respondents who reported having had some accidents and accident-free respondents.

Scale	Mean scale score		
	Accident-involved	No accidents	Possible range
Competitive speed	1.56	1.15	0-6
Tension reduction	0.93	0.82	0-4
Aggression	3.04	2.60	0-12
Inhibition	1.61	1.81	0-3
External locus of control	0.40	0.31	0-3
Internal locus of control	2.71	2.76	0-3

Table 4.21. Mean scores on driver attitude and behaviour scales for respondents who reported having had some speeding offences and respondents with no speeding offences.

Scale	Mean scale score		
	Any speeding offences	No speeding offences	Possible range
Competitive speed	1.65	1.01	0-6
Tension reduction	0.98	0.74	0-4
Aggression	3.31	2.44	0-12
Inhibition	1.55	1.90	0-3
External locus of control	0.36	0.33	0-3
Internal locus of control	2.71	2.79	0-3

4.8 SUMMARY OF RESULTS

The analyses compared drivers who had undertaken pre-driver education programs with an in-car component (cases) with drivers who had not (controls). The results for the measures are summarised below:

licensing ages and rates – cases obtained their learner permits and probationary licences at a lower average age than controls but did not differ in how long they held a learner permit. Similar percentages of cases and controls aged under 20 had obtained a probationary licence.

amount of experience gained at each stage of the licensing process – there was no difference between cases and controls in the number of hours driven on the road before obtaining a learner permit, but cases had driven more hours off the road. This was possibly because they counted the pre-driver education course as off-road driving. There were no differences between cases and controls in the total number of hours of driving while holding a learner permit. After controlling for age, cases and controls did not differ in the distance or time they had driven since obtaining a probationary licence. Cases did more of their driving in the Melbourne metropolitan area than controls.

training – there were no differences in the percentages of cases and controls who received lessons from a professional driving instructor or in who else accompanied the learner driver. Among respondents who obtained their learner permits after 1 July 1990, relatively fewer cases than controls had more than 10 hours of lessons. Similar numbers of cases and controls had completed other driver training courses and the mix of locations (on- and off-road) did not differ.

accident involvement – being older, being male, living in McEwen (compared to Mallee) electorate and driving more in the Melbourne metropolitan area were significantly associated with increased risk of having had at least one accident. However, the 20% reduction in risk associated with having completed a pre-driver education program with an in-car component was not statistically significant. The

numbers of injury accidents were too small to show significant effects of any variables. The risk of having a single-vehicle accident was significantly greater for older drivers, males and drivers living in McEwen (compared to Mallee) electorate. The 30% reduction in risk associated with having completed one of the programs was not statistically significant.

When the analyses were repeated with an adjustment for time lapsed since obtaining a learner permit, instead of age, the pattern of results was the same.

When the cases were restricted to those who had completed the programs at Alexandra Secondary College and CHARTSEC, the risk reductions associated with having completed one of the programs were somewhat larger than for the entire sample but remained not statistically significant.

traffic offences – being older, being male and driving more in the Melbourne metropolitan area were associated with significantly increased risk of having at least one speeding offence. The 12% increase in risk associated with having completed a pre-driver education program with an in-car component was not statistically significant. The analysis related to having more than one speeding offence (compared to zero or one) gave a similar pattern of results.

Being older and being male were significantly associated with an increased risk of having at least one other traffic offence. The 19% increase in risk associated with having completed a pre-driver education program with an in-car component was not statistically significant. The analysis related to having more than one other traffic offence (compared to zero or one) gave a similar pattern of results.

When the cases were restricted to those who had completed the programs at Alexandra Secondary College and CHARTSEC, the adjusted analyses showed no significant effects of the programs on risk of having at least one speeding offence (or more than one speeding offence) or on risk of having at least one other traffic offence (or more than one other traffic offence).

driving-related attitudes and behaviours - the only driver attitude scale for which mean scores differed between cases and controls was tension reduction, where cases drove more to reduce tension han controls. The driver attitude scales were sensitive to accident and infringement history, however. Compared to respondents who had not been involved in accidents, respondents who had been involved in at least one accident had significantly higher scores on the competitive speed, aggression and external locus of control scales and lower scores on the inhibition scale. Compared to respondents without speeding offences, respondents with one or more speeding offences had higher scores on the competitive speed, tension reduction and aggression scales and lower scores on the inhibition scale.

