Title
Speed and Young Drivers: Developing Countermeasures to Target Excessive Speed Behaviours Amongst Young Drivers.

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Abstract
The purpose of this project was the provision of recommendations concerning the development of enforcement methods or procedures that will better target excessive speed amongst younger drivers. An analysis of crash data confirmed general predictions that young drivers, and young males in particular, are more likely to be involved in crashes defined as speed-related than are older drivers.

The results of a survey of younger drivers were ambiguous with respect to the likely effect of an enforcement program. It was clear that exposure to enforcement has an effect on the perceived risk of detection for speeding, but it was also clear that the perceived risk of detection was not related to other speed-related attitudes such as the driver’s comfort exceeding the speed limit or the effect of the speed limit on driving behaviour. This confirms that factors other than enforcement contribute to speeding behaviour, and that increased enforcement levels are unlikely, on their own, to impact on the actual behaviour of younger drivers.

This issue is discussed, and it is concluded that some characteristics of a successful enforcement program might include additional nighttime enforcement activity; a focus on the personal risk of detection as opposed to a focus on the theoretical risk of detection; a reliance on uncertainty in the placement of enforcement activity; and the use of visible enforcement.

Key Words
Enforcement, Police, Speed, Driver behaviour, Adult

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EXECUTIVE SUMMARY

The purpose of this project was the provision of recommendations concerning the development of enforcement methods or procedures that will better target excessive speed amongst younger drivers. Crash data and a survey of the attitudes of younger drivers were used as the basis for considering the development of targeted enforcement techniques.

The analysis of crash data confirmed general predictions that young drivers, and young males in particular, are more likely to be involved in crashes defined as speed-related than are older drivers. This underscores the potential benefits that may still result from the application of targeted countermeasures directed specifically towards younger (male) drivers engaged in excessively fast driving.

A number of factors suggested that it might be necessary to increase the amount of nighttime speed enforcement substantially to have an impact on the driving behaviour of younger drivers. These included the lack of high-intensity speed enforcement programs at night, evidence that younger drivers are more likely to engage in nighttime road use than are older drivers, and that road use patterns for younger drivers at night were related to motivations that are associated with a higher risk of crashing.

The pattern of speed-involvement in crashes also argues for an enforcement method and supporting public education which links enforcement activity to wet-weather driving and driving on curves, as both presented problems for younger drivers.

The attitude data were ambiguous with respect to the likely effect of an increased enforcement program. It is clear that exposure to enforcement has an effect on the perceived risk of detection for speeding, suggesting that an increase in the perceived level of enforcement should at least increase the perceived risk of detection for this offence. Further, it is well understood that high levels of enforcement activity in Victoria have been shown to be associated with reduced crashes. It is also clear, however, that the perceived risk of detection was unrelated to other speed-related attitudes such as the driver's comfort exceeding the speed limit or the effect of the speed limit on driving behaviour. This suggests that increased enforcement levels may need to be considered in the broader context of other factors known to be associated with driving speed.

This issue is discussed, and it is concluded that some characteristics of a successful enforcement program might include:

- A focus on the personal or actual risk of detection rather than the theoretical or risk of detection. This characteristic argues for a high-detection approach to the targeted enforcement program, perhaps using automated enforcement techniques.

- A reliance on uncertainty in the placement of enforcement activity. The use of predictable enforcement locations and times would be expected to maximise the perceived risk of detection at those locations and times, but would do little to increase the ability of perceived risk of detection to control behaviour in a general sense. A randomised enforcement program might assist in the increasing the unpredictability of enforcement activity.
- Some use of visible enforcement. Some level of highly visible enforcement would act to reinforce any public education programs that focus on the perceived risk of detection.

The cluster analysis provided additional data that may be useful in the development of any accompanying public education program to support an increase in targeted enforcement. There were some specific characteristics of the high-risk groups that could be used as the basis for characters in public-education material to improve its relevance. These characteristics included biases towards:

- Males rather than females;
- Car owners;
- People who drive for social reasons at night (nightclubs and parties); and
- People with offence histories.
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INTRODUCTION

This project was concerned with the road safety problems associated with excessive driving speed and younger or novice drivers. Speed enforcement programs (combined with supporting public education programs) have proven effective in Victoria with consistent evidence supporting the road safety benefits of high-intensity speed enforcement (Newstead, Mullan, & Cameron, 1995). While some evidence (Newstead, Cameron, Gantzer, & Vulcan, 1995) suggests that younger drivers have also been influenced by the combined media/enforcement programs typical in Victoria, there is little other evidence available concerning the effect of speed enforcement on younger drivers or, more importantly, which suggests ways in which speed enforcement could be targeted specifically at this group of road users.

The aim of this project was to use a number of sources of data to suggest enforcement strategies that might ensure improved outcomes for this group of road users.

THE NATURE OF THE PROBLEM

Novice drivers are widely recognised as having specific road-safety problems. In addition to the wide range of cognitive-skill deficits thought to accompany novice driving (Gregersen, 1997; Harrison, 1997; Harrison, Triggs, Wheeler, & Fitzharris., 1997; Mayhew and Simpson, 1995), young drivers are also subject to a number of additional factors which are likely to impact negatively on their safety. For young, novice drivers these include a number of maturational or developmental processes which are likely to make them less safe. They are also developing increasing autonomy from their parents and links with a wider range of social influences. There is some evidence that driving in this age group can serve a range of needs that are not strictly transport related, and that these non-transport needs may be related to a higher risk of crash involvement (Gregersen & Berg, 1994).

The use of motor vehicles for social and other non-transport motivations may result in young drivers having greater exposure at nighttime, when they may be less able to cope with complex driving tasks under conditions of limited visibility. Evidence relating to the crash risk of young drivers at night suggests that their crash risk is higher under these conditions (Drummond, Cave, & Healy, 1987).

Novice drivers are more likely to engage in objectively risky behaviour - that is, behaviour that is more likely to result in a crash. Evans and Wasielewski (1983), for example, reported that driving headway choice (previously shown to be related to crash involvement and offence history) was relatively consistent within individuals and was related to driver age. Younger drivers chose closer (and therefore riskier) headways. Wasielewski (1984) reported similar results using speed as his measure of risky behaviour, and Noordzij, Meester, and Vershuur (1988) noted that young drivers were less likely to wear seat belts.