5.0 DISCUSSION

The analyses showed that the respondents who had completed a pre-driver education program with an in-car component obtained their learner permits and probationary licences at lower average ages than the respondents who had not. However, the two groups did not differ in the duration that the learner permit was held or the amount of experience obtained during this period.

Completing a pre-driver education program with an in-car component led to a nonsignificant reduction in accidents and a nonsignificant increase in traffic offences. The major factors associated with having had accidents or traffic offences were driver age, sex and the amount of driving that took place in the Melbourne metropolitan area.

The respondents who had completed a pre-driver education program with an in-car component and those who had not did not differ significantly on most measures of driving-related attitudes and behaviours. These measures were, however, sensitive to accident and traffic offence history.

This section discusses a number of issues in the interpretation of the results:

- the validity of the comparisons,
- the statistical power of the study, and
- the generalisability of the findings.

Other issues discussed here are the duration of the effects, differences between locations and rural and metropolitan driving, and driving-related attitudes and behaviours.

5.1 THE VALIDITY OF THE COMPARISONS

The aim of this study was to compare the effects of pre-driver education programs at rural secondary schools which have an in-car component with the effects of pre-driver education programs which do not have an in-car component. Thus, the study attempted to measure the net effects of the in-car component of these programs.

The analyses compared drivers who had undertaken pre-driver education programs with an in-car component (cases) with drivers who had not (controls). The controls were a mixture of drivers who had undertaken pre-driver education programs **without** an in-car component and drivers who had **not** undertaken a pre-driver education program. Unfortunately, the wording of the questionnaire did not distinguish between these two sub-groups of controls.

Given the mixed set of controls, the comparison between cases and controls does not clearly measure the net effect of the in-car component but rather the effect of the in-car component plus part of the effect of the classroom component. This is because

those controls who did not undertake a pre-driver education program did not have the classroom component or the in-car component.

Thus, the finding that cases received learner permits and probationary licences earlier than controls may not have been an effect purely of the in-car component. It is possible that the more widespread completion of the classroom component by cases than controls may have also contributed to this finding.

5.2 STATISTICAL POWER OF THE STUDY

The power calculations reported in Section 3.1 predicted that a significant result would be found if there was a 40% response rate and a drop in the accident rate from 50% to 40% or 45% (or a 30% response rate and a drop in the accident rate from 50% to 40%). The actual response rate to the 2,000 questionnaires was 34% overall, comprising 23% for cases and 45% for controls (this assumes that equal numbers of recipients were cases and controls which may not be correct, but this does not affect the power calculations). The power calculations for the actual response rate show that a difference of 22% in the accident rates of the case and control groups would have been required for this difference to be statistically significant. In the unadjusted analyses, significant effects of having completed a pre-driver education program with an in-car component were found but these were artefacts resulting from the different mean ages of the two groups.

The adjusted analyses had sufficient power to detect effects of driver age, sex and proportion of driving that was undertaken in the Melbourne metropolitan area on risk of involvement in an accident, risk of having one or more speeding offences and risk of having one or more other traffic offences. The same analyses showed no significant effects of having completed a pre-driver education program with an in-car component.

This suggests that the effects of having completed a pre-driver education program with an in-car component are less than the effects associated with driver age, sex and proportion of driving which is undertaken in the Melbourne metropolitan area.

5.3 GENERALISABILITY OF THE FINDINGS

5.3.1 Representativeness

The questionnaires were mailed to 2,000 people enrolled to vote in the Federal electoral divisions of Mallee and McEwen. At least 6% of these people were no longer living at their enrolled address (as indicated by the questionnaire being returned to sender). Of those who were contacted, 38% returned completed questionnaires.

Response rates for mail surveys are generally low (Harrison, Penman and Pennella, 1997). A typical response rate of 25% for single wave mail surveys in Australia has been reported by Ray and Still (1987, cited in Harrison et al., 1997). Response rates of this magnitude have been reported in various other studies also (e.g., Church and

Burke, 1994; Guadagnoli and Cunningham, 1989; Wunder and Wynn, 1988; all cited in Harrison et al., 1997; Tambor, Chase Faden and Geller, 1993;).

A low response rate can provide a representative sample of the population, although this is less likely than with a higher response rate (Harrison et al., 1997). The issue to be addressed is the extent to which the respondents can be considered to be representative of the original sample of 2,000.

The rate of questionnaires being returned to sender was 3% among probable cases but 9% among probable controls (largely contributed by Mallee probable controls). It is possible that the young people who were no longer living at their enrolled address were different than the young people who still lived at their enrolled address. Given the small percentage of the 2,000 that this involved (6%), any effect on the results would be expected to be very small.

The percentage of respondents who were female was similar for cases and controls. Controls were older than cases, on average, but this bias was adjusted for in the statistical analyses.

To some extent the respondents are a "survivor" population in that information was not available from those persons who had been killed or severely injured in crashes. If a pre-driver education program with an in-car component truly reduced involvement in serious crashes, then the exclusion of persons who had been killed or severely injured would reduce the ability of the study to detect such an effect.

However, the magnitude of any reduction is likely to have been small. Examination of published death rates (Bordeaux, 1998) suggests that from a population of 2000 young people less than 10 people would have been killed or injured severely enough to prevent them completing the questionnaire in the time since age 15 or 16.

A potentially larger issue is that perhaps the people who did not return questionnaires had more accidents and infringements than those who responded. If a pre-driver education program with an in-car component truly reduced involvement in accidents and reduced infringements, then lower responding by those who had been involved in accidents and had a history of infringements would reduce the ability of the study to detect such an effect.

While the above is possible, the finding that both cases and controls reported more than 90 speeding offences per 100 drivers suggests that drivers who had committed speeding offences remained willing to complete the questionnaire.

In summary, three potential issues which could affect the representativeness of the data were identified:

- possible differences between people who were still living at their enrolled address and those who were not
- the lack of data from people who had been killed or injured severely enough to prevent them completing the questionnaire
- possible differences in accident and infringement history between those who returned the questionnaire and those who did not

However, the effect of these three factors, separately and combined, on the results of the study is likely to have been small.

5.3.2 Nature of the population and the programs

The respondents in the study were recruited from the population of persons aged 18 to 29 years (at 1 August 1998) who were enrolled to vote in the Federal electoral divisions of Mallee and McEwen. With some exceptions, the respondents grew up in the country, were living in the country and drove mostly in the country. It is unclear whether the effect of a pre-driver education program with an in-car component would have been the same for persons resident in urban areas. The results suggest that residents of Melbourne would have had more speeding and other traffic offences and thus the potential for a pre-driver education program with an in-car component to decrease this measure of unsafe driving behaviour may have been greater.

The programs were delivered to students in Year 10 who were mostly 15 or 16 years old. The minimum age for obtaining a learner permit was 16 for most of the respondents. This relationship of the age of the students and the age at which they may obtain a learner permit appears to contribute to the degree of interest in the programs by the students. It may also affect the outcome of the program. Thus, the results of this study may not generalise to programs presented to students who are older or younger or to jurisdictions where the minimum age for obtaining a learner permit differs.

The study compares outcomes for students who attended pre-driver education programs with an in-car component with students who did not. But clearly the extent and manner in which pre-driver education was taught in the other schools may differed. This study thus compares the outcomes of the two programs with that of a group of schools who probably represent the average of what is done in rural Victoria, rather than the optimum pre-driver education program (without an in-car component).

5.4 DURATION OF EFFECTS

The respondents in this study were aged from 18 to 29 years. While the youngest respondents may have completed a pre-driver program only two years ago, the elapsed time since older respondents had completed a course was much greater. It is possible that any effect of a pre-driver program decreases over time and that using a large age range in this study may have diluted any possible effect.

It would be useful to examine the effects of pre-driver programs over a shorter time period to assess whether there is a short-term effect. The number of accidents would be a less useful measure over a shorter time, but the current study has shown that driving-related attitudes and behaviours appear to be a good proxy measure for accident involvement.

5.5 DIFFERENCES BETWEEN LOCATIONS

The study included respondents (both cases and controls) from the Federal electoral divisions of Mallee and McEwen. In order to maximise statistical power, data from the two locations were combined for most analyses. When data from the two locations were analysed separately, both showed no significant effect of having completed a pre-driver education component with an in-car component on accident involvement (after adjustment for age).

Both cases and controls from the McEwen electoral division were more likely to have had accidents than cases and controls from the Mallee electoral division, even after adjusting for more Melbourne driving by McEwen respondents. This may reflect more difficult driving conditions in McEwen which has a hilly and forested terrain or perhaps higher traffic volumes in McEwen because of its proximity to Melbourne.