There is some evidence that young drivers are more likely to be involved in speed-related crashes. Macdonald’s (1994) review of a range of empirical sources suggests that younger drivers are more likely than older drivers to be involved in single vehicle crashes, crashes on curves, crashes at night, and crashes thought to involve excessive speed.
Converging lines of evidence, therefore, lead to a general conclusion that younger drivers may be more likely to drive at excessive speed than older drivers, to have driving motivations that are associated with heightened crash risk, to be under a range of social and psychological pressures when driving that bias their behaviour towards higher risk, to lack the cognitive to cope with complex or unusual driving situations, and to have a higher level of involvement in speed-related crashes than other drivers.

The potential for enforcement and related programs to influence the speed-related behaviours of young drivers was the central issue in this project.

PLACING ENFORCEMENT IN CONTEXT

There is no doubt that speed enforcement has an effect on driving behaviour — measured in terms of both speed and crash outcomes. There is strong and consistent evidence that the Victorian speed enforcement program has resulted in significant reductions in crash frequency at or near the location of the speed enforcement activity (eg. Harrison, Fitzharris, Newstead, Gelb, & Cameron, in preparation; Newstead, Cameron, Gantzer, & Vulcan, 1995; Newstead, Mullen, & Cameron, 1995).

In the broader context, many factors (in addition to enforcement activity) contribute to driving speed. An understanding of the way in which speed choice relates to these factors is essential in the development of enforcement strategies to control speed, as they form the background onto which enforcement programs are placed. The ability of enforcement programs to modify speeding behaviour is likely, in part, to be determined by the interaction between these and the other factors that contribute to speed choice.

Harrison, Fitzgerald, Pronk, & Fildes (1998) introduced a model of speed behaviour designed to take into account the complexity of factors involved in speed selection. This model views speed selection as a feedback-controlled behaviour under the control of many environmental and intrapersonal factors. It is consistent with recent arguments about the effect of enforcement on behaviour that involve the application of recent developments in psychological theories of decision-making (Harrison, 1998a, 1998b).

The model introduced by Harrison et al. (1998) was based on the following considerations:

• Decisions about driving speed cannot adequately be described as single decisions at a single point in time prior to a journey. Rather, they are better described as continuous adjustments to driving speed at many points in time in the presence of a range of influences and feedback concerning the effects of earlier adjustments.

• Speed choice, as a continuous process, is likely to be influenced by many factors, including a range of environmental and psychological factors (Harrison, 1998a, b). Enforcement under this model would be viewed as an environmental factor.

• In the context of a “continuous adjustment” model of speed decisions, drivers may be viewed as behaving in response to a range of forces that bias them towards increasing or reducing their speed at any point in time. These forces include internal forces such as motivational factors, attitudes, beliefs about the likelihood of detection or crashing, and physical and psychological comfort, and external forces such as the speed limit, road condition, the speed of other traffic, the level of enforcement activity, and social factors.
The action of external cues that bias speed choices either upwards or downwards can be either continuous or intermittent.

- The relative contributions of these factors have not been investigated, although an understanding of these may be critical for the development of new speed countermeasures.

The “continuous adjustment” view of speed choice predicts that speed enforcement would have its effect at or near to the location and time of the enforcement activity, as it would act as an environmental factor influencing speed at that location and time. The effect of previously encountered speed enforcement, similarly, would be strongest near to the location of that enforcement. This model of speed choice, therefore, is consistent with widespread evidence that the effects of visible speed enforcement are generally limited to the location and time of the enforcement activity (see Zaal, 1994).

It is a general conclusion following from the model of speed decisions outlined in Harrison et al. (1998) and evidence concerning the spatial and temporal halo effect of speed enforcement, that enforcement programs targeting speed are unlikely to have a substantial effect on speed outside the immediate area and time at which the enforcement occurs, and are most likely to have an effect in specific situations where other factors influencing speed decisions have less influence. In situations where these other internal and environmental factors strongly bias speed decisions either up or down, the application of an enforcement program, arguably, would be less likely to impact on driving speed than might be the case in other situations. Similarly, the effect of an enforcement program may be less amongst those drivers for whom there are internal factors that bias speed choices strongly upwards or downwards.

It was one aim of this report to investigate the implications of this type of model of speed choice for enforcement programs targeting younger drivers.

SPEED ENFORCEMENT

Speed enforcement in Victoria involves a number of techniques used by the Victoria Police. The Police have access to hand-held radar and laser speed-measurement devices that are used to detect drivers exceeding the speed limit. They are then generally stopped and issued with a penalty notice with a fixed fine (related to the severity of the offence) in place of having to attend court. More-severe offences attract licence suspension.

The Police also have access to automated speed detection devices that can be operated beside the road. These devices are radar-based and photograph offending vehicles. Registration details are then used to obtain the details of the owner of the vehicle, and a penalty notice is sent to the owner on the presumption that they were the driver at the time of the offence. Under specific legislation, owners are responsible for offences detected in this way unless they can identify the driver. The automated speed cameras have been used intensively in urban and rural areas since 1990 and the number of penalty notices issues under the speed camera program has been shown to be related to crash frequencies in the Melbourne metropolitan area (Newstead et al., 1995).

The operation of the Victorian speed-camera program tends to be biased towards daytime enforcement activity at the expense of nighttime speed enforcement for a number of operational reasons. One consequence of this, combined with the higher level of nighttime
driving amongst younger drivers, may be a lower level of exposure to speed enforcement amongst younger drivers. When combined with the continued, relatively high crash risk of younger drivers and their tendency to engage in relatively high-risk driving behaviours such as speeding, it is conceivable that the current operation of the speed camera program (and speed enforcement in general) in Victoria may not allow its full potential to be reached with younger drivers.

OUTLINE OF THIS PROJECT

This project resulted from the concerns noted above that the Victorian speed enforcement program may not be optimal in terms of its potential to influence the driving behaviour of younger drivers, particularly given the likelihood that young drivers are at a higher risk of involvement in speed-related crashes. It was considered important to investigate the possibility of developing an enforcement strategy and other countermeasures that would better target younger offenders. The project was conducted in three parts.

The first component of the project was an investigation of speed-related crashes in younger drivers using the Victorian crash database and a surrogate for speed involvement in crashes. The purpose of this component of the project was to investigate some characteristics of speed-related crashes that might be used to assist in better targeting of speed enforcement.

The second component of the project was a telephone survey of young drivers concerning their attitudes towards speeding and their perceptions of speed enforcement. This component of the project aimed to identify high-risk subgroups of drivers and to investigate the relationship between perceived enforcement activity and attitudes towards speeding. The results of this component of the project were also expected to inform the development of alternative enforcement activities to target younger offenders, and were expected to have implications for the development and targeting of public education programs.