5.6 DRIVING IN MELBOURNE

The amount of a respondent's driving that occurred in the Melbourne metropolitan area affected most of the measures. Cases did more of their driving in the Melbourne metropolitan area and therefore the logistic regression analyses adjusted for this variable. In these analyses, driving more in the Melbourne metropolitan area was associated with increased risk of having had at least one accident and with having one or more speeding offence.

The mechanism of the effect of driving more in Melbourne is unclear from the study. The simplest explanation is that more driving in Melbourne means exposure to greater traffic volumes and a higher level of speeding enforcement. It is possible, however, that respondents who drive more in Melbourne are somehow different from those who drive less in Melbourne.

5.7 DRIVING-RELATED ATTITUDES AND BEHAVIOURS

The scores on the driving-related attitudes and behaviours scales discriminated between respondents who had some accidents and those who had not and between respondents who had some speeding offences and those who had not.

Respondents with an accident history had significantly higher scores on competitive speed, aggression and external locus of control and lower scores on inhibition. In Deery et al.'s (1998) study, drivers were newly licensed and so numbers of accidents were small. The current study shows that, given a wider range of age and driving experience than available in their study, the scale scores differ between accident and nonaccident-involved drivers.

Respondents who had one or more speeding offences had higher scores on competitive speed, tension reduction and aggression and lower scores on inhibition. These results are similar to those reported by Deery et al. (1998) who found that drivers in the most deviant clusters, who had more traffic violations, also scored

higher on competitive speed and tension reduction (and drivers in his Cluster 5 also scored higher on aggression).

This study provides further evidence that driving-related attitudes and behaviours are good predictors (or proxy measures) of accident involvement.

5.8 RELEVANCE OF THE RESULTS

The results of this study are similar to those found in earlier, larger studies. The DeKalb County Driver Education Project and the New Zealand Automobile Association study (Lonero et al., 1998), like the current study, found that students assigned to the improved curriculum were licensed earlier. In contrast to the DeKalb County Project, the current study found no increase in accident involvement or traffic violations for students who had completed pre-driver education with an in-car component. This may be because the earlier licensing in this study allowed accompanied driving only. Thus, pre-driver education prior to a learner permit may not be subject to the same possibility of negative effects as found in jurisdictions where there is not a learner permit system.

The more recent view (Cavallo and Triggs, 1996; Smith and Triggs, 1996) has been that increased experience on-road as a learner driver may be the crucial factor in learning safe driving behaviour. If this is true, then a large effect of pre-driver education with an in-car component on accident involvement would be unlikely given that, while the program appeared to result in earlier licensing, it did not lead to increased experience while a learner driver.

Perhaps the most significant effect of the in-car component is to increase the participation rate of young students in the program when it is offered on a voluntary basis. Anecdotal reports support this possibility.

6.0 CONCLUSIONS

The analyses showed that the respondents who had completed a pre-driver education program with an in-car component obtained their learner permits and probationary licences at lower average ages than the respondents who had not. However, the two groups did not differ in the duration that the learner permit was held or the amount of experience obtained during this period.

Completing a pre-driver education program with an in-car component led to a nonsignificant reduction in accidents and a nonsignificant increase in traffic offences. The major factors associated with having had accidents or traffic offences were driver age, sex and the amount of driving that took place in the Melbourne metropolitan area.

The respondents who had completed a pre-driver education program with an in-car component and those who had not did not differ significantly on most measures of driving-related attitudes and behaviours. These measures were, however, sensitive to accident and traffic offence history.

The results were similar whether the cases were defined as drivers who had completed the pre-driver education program at Alexandra Secondary College or CHARTSEC, or the cases were defined as all those who had completed any school-based pre-driver education program with an in-car component.

It should be noted that the analyses compared drivers who had undertaken pre-driver education programs with an in-car component (cases) with drivers who had not (controls). The controls were a mixture of drivers who had undertaken pre-driver education programs **without** an in-car component and drivers who had **not** undertaken a pre-driver education program. Thus, the finding that cases received learner permits and probationary licences earlier than controls may not have been an effect purely of the in-car component. It is possible that the more widespread completion of the classroom component by cases than controls may have also contributed to this finding.

Like earlier, larger studies, the current study found that students assigned to the improved curriculum were licensed earlier. In contrast to some of the earlier studies, the current study found no increase in accident involvement or traffic offences for students who had completed pre-driver education with an in-car component. This may be because the earlier licensing in this study allowed accompanied driving only. Thus, pre-driver education prior to a learner permit may not be subject to the same possibility of negative effects as found in jurisdictions where there is not a learner permit system.