The third component involved the development of recommendations concerning the targeting of speed enforcement strategies at younger, novice drivers.
ANALYSIS OF CRASH DATA FOR YOUNG DRIVERS

INTRODUCTION

The aim of this section of the report was to present an investigation of the driver and crash characteristics thought to be associated with the involvement of speed in crashes.

The analyses presented here were based on data extracted from the VicRoads crash data file. All reported serious casualty crashes (taken-to-hospital or fatality crashes) involving car drivers in the years 1995 and 1996 were included. Less serious injury crashes and property damage only crashes have been excluded from the analyses due to the substantial underreporting of these types of crashes.

METHOD

Initially the VicRoads crash data files from 1995 and 1996 were merged into one file, containing all the crash data for the two-year period. Crashes in Victoria must be reported to the Police if they result in medical treatment for someone involved in the crash or if property damage occurs and the owner of the damaged property is not at the scene of the crash. After selection of specific data for the current analyses, the final data file was composed of crash data relating to drivers (of cars only) who were involved in serious casualty crashes (fatal crashes or those in which one or more of those involved were taken to hospital) involving cars or car derivatives only. This file contained data relating to 9,694 serious-casualty crashes that occurred in Victoria in 1995/1996. Data analysis involved initial descriptive analyses of the data followed by a multivariate, loglinear analysis. This analysis method was chosen to allow the influence of a number of factors on speed-related crashes to be investigated simultaneously.

There was a need to identify crashes that could be used as a surrogate for speed-involvement as speed-related crashes are not clearly identified in the VicRoads crash data file. One method was to use combinations of variables in the data file to create a surrogate measure for speed-related crashes. This method is based on the assumption that crashes that meet the definition are more likely to be speed-related than are other crashes. For example, it might be possible to use single vehicle crashes on curves as a surrogate measure for speed-related crashes as these are generally considered to include speed as a causal factor (eg. Catchpole, 1997).

For the analyses reported here, loss-of-control crashes were used as a surrogate for speed-related crashes. Thus, speed-related crashes in this report were defined as crashes involving loss of control of the motor vehicle. Specifically, the crashes in the VicRoads crash data file

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1 Loglinear analysis is a method for analysing the pattern of results and relationships in multidimensional contingency tables. In the analysis used here, the loglinear method was used to construct the simplest possible model of the crash data using variables of direct relevance to the speed-involvement issue. This approach had the advantage of excluding relationships between the variables that were unnecessary to account for variation in the data. The result of the loglinear analysis is a model of the data which includes a number of complex relationships between the variables, but which potentially excludes many insignificant relationships.
with a DCA coding of 170-174 and 180-184 (see appendix for further explanation) were used. Although these crashes are referred to as speed-related crashes in the following sections of this report, it is important to note some cautions in the use of this surrogate measure of speed involvement. This use of loss-of-control crashes as a surrogate for speed-involvement is supported by Catchpole (1997) who notes that these crashes generally result from inadequate speed or vehicle control, and Bowie & Walz (1994) who report that speed is involved in 22-39% of single-vehicle crashes but only in 7-17% of crashes in general. They also note that 70% of drivers involved in speed-related fatal crashes were involved in single-vehicle crashes. It is noted below that 98.8% of the loss-of-control crashes used here were single-vehicle crashes.

It needs to be emphasised that this technique of defining speed-involvement in crashes serves only to identify crashes that are relatively likely to involve speed as a factor. It is clear that not all crashes identified in this group involve speed as a factor, and it is clear that speed may not be the only causal factor. Similarly, many speed-related crashes may not be included in these crashes and it is not possible to identify these in the current analysis. While these serve as important caveats for the current analysis, it was considered that the surrogate measure applied here was appropriate for the exploratory analyses reported below. This was particularly so given that the purpose of this analysis was to compare speed involvement in different driving situations, not to assess the absolute level of speed involvement in crashes. Thus, the loss-of-control surrogate for speed involvement was used to flag crashes where speed was considered relatively likely to have been a causal factor.

It also needs to be noted that the use of loss-of-control crashes as a surrogate for speed involvement was also expected to bias the measurement of speed involvement towards crashes that occurred in locations where high speeds were possible (e.g. higher speed zones) and to crashes in locations where speed might cause a loss of control rather than other consequences (e.g. on a curve or on a straight section of road). The results of the analyses need to be interpreted in light of these potential biases.

RESULTS – DESCRIPTIVE ANALYSES

The descriptive results are presented in Table 1, which shows the relationship between involvement in loss-of-control crashes and some other crash and driver factors. It is clear that crashes defined as speed-related were more likely (than other crashes) to:

- Result in fatal injuries;
- Occur in higher speed zones;
- Occur during rainy weather;
- Occur on curved sections of road;
- Occur at night;
- Involve male drivers; and
- Involve younger drivers.

In each case, a chi-square test of independence confirmed that speed involvement (as defined above) was significantly related to the variable concerned (p < .01 for all analyses).
Table 1: Descriptive Statistics for Serious Casualty Crashes and Speed-related Serious Casualty Crashes, 1995-1996