Further research is needed to examine whether there are short-term effects of pre-driver education with an in-car component and whether these effects justify the resources required for delivery of the in-car component.

ACKNOWLEDGMENTS

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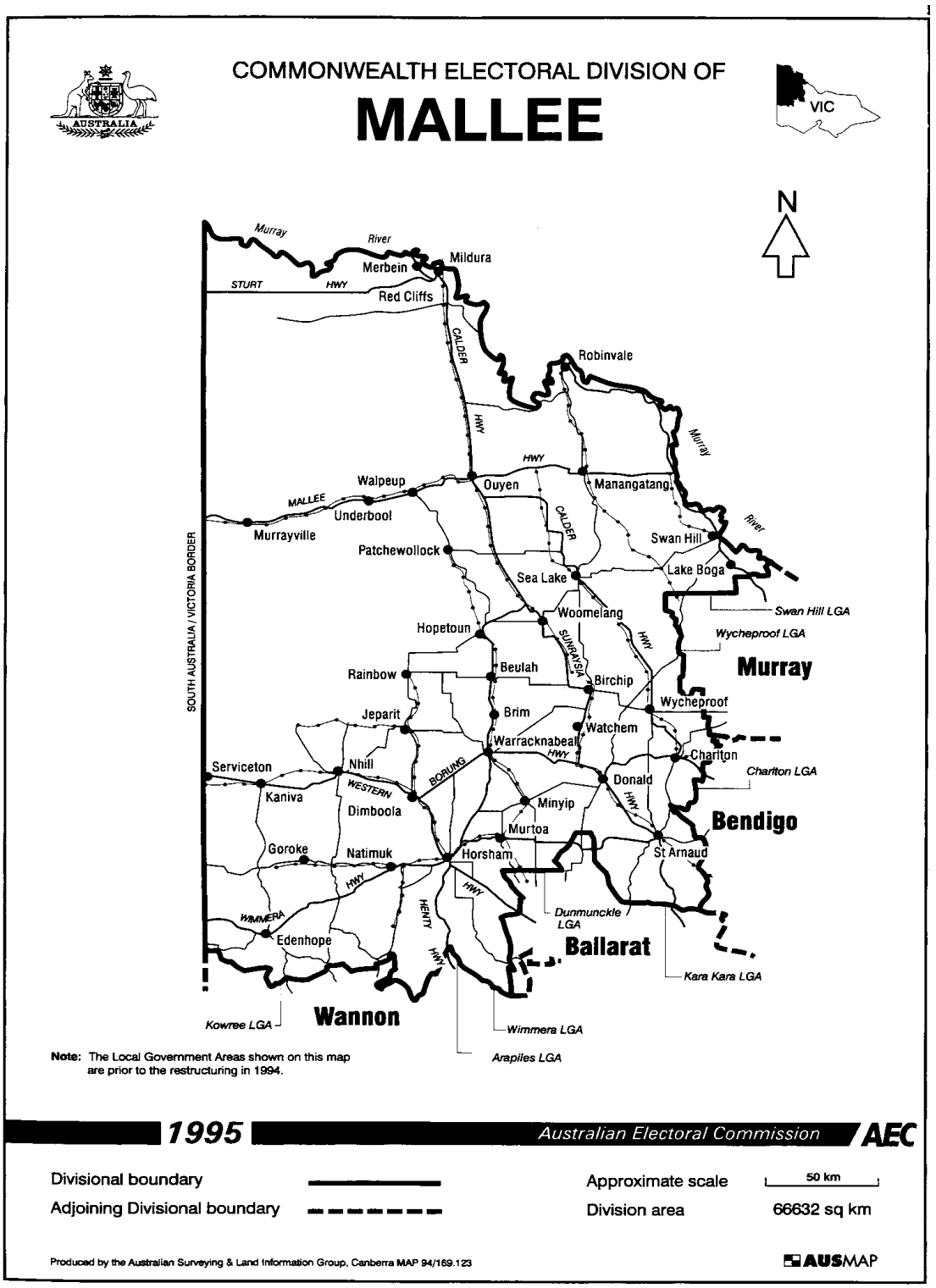
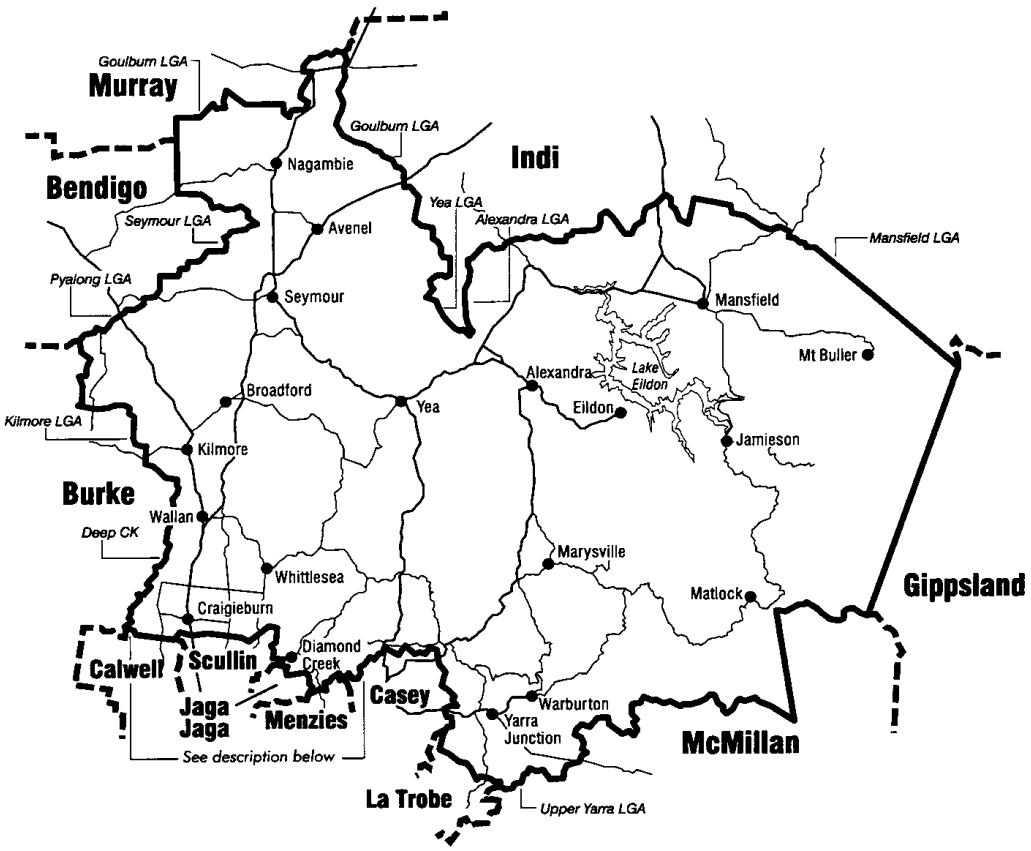
APPENDIX ONE: MAPS OF THE ELECTORATES OF MALLEE AND McEWEN



COMMONWEALTH ELECTORAL DIVISION OF

McEWEN



Description: Deep Creek, Wildwood Road, Somerton Road, Power Transmission Line, Yan Yean Road, Sutherland Road, Main Street, Ryans Road, Allendale Road, Diamond Creek, Wattletree Road, Main Road, Mt Pleasant Road, Research-Warrandyte Road, Stony Creek, Yarra River, Upper Yarra LGA

Note: The Local Government Areas shown on this map are prior to the restructuring in 1994.

1995 *Australian Electoral Commission* AEC

Divisional boundary

Adjoining Divisional boundary

Approximate scale 25 km

Division area 14328 sq km

Produced by the Australian Surveying & Land Information Group, Canberra MAP 94/169.125

AUSMAP

APPENDIX TWO: COVERING LETTER

DRIVER EDUCATION SURVEY

The Accident Research Centre at Monash University is undertaking a survey of how country people learn to drive, how far they drive and how these factors affect the types of accidents that they have. Our aim in collecting this information is to be able to make recommendations about how to improve the safety of new drivers.

We are asking you to help us do this. We would like you to complete the enclosed survey form and send it back to us in the enclosed envelope. No postage stamp is required. Most questions just require you to place a tick (✓) in the appropriate box. Some others require you to write down a date or a number.

The Australian Electoral Commission (AEC) has provided name, address and decade age-range information for this medical research study in conformity with sections 91(4A)(e) and 91A(2A)(c) of the Commonwealth Electoral Act 1918 and Regulation 10 of the Electoral and Referendum Regulations. The AEC has not disclosed particulars of the occupations, dates of birth or gender of any electors registered on the Commonwealth Electoral Roll.