<table>
<thead>
<tr>
<th></th>
<th>&quot;Speed-Related&quot; (Loss-of-Control)</th>
<th>Other Serious Casualty Crashes Involving Cars and Derivatives, 1995-1996 (and percentage of total)</th>
<th>All Serious Casualty Crashes Involving Cars and Derivatives, 1995-96 (and percentage of total)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Number of Crashes</strong></td>
<td>2,520</td>
<td>7,164</td>
<td>9,684</td>
</tr>
<tr>
<td>Number of Fatal Crashes</td>
<td>223 (8.8%)</td>
<td>487 (6.8%)</td>
<td>710</td>
</tr>
<tr>
<td>Number of &quot;Taken-to-Hospital&quot; Crashes</td>
<td>2,297 (91.2%)</td>
<td>6,687 (93.3%)</td>
<td>8,984</td>
</tr>
<tr>
<td>60 km/h Speed Zone</td>
<td>853 (33.8%)</td>
<td>4,802 (67.0%)</td>
<td>5,655</td>
</tr>
<tr>
<td>70-80 km/h Speed Zone</td>
<td>392 (15.6%)</td>
<td>1,297 (18.1%)</td>
<td>1,689</td>
</tr>
<tr>
<td>100 km/h Speed Zone</td>
<td>1,163 (46.2%)</td>
<td>951 (13.2%)</td>
<td>2,114</td>
</tr>
<tr>
<td>110 km/h Speed Zone</td>
<td>74 (2.9%)</td>
<td>116 (1.6%)</td>
<td>190</td>
</tr>
<tr>
<td>Rainy Weather</td>
<td>422 (16.7%)</td>
<td>1,033 (14.4%)</td>
<td>1,455</td>
</tr>
<tr>
<td>Clear Weather</td>
<td>2,004 (79.5%)</td>
<td>5,999 (83.7%)</td>
<td>8,003</td>
</tr>
<tr>
<td>Straight Road Section</td>
<td>1,746 (69.3%)</td>
<td>6,833 (95.4%)</td>
<td>8,579</td>
</tr>
<tr>
<td>Curved Road Section</td>
<td>774 (30.7%)</td>
<td>341 (4.7%)</td>
<td>1,115</td>
</tr>
<tr>
<td>Daytime (6 am - 7:59 pm)</td>
<td>1,492 (59.0%)</td>
<td>5,768 (80.5%)</td>
<td>7,260</td>
</tr>
<tr>
<td>Early Night (8 pm - 11:59 pm)</td>
<td>440 (17.5%)</td>
<td>897 (12.5%)</td>
<td>1,337</td>
</tr>
<tr>
<td>Late Night (12 am - 5:59 am)</td>
<td>570 (22.6%)</td>
<td>482 (6.7%)</td>
<td>1,052</td>
</tr>
<tr>
<td><strong>Total Number of Drivers</strong></td>
<td>2,652</td>
<td>11,954</td>
<td>14,606</td>
</tr>
<tr>
<td>Males</td>
<td>1,791 (67.5%)</td>
<td>7,677 (64.2%)</td>
<td>9,468</td>
</tr>
<tr>
<td>Females</td>
<td>823 (31.0%)</td>
<td>4,096 (34.3%)</td>
<td>4,919</td>
</tr>
<tr>
<td>Younger Drivers (18-21 years)</td>
<td>608 (22.9%)</td>
<td>1,696 (14.2%)</td>
<td>2,304</td>
</tr>
<tr>
<td>Older Drivers (30-59 years)</td>
<td>957 (36.1%)</td>
<td>5,761 (47.2%)</td>
<td>6,718</td>
</tr>
</tbody>
</table>

It needs to be noted (as is discussed above) that the results in Table 1 may reflect, in part, the use of loss-of-control crashes as a surrogate for speed involvement. Speed-related crashes might be expected to occur in all speed zones, for example, where drivers are driving at speeds that are inappropriate for the conditions. In lower speed zones or on straight road segments these speed-related crashes may be less likely to involve loss of control and may instead involve rear-end collisions or failure to stop at an intersection.

*SPEED AND YOUNG DRIVERS: DEVELOPING AN ENFORCEMENT STRATEGY* 7
RESULTS - MULTIVARIATE MODELLING

The descriptive analysis presented above was considered insufficient to describe the situation with respect to speed involvement in crashes. Analyses such as this do not allow consideration of the full range of interactions between variables. For this reason, it was considered important to conduct a more complex analysis of the data that allowed for some consideration of significant higher-level interactions between a number of variables.

It was considered that the best way to accomplish this goal in light of the potential problems associated with performing a large number of contingency table analyses (elevation of the type I error rate in particular) was to use a multivariate technique (loglinear analysis) to construct and fit the simplest model possible to the crash data using a number of relevant variables. It was hoped that building a model in this way, which accounted for the variation in the data in terms of a number of interactions between variables, would allow conclusions to be drawn about the relative involvement of younger drivers in speed-related crashes in a range of driving contexts.

The driver data were analysed using the Loglinear procedure in SPSS for Windows (Norusis, 1994). The variables included in this procedure are shown in Table 2. All interaction terms were entered into the analysis and stepwise removal of interaction terms was performed until removal of the next term would have resulted in a significant difference between the model and the data. The resulting model was assumed to be the most parsimonious model of the data using the variables in Table 2. It needs to be emphasised that this analysis used driver data, which means that assumptions about independence of data points may not be met strictly due to the potential involvement of a number of drivers in a single crash. This was not considered a significant problem given the exploratory nature of the analyses.

The most parsimonious model that fitted the data included eight terms or interactions ($\chi^2_{(185)} = 164.8, p = .9$). These interactions are shown in Table 3. The inclusion of an interaction term in a loglinear model assumes the inclusion of lower order interactions and main effects involving the variables in the higher order interaction. Thus, the inclusion of the time of day and sex interaction in this model implicitly includes the main effects of time of day and sex in the model as well. The interpretation of the results discussed below focuses on the higher-order interactions in Table 3 and discusses the lower order results only where this is necessary for understanding the results and if they would not otherwise be discussed.

It needs to be noted that the use of a large data set such as that used here may result in the inclusion of relatively unimportant (though still statistically significant) interactions in the model. This is difficult to avoid, except perhaps by using a relatively conservative Type I Error Rate. While the usual Type I Error Rate ($p = .05$) was used here, less importance was given to interactions that did not meet a more conservative significance level ($p = .01$).
Table 2: Variables Included in the Log-Linear Analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>age</td>
<td>Age Group of Driver</td>
<td>1 = Young (18-21 years)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 = Older (30-59 years)</td>
</tr>
<tr>
<td>sex</td>
<td>Sex of Driver</td>
<td>1 = Male</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 = Female</td>
</tr>
<tr>
<td>speed_crash</td>
<td>Speed-Related Crash (surrogate</td>
<td>1 = Speed-Related Crash</td>
</tr>
<tr>
<td></td>
<td>measure)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 = Non-Speed-Related Crash</td>
</tr>
<tr>
<td></td>
<td>(see previous section for</td>
<td></td>
</tr>
<tr>
<td></td>
<td>definitions)</td>
<td></td>
</tr>
<tr>
<td>time_of_day</td>
<td>Time of Day of the Crash</td>
<td>1 = Day (6am – 8pm)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 = Early Evening (8pm – midnight)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 = Late Night (midnight – 6am)</td>
</tr>
<tr>
<td>speed_zone</td>
<td>Speed Zone Category in Which Crash</td>
<td>1 = 40 – 60 km/h</td>
</tr>
<tr>
<td></td>
<td>Occurred</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 = 70 – 90 km/h</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 = 100 – 110 km/h</td>
</tr>
<tr>
<td>road_shape</td>
<td>Road Characteristics at Crash Site</td>
<td>1 = Straight</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 = Curved</td>
</tr>
<tr>
<td>wet_road</td>
<td>Road Condition at Crash Site</td>
<td>1 = Wet (including water, ice, snow, mud)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 = Dry</td>
</tr>
</tbody>
</table>