The information we collect is for research purposes only and will be treated in the strictest confidence. The way the information will be held will be anonymous and will not be traced back to you. The survey form does not have your name or address on it. The code number on the survey form allows us to check off which forms have been returned so that we can send out reminder notices, if necessary. We will destroy the link between the names and the code numbers as soon as the deadline for receiving questionnaires has passed.

If you would like to find out about the results of the study, or about the work of the Monash University Accident Research Centre, please visit our Web site at www.general.monash.edu.au/muarc. We anticipate that the final results of the study will be available and posted on the web site in early 1999.

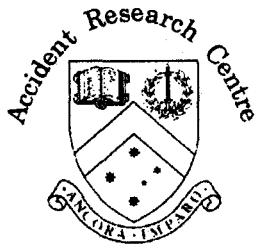
Yours sincerely

Dr Narelle Haworth
Senior Research Fellow

Should you have any complaint concerning the manner in which this research (project number 98/235) is conducted, please do not hesitate to contact The Standing Committee on Ethics in Research on Humans at the following address:

The Secretary
The Standing Committee on Ethics in Research on Humans
Monash University
Wellington Road
Clayton Victoria 3168
Telephone (03) 9905 2052 Fax (03) 9905 1420

APPENDIX THREE: QUESTIONNAIRE



MONASH UNIVERSITY
ACCIDENT RESEARCH CENTRE

DRIVER EDUCATION SURVEY

RESEARCH SUPPORTED BY
THE COMMUNITY SUPPORT FUND, VICTORIA

We are interested in finding out how country people learn to drive, how far they drive and how this affects the types of accidents that they have. Our aim in collecting this information is to be able to make recommendations about how to improve the safety of new drivers.

Please answer all questions honestly. Remember that any information you provide will remain strictly confidential and will only be used for this study.

Most questions require you to place a tick (✓) in the appropriate box. Some others require you to write down a date or number.

Think back to before you obtained your car learner's permit:

1. How many hours in total had you driven **on the road**?
   - none ❑
   - 1 to 10 ❑
   - 11 to 20 ❑
   - more than 20 ❑

2. How many hours in total had you driven **off the road** (i.e. on farms, private property, school facilities etc.)?
   - none ❑
   - 1 to 10 ❑
   - 11 to 20 ❑
   - more than 20 ❑

3. When did you obtain your car learner's permit? ...../..... (month/year)
   - haven't obtained yet ❑

4. While you had your car learner's permit, did you receive any lessons from a professional driving instructor?
   - yes ❑
   - no ❑

If so,

5. How many hours of lessons did you receive?
   - 1 to 3 ❑
   - 4 to 10 ❑
   - more than 10 ❑

6. Who else accompanied you when you had your learner's permit?
   - mostly parent ❑
   - mostly older friends or siblings ❑
   - sometimes parent, sometimes older friend or sibling ❑

7. Approximately how many hours in total did you drive while you held your car learner's permit?
   - less than 10 hours ❑
   - 10 to 49 hours ❑
   - 50 to 99 hours ❑
   - more than 100 hours ❑

8. When did you first obtain your **car probationary licence**?
   ...../..... (month/year)
   - haven't obtained yet ❑

9. Approximately how many **hours** in total have you driven since obtaining your car probationary licence?
   - less than 100 hours ❑
   - 100 to 199 hours ❑
   - 200 to 299 hours ❑
   - more than 300 hours ❑

10. Approximately how **far** in total have you driven since obtaining your car probationary licence?
    - less than 200 km ❑
    - 200 to 999 km ❑
    - 1,000 to 9,999 km ❑
    - 10,000 to 24,999 km ❑
    - more than 25,000 km ❑

INSTRUCTIONS: Circle the **True (T)** next to the item if it is **generally true** of your opinion about driving or of your behaviour as a driver. Circle the **False (F)** next to the item if the statement is **not true** of your opinion about driving or your behaviour as a driver.