Table 3: Interactions Included in the Model, Chi-Square for Removal of the Term, Degrees of Freedom, and the Probability Level

<table>
<thead>
<tr>
<th>Interaction</th>
<th>$\chi^2$</th>
<th>DF</th>
<th>Probability for Removal</th>
</tr>
</thead>
<tbody>
<tr>
<td>time_of_day * road_shape * age * wet_road * speed_zone</td>
<td>11.3</td>
<td>4</td>
<td>.024</td>
</tr>
<tr>
<td>sex * age * speed_zone</td>
<td>18.9</td>
<td>2</td>
<td>.000</td>
</tr>
<tr>
<td>speed_crash * sex * age</td>
<td>26.2</td>
<td>1</td>
<td>.000</td>
</tr>
<tr>
<td>time_of_day * speed_crash * road_shape</td>
<td>14.1</td>
<td>2</td>
<td>.001</td>
</tr>
<tr>
<td>speed_crash * road_shape * age * speed_zone</td>
<td>10.6</td>
<td>2</td>
<td>.005</td>
</tr>
<tr>
<td>speed_crash * wet_road * speed_zone</td>
<td>21.9</td>
<td>2</td>
<td>.000</td>
</tr>
<tr>
<td>speed_crash * sex * speed_zone</td>
<td>6.8</td>
<td>2</td>
<td>.034</td>
</tr>
<tr>
<td>time_of_day * sex</td>
<td>112.7</td>
<td>2</td>
<td>.000</td>
</tr>
</tbody>
</table>
There was a significant interaction between drivers' age, the time of day, the road characteristics, the road condition, and the speed zone in which the crash occurred. This relationship is shown in Figure 1.

![Figure 1: The Percentage of Crash Involved Drivers Who Were Young Drivers, by Time of Day, Road Characteristic, Road Condition, and Speed Zone](image)

Figure 1 shows the percentage of crash involved drivers who were young drivers, disaggregated by time of day, road characteristic, road condition, and speed zone. This five-way interaction was complex and, given its significance level ($p = .024$) was considered relatively unimportant in practical terms. In terms of lower-order interactions, it is important to note, however, that young drivers were relatively more likely to be involved in crashes on curves than on straight sections of road, especially late at night, and were relatively more likely to be involved in crashes late at night.

There was a significant interaction between drivers' age group, their sex, and the speed zone in which they crashed. This relationship is shown in Figure 2.
Figure 2: The Percentage of Younger and Older Male and Female Drivers Who Crashed in Each Speed Zone Category

Figure 2 shows the percentage of younger and older male and female drivers who were involved in crashes in each speed zone. This graph suggests that younger males were relatively less likely to be involved in crashes in higher speed zones (compared to older male drivers) while the opposite was found for female drivers, where younger female drivers were more likely (than older female drivers) to be involved in higher speed zone crashes. This may reflect exposure factors, where older males might be more likely than other drivers to drive in high-speed zones because of work-related driving.

There was a significant interaction between drivers’ age group, their sex, and their involvement in speed-related crashes. This interaction is shown in Figure 3, a graph of the percentage of younger and older, male and female drivers involved in speed-related crashes. Younger drivers were more likely (than older drivers) to be involved in speed-related crashes, and this difference was greater for males than females.
There was a significant interaction between the time of day, the road characteristic (straight or curved), and speed involvement. This relationship is shown in Figure 4.
Figure 4 suggests that while crashes at night were more likely to be speed related than those earlier in the day, the difference was larger for crashes on curves than for crashes on straight road segments.

![Figure 5: The Percentage of Younger and Older Drivers Involved in Speed-Related Crashes on Straight and Curved Road Sections by Speed Limit](image)

There was a significant interaction between drivers' age group, the speed zone category, the road characteristic (straight or curved), and speed involvement. This interaction is shown in Figure 5. It is apparent that younger drivers were more likely to be involved in speed-related crashes in all conditions, and that this was especially so on curved road segments in 70-90 km/h speed zones. This suggests a particular problem with loss-of-control on arterial roads for younger drivers.

There was a significant interaction between speed involvement, speed zone, and road condition. This relationship is shown in Figure 6, which shows the percentage of drivers involved in crashes in each combination of speed zone and road condition for whom the crash was coded as speed-related.
Against the general background of higher levels of speed involvement in crashes in 100–110 km/h speed zones compared to other speed zones, speed-related crashes were slightly more likely to occur on wet roads than on dry roads in lower speed zones.

There was a significant interaction between drivers’ sex, the speed zone, and speed involvement. This interaction is shown in Figure 7, which shows the percentage of male and female drivers involved in crashes in each speed zone who were involved in speed-related crashes. Females crashing in higher speed zones were more likely to be involved in crashes identified as speed-related than were male drivers in high speed zones.
There was a significant interaction between drivers’ sex and the time of the day of their crash. This interaction is shown in Figure 8.

Figure 8 shows that male drivers were more likely than female drivers to be involved in night time crashes (early and late) while female drivers were relatively more likely than male
drivers to be involved in crashes during the daytime. This most likely reflects the effects of exposure.

DISCUSSION

The analyses of the 1995/96 crash data files presented above were concerned particularly with the involvement of younger drivers in speed-related crashes. The general aim of the analyses was to provide information about this involvement that would be of potential benefit in the development of enforcement and public-education programs.

Loss-of-control crashes were used as a surrogate for speed involvement. Loss-of-control crashes involve the vehicle failing to remain on the correct path on the roadway without an initial collision causing the loss of control. These crashes may or may not involve a collision with another vehicle or object after losing control. Although they were not necessarily single vehicle crashes, only 1.2% of the loss-of-control crashes involved a collision with another vehicle.

The loss-of-control surrogate for speed-related crashes used here included crashes on both curves and straight sections of road as it was unclear that there would be many other (non-speed) causal factors in such crashes, and restricting the analysis to crashes on curves would have reduced the number of crashes in the multivariate analysis. The possibility that drink-driving contributed to some or many of the loss of control crashes was not considered in this analysis, primarily because reliable BAC data are only available for those fatally injured in crashes.

The general findings of the descriptive analyses presented above support the surrogate measure of speed-involvement. Consistent with general expectations about speed-related crashes, crashes were more likely to be defined as involving speed as a causal factor if they involved a fatality, occurred in higher speed zones, occurred in wet weather, occurred late at night, or occurred on curved sections of road.

The results of the multivariate analysis were also generally consistent with hypotheses discussed earlier. Crashes that were classified as speed-related were more likely to involve younger drivers and were more likely to involve young males than they were to involve any other sex/age group. They were generally more likely to occur on curved sections of road, and particularly on curved road sections in the evening and late at night. They were more likely to occur in higher speed zones (this effect was slightly stronger for female drivers) and males were more likely (on average) to crash in the evening and late at night than were females. Speed-related crashes involving younger drivers were over-represented on curved road sections, and especially on curved road sections in the evening in wet conditions, and curved road sections late at night.

The over-involvement of young male drivers provides further evidence that there is an ongoing need to target this group of road users. That males are generally more likely to crash at night than female drivers suggests there is also a need to target nighttime road use in particular, as suggested in the Introduction.

The driving context associated with speed related crashes – curves, wet conditions, and nighttime driving – provide additional support to the argument that enforcement practices may need to be modified to increase the effect of enforcement on nighttime driving speed,
and perhaps that any modifications to publicity programs need to focus on targeting speeding on curved road sections and during wet weather. Loss-of-control crashes on curves in wet conditions account for about 2% of serious injury crashes in Victoria.

It needs to be emphasised that the consistency between general expectations about speed related crashes and the results of this analysis might in part reflect the choice of crash types used to identify speed-involvement in crashes. The use of loss-of-control crashes is likely to bias the surrogate measure towards higher speed zones (it is harder to lose control at lower speeds); away from urban areas (where excessive speed may be more likely to result in a collision with another vehicle rather than loss of control); and towards crashes in the wet (where road-tyre friction is likely to be reduced).

The general findings noted above, although based on loss-of-control crashes, would be expected on an a priori basis to apply to crashes in which speed was an important factor. Crashes involving speed as a cause would, for example, be more serious, tend to occur in higher speed zones where higher speeds are possible, and tend to occur in situations where additional speed might be expected to add significant information processing demands to the driving task (such as on curves, in the rain, and at night).
INTRODUCTION

While the mechanisms by which speed enforcement influences speed choice are still not clear, evidence relating to the halo effect of speed enforcement in space and time (Fildes & Lee, 1993) suggests that the strongest effects of speed camera use will occur during the times when they are actually used. Speed cameras (as a major speed enforcement tool in Victoria) are employed mostly during the daylight hours (Sullivan, Cavallo, & Drummond, 1992; and confirmed by one of the current authors (WH) using 1996 data) so it is likely that they would have their strongest impact on the perceived threat of detection for exceeding the speed limit during daylight hours and less of an impact on the perceived risk of detection for exceeding the speed limit during nighttime hours. The limited use of speed cameras at night in Victoria means that there is little evaluation data bearing on this issue.

Research indicates that young drivers are over represented on Victorian roads at night. For example, Diamantopolou, Skalova, Dyte, & Cameron (1996) found that 22% of the driving of 18-21 year olds is done between the hours of 8pm and 6am compared with only 12% of the driving of 30-39 year olds. The likelihood that driving at night is less likely to be affected by the deterrent effects of speed camera use, and the likelihood that this driving is associated with less safe car use motivations (e.g. Gregersen & Berg, 1994), raises additional concerns about nighttime car use by younger drivers.

This section of the report details the method and results of a survey of younger drivers undertaken as part of the present investigation of the potential for enforcement programs to impact the speed-related behaviour of younger drivers. The survey was completed in September 1997.

METHOD

Sample

Participants were recruited from households where a member had taken part in a Roy Morgan Research P/L omnibus survey during the past year and where it was considered likely (from that survey) that an 18-21 year old person was resident. Households were originally sampled randomly for the omnibus surveys. This method of selecting households for the current survey was chosen to reduce the costs associated with locating households with appropriately aged drivers, but raises some methodological concerns.

The most significant concern raised by this sampling technique is the potential bias away from some groups of respondents that may represent particular road-safety problems. The selection of respondents for the survey passed through a number of filters. The random selection of households for potential participation in omnibus surveys would not be expected to bias the sample, but patterns of refusal by households would be expected to bias the actual omnibus sample away from some cultural groups and some socioeconomic groupings. The use of these surveyed households for the current survey would then add refusal-related biases from the 18-21 year old potential participants themselves, further adding to the possible problems resulting from the original omnibus survey sampling process.

It was not considered possible to solve these potential problems given the budgetary limitations of the current study, and in spite of these the survey was viewed as an opportunity to investigate the relationship between enforcement and speeding amongst a sample of younger drivers. This issue appears not to have been addressed prior to this study. It was considered worthwhile even if generalisation to the wider population of young drivers was likely to be difficult.

The initial sample consisted of 250, 18-21 year old car drivers with probationary or full licences. One respondent was deleted from the analysis due to his unusual pattern of responses that suggested that he had failed to understand some items. Thus, 249 participants were included in the analyses, 126 females and 123 males.

Just over 40% of the sample \((N=106)\) reported being a part of the workforce (as their main occupation) and less than 4% \((N=9)\) were registered as unemployed. Categories of occupations in the sample of young drivers are shown in Table 4.

**Table 4: Categories of Young Drivers' Occupations (Excludes Students and Unemployed Respondents)**

<table>
<thead>
<tr>
<th>Category of Occupation</th>
<th>Number of Young Drivers (and Percentage of total sample)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professional or Owner of small business</td>
<td>9 (3.6%)</td>
</tr>
<tr>
<td>Sales or Semi-professional</td>
<td>25 (10.0%)</td>
</tr>
<tr>
<td>Other white collar</td>
<td>19 (7.6%)</td>
</tr>
<tr>
<td>Skilled</td>
<td>26 (10.4%)</td>
</tr>
<tr>
<td>Semiskilled</td>
<td>22 (8.8%)</td>
</tr>
<tr>
<td>Unskilled</td>
<td>3 (1.2%)</td>
</tr>
<tr>
<td>Farm workers</td>
<td>2 (0.8%)</td>
</tr>
</tbody>
</table>

More than 60% \((N=160)\) of respondents reported studying at the time of interview. Of this number, eight were secondary students, 42 were students at a TAFE/technical school/commercial college (26 full time, 16 part time) and 110 were university students (107 full time, 3 part time).