		True	False
11.	Skill in handling a car is less important to safety than an attitude of carefulness	T	F
12.	I often make rude signs at other motorists who annoy me	T	F
13.	I find driving a form of relaxation which I use when I feel tense	T	F
14.	It's fun to manoeuvre and weave through traffic	T	F
15.	I lose my temper when another driver does something stupid	T	F
16.	During the past few months I have gone driving to "blow off steam"	T	F
17.	I am not easily provoked or angered when driving	T	F
18.	It's fun to outwit other drivers	T	F
19.	I have given chase to a driver who has annoyed me	T	F
20.	I find it difficult to control my temper when driving	T	F
21.	Taking chances while driving is just asking for trouble	T	F
22.	I have been known to flash my car lights at others in anger	T	F
23.	When driving on a highway I normally get passed by more cars than I pass myself	T	F
24.	Driving helps me forget about pressures	T	F
25.	Most drivers who have accidents are just unlucky	T	F
26.	I like to pass other cars on the highway even if I'm not in a hurry	T	F
27.	I swear out aloud at other drivers	T	F

		True	False
28.	The driver who breaks the law should be held responsible for an accident in which they are involved	T	F
29.	I use my horn a great deal	T	F
30.	When I am feeling annoyed or angry I tend to drive more carefully because I am afraid of losing control of the car	T	F
31.	It's not reasonable to blame "conditions" for accidents since it's up to the driver to allow for them	T	F
32.	If a driver follows too closely, I might hit the brakes to teach him or her a lesson	T	F
33.	Modern highways are so good you don't have to worry about the conditions of the road when you drive	T	F
34.	It's fun to beat other drivers when taking off from traffic lights	T	F
35.	I get annoyed if the traffic lights change to red as I approach them	T	F
36.	When I am angry or stressed I make a conscious effort to make sure I drive safely	T	F
37.	Driving at high speeds is exciting	T	F
38.	I swear under my breath at other drivers	T	F
39.	I generally become more cautious while driving when I am upset	T	F
40.	If the driver behind me has his lights shining in my mirror, I pay him back in some way	T	F
41.	When I am upset, driving helps soothe my nerves	T	F

42. How many road accidents have you been involved in as a driver? .....
(if zero, go to Question 46)
(Include any accident in which someone was hurt, the Police were called OR the car was damaged to the extent that it could not be driven away.)

FOR THE THREE MOST SERIOUS ACCIDENTS:

		First	Second	Third
43.	Was yours the only vehicle involved in the accident?			
	yes	❑	❑	❑
	no	❑	❑	❑
44.	The most severely injured person was			
	killed	❑	❑	❑
	admitted to hospital	❑	❑	❑
	treated at hospital but not admitted	❑	❑	❑
	received medical treatment or first aid	❑	❑	❑
	not injured	❑	❑	❑
45.	Was the accident reported to the Police?			
	yes	❑	❑	❑
	no	❑	❑	❑
	don't know	❑	❑	❑

46. Do you agree to us obtaining information from VicRoads regarding your drivers' licence record?
yes ❑
no ❑

47. If so, please write down your drivers' licence number here
.....

How many times have you received a ticket (or had to go to Court)

48. for speeding? .....
49. for any other driving-related matter (not parking)? .....

50. What proportion of your driving has been in the Melbourne metropolitan area?

- almost none ❑
- some but less than half ❑
- half or more ❑

In order to look at some of the factors which may affect driving experience, we would like to know a few things about you.

51. What is your sex?

- male ❑
- female ❑

52. What is your date of birth? ...../ ..... /.....
(day) /(month)/ (year)

53. Which secondary college did you attend?
.....

54. Did you attend a driver education course **arranged by your secondary college** that involved driving a car?

- yes ❑
- no ❑

If so,

55. Where did the driving occur?

- on the road ❑
- off the road ❑

56. Where was the course held? .....

57. When did you attend the course? 19..... (year)

58. Did you complete the course **before** obtaining your learner's permit?

- yes ❑
- no ❑

59. Have you completed **any other** driver training courses?

yes ❑

no ❑

If so,

60. Where did the driving occur?

on the road ❑

off the road ❑

61. Where was the course held? .....

62. When did you attend the course? 19..... (year)

Thank you for taking the time to complete this questionnaire.

Please place your completed questionnaire in the reply-paid envelope and post it to us. No postage stamp is required.

If you would like to find out about the results of the study, or about the work of the Monash University Accident Research Centre, please visit our Web site at www.monash.edu.au/muarc. We anticipate that the final results of the study will be available in early 1999.

Should you have any complaint concerning the manner in which this research is conducted, please do not hesitate to contact The Standing Committee on Ethics in Research on Humans at the following address:

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