Most (72%) of the respondents lived in the Melbourne metropolitan area.

In order to establish whether the sample was representative of this age group in Victoria, some sample data (sex, area of residence, employment and educational status) were compared with data for this age group from census data provided by the Australian Bureau of Statistics. According to the 1996 census data, 50.9% of 18-21 year olds in Victoria were male and 49.1% were female. Further, 75.5% of 18-21 year olds in Victoria were resident in the Melbourne statistical district. The sample therefore reflected the sex and residence data for the Victorian population.

Comparison of the employment/educational data is shown in Table 5. Unemployed and (to a lesser degree) employed young people were under-represented in the sample, while people stating that their main occupation was "student" were over-represented. These differences between the sample and the population most likely relate to the sampling problems noted.
above. To minimise the impact of these problems, the remaining analyses were based on data that was weighted to match the ABS Census data in Table 5.

Table 5: Comparison of “Main Occupation” of 18-21 Year Old Drivers with ABS Census Data (1996)

<table>
<thead>
<tr>
<th></th>
<th>Survey Drivers’ Reported Main Occupation (18-21 years)</th>
<th>ABS Census data, 1996 (18-21 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employed</td>
<td>42.6%</td>
<td>56.1%</td>
</tr>
<tr>
<td>Student</td>
<td>53.4%</td>
<td>31.0%</td>
</tr>
<tr>
<td>Unemployed</td>
<td>3.6%</td>
<td>12.9%</td>
</tr>
</tbody>
</table>

Procedure

Participants took part in a ten-minute telephone survey conducted by Roy Morgan Research Ltd for the Centre. The survey (in the Appendix) consisted of items that measured drivers’ speed-related behaviour, attitudes, and perceptions towards speed enforcement. Information was also collected about participants’ driving exposure and their speeding offence and crash history. The survey was conducted during the evenings. Data analysis was conducted using SPSS for Windows (Norusis, 1994).

A variety of statistical methods was used in the analysis of the survey data. Differences between participants’ road safety perceptions were analysed using analysis of variance. A factor analysis was used to investigate the underlying structure of young drivers’ attitudes relating to speeding and speed enforcement, and a cluster analysis was used to group respondents with similar attitudes in these areas. The cluster analysis was used to identify potential target groups of young drivers, and the factor analysis provided a simplified structure for understanding the attitudes of these potential target groups.

RESULTS AND DISCUSSION: GROUPS OF YOUNG DRIVERS

The data analysis was conducted in several stages:

- Examination of the driving exposure data for different groups of young drivers;
- A factor analysis to investigate the underlying structure of young drivers’ attitudes relating to speeding and speed enforcement; and
- A cluster analysis to identify potential target groups of young drivers based on their perceptions and attitudes towards road safety.

In general, a view was taken that the analysis of the survey results was exploratory, serving the ultimate end of providing input to potential interventions to reduce the speed-related behaviours of young drivers but some efforts were made to reduce the possibility that
multiple analyses of the data set might result in type one errors (finding a significant effect when one was not present). All the analyses were based on the weighted sample data.

**Exposure**

Participants were asked to provide data concerning the amount of driving they had undertaken in the preceding seven days and the purpose of their driving. The average time spent driving was 9.9 hours ($SD=11.8$).

Participants' driving in the preceding seven days, disaggregated by trip purpose, is shown in Table 6. Commuter driving was the most common form of car use.

<table>
<thead>
<tr>
<th>Trip purpose</th>
<th>Total number who drove for this purpose</th>
<th>Mean hours driven for this purpose (across total sample)</th>
</tr>
</thead>
<tbody>
<tr>
<td>To/from work/study</td>
<td>188 (75.4%)</td>
<td>4.5</td>
</tr>
<tr>
<td>For work</td>
<td>62 (25.0%)</td>
<td>2.1</td>
</tr>
<tr>
<td>To/from parties/pubs</td>
<td>76 (30.3%)</td>
<td>0.7</td>
</tr>
<tr>
<td>To/from sport/hobbies</td>
<td>89 (35.5%)</td>
<td>0.9</td>
</tr>
</tbody>
</table>

Many respondents ($N=136$) reported some driving for reasons other than those mentioned above. These reasons included activities such as visiting friends/relatives ($N=65$), local driving trips ($N=91$) and recreational driving ($N=9$). Less than 10% ($N=19$) of respondents had not driven during the past week.

The participants' self reported driving disaggregated by trip purpose and time of day is shown in Table 7.

The data in Table 7 indicate that over two-thirds of the participants reported driving to or from work or a place of study during daylight hours, and that the next most common driving behaviours were driving to or from social activities between 8 pm and midnight (28% of respondents), driving to or from sporting activities or hobbies between midday and 7 pm (26% of respondents), and driving to or from social activities between midnight and 6 am (19% of respondents). Nighttime driving was primarily related to social activities such as driving to and from parties, hotels, or nightclubs.
Table 7: Driving Exposure Over the Past Seven Days for Young Drivers by Trip Purpose and Time of Day (Weighted Sample)

<table>
<thead>
<tr>
<th>Trip purpose</th>
<th>Total number who drove a car for this trip purpose</th>
<th>Number of respondents who reported driving for this trip purpose by time of day of trip (with Percentage of sample)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0600-1159</td>
</tr>
<tr>
<td>To/from work/study</td>
<td>188</td>
<td>168</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(67.1%)</td>
</tr>
<tr>
<td>For work</td>
<td>62</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(16.3%)</td>
</tr>
<tr>
<td>To/from parties/pubs</td>
<td>76</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.7%)</td>
</tr>
<tr>
<td>To/from sport/hobbies</td>
<td>89</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(7.9%)</td>
</tr>
</tbody>
</table>

Male and female participants did not differ significantly in the total number of hours of driving over the previous week. They did differ, however, in the number of hours they spent driving for work-related reasons ($F_{(1,247)} = 4.3, p < .05, \text{Mean}_{males} = 3.0$ hours, $\text{Mean}_{females} = 1.1$ hours) and in the number of hours spent driving to/from parties/nightclubs/pubs ($F_{(1,247)} = 3.8, p < .05, \text{Mean}_{males} = .8$ hours, $\text{Mean}_{females} = .4$ hours). There were no significant differences between males and females in the number of hours of driving to/from study/work, driving to/from sport/hobbies or driving to/from parties/nightclubs/pubs.

Participants from rural and metropolitan areas did not differ in the total number of hours they reported driving over the previous week. They also did not differ in the number of hours they spent driving to/from sporting activities/hobbies. Young drivers from rural areas spent more time driving for work-related reasons compared with those from metropolitan areas ($F_{(1,247)} = 6.2, p < .05, \text{Mean}_{rural} = 3.7$ hours, $\text{Mean}_{metro} = 1.3$ hours). Young drivers in the metropolitan area spent more time driving to/from study/work ($F_{(1,247)} = 8.5, \text{n.s.}, \text{Mean}_{rural} = 2.9$ hours, $\text{Mean}_{metro} = 5.2$ hours), and to/from parties/nightclubs/pubs ($F_{(1,247)} = 5.9, \text{n.s.}, \text{Mean}_{rural} = .3$ hours, $\text{Mean}_{metro} = .8$ hours).

Approximately three quarters of all respondents ($N=180$) owned their own car. Males and females were equally likely to own a car. Young drivers from rural areas were found to be more likely to own their own car than those living in metropolitan areas ($\chi^2_{(1)} = 10.8, p < .05$, 86% of rural residents compared with 66% of metropolitan residents).

One third ($N=76$) of the drivers reported having been involved in a car accident (as a driver), however less than 5% ($N=10$) of these crashes involved injuries requiring medical assistance. Almost 10% ($N=24$) of the total sample of young drivers reported having been involved in two or more crashes since obtaining their driving licence. The relationship between sex and
crash involvement (as a driver) was not significant and there was no significant relationship between residence and crash involvement.

Respondents were asked how many times over the preceding month they had seen speed cameras during daylight and nighttime hours. The mean numbers of speed camera operations reported by participants were 4.8 during the daytime and 1.3 at night. Over the preceding month approximately 20% (N=45) of respondents reported not having seen any speed cameras during the daylight hours, and 60% (N=155) of respondents reported not having seen a speed camera during the nighttime hours. These results are consistent with what is known about the relative level of speed camera operations during the daytime and at night.

Respondents were also asked how many times they had seen police traffic enforcement (other than speed cameras) over the preceding month during the daylight and nighttime hours. The mean numbers of general (not speed camera) enforcement operations reported by the participants were 5.8 for daytime activity and 4.2 at night. Over the preceding month approximately 17% of respondents (N=42) reported not having seen any other police traffic enforcement activity during daylight hours and approximately one quarter of respondents (N=63) reported not having seen any other police traffic enforcement activity at night.

More than one quarter (N=76) of the respondents reported having been caught by the police for exceeding the speed limit, with 37% (N=28) of these drivers having been caught speeding more than once (11% of the total sample).

Young male and female drivers did not differ in the number of times they had seen speed cameras over the preceding month or the number of times they had seen other types of police traffic enforcement. Young male drivers were more likely than young female drivers to have been caught speeding since obtaining their licence ($\chi^2_{(1)} = 8.9, p < .05$, approximately 38% of young males compared with 21% of young females).

The young drivers from rural areas did not differ significantly from those from metropolitan areas in the number of times they had seen speed cameras over the preceding month. However, young drivers from rural areas reported seeing more police traffic enforcement activity (excluding speed cameras) during daylight hours over the preceding month than those from metropolitan areas ($F_{(1,247)} = 7.8, p < .05$). Young drivers from rural and metropolitan areas were no more likely to have been caught speeding by the police since obtaining their licence.

**Identification of Relationships Between Attitudes and Beliefs**

Table 8 summarises the mean responses of participants to the attitude and belief items in the survey questionnaire. Responses to these items were provided on a 10-point rating scale (1 – 10) where the end-points were anchored with labels expressing extreme attitudes or beliefs about the item.

The items in Table 8 were entered into a factor analysis to examine the structure of beliefs and attitudes relating to speeding and speed enforcement. The factor analysis was based on a principal components extraction of factors followed by an oblique (OBLIMIN) rotation ($\delta = 0$). Five factors with eigenvalues greater than one were extracted, together accounting for 78.1% of the variance.

The pattern matrix showing the rotated variable loadings on the five factors is shown in
The factor analysis was conducted for two reasons. It allowed confirmation that responses to the items considered similar in the questionnaire were correlated, and the use of the factor scores in the cluster analysis reduced some of the error variance that might have made the cluster analysis less reliable.

Factor 1 accounted for 31% of the variance and appears to measure how uncomfortable drivers are exceeding the speed limit. Drivers who scored highly on this factor were less comfortable driving above the speed limit. The inclusion of the four items relating to comfort exceeding the speed limit in one factor suggests that drivers may have an underlying level of comfort or discomfort that applies across driving environments (main roads and residential streets) and across driving situations (daytime and nighttime). If comfort exceeding the speed limit is a factor with some level of causal influence in speed selection, then it may be possible to have a general effect on driver behaviour across environments and driving situations by influencing the discomfort levels experienced by drivers when they do exceed the speed limit. In this context it is important to note that Harrison et al. (1998) found that speed-related comfort or discomfort was consistently the best predictor of actual driving speed, supporting the potential of targeting this underlying factor.

Factor 2 accounted for 16% of the variance and appears to be a measure of drivers' perceived risk of detection by the police for speeding on residential back streets. Drivers who scored highly on this factor believe there is a high risk of detection by the police if they were to drive in excess of the speed limit on residential back streets. Driver perceptions of the likelihood of detection for speeding in residential streets at night and during the day were correlated, suggesting that drivers may have a general sense of the risk of detection in residential environments that is relatively consistent for daytime and nighttime driving such that drivers who rate a relatively high level of risk in one time of day will rate the other as having a relatively high level of risk.

Factor 3 accounted for 13% of the variance and appears to be a measure of driver self-calibration. The items on this factor measure drivers' feelings of safety when driving at certain speeds. Drivers who scored highly on this factor believe that they could drive more safely at the three nominated speeds than did drivers with low scores on this factor, and ratings of safety at one speed were highly correlated with ratings of safety at the other speeds. This suggests that there is an underlying consistency in young driver ratings of their own safety or driving skill. Harrison et al. (1998) demonstrated that ratings of driving skill were correlated with actual driving speed.
Table 8: Mean Scores and Standard Deviations for the Attitudes Towards Speeding and Belief Items of the Young Drivers and Speed Enforcement Survey.

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q9A</td>
<td>9.0</td>
<td>1.2</td>
</tr>
<tr>
<td>Q9B</td>
<td>8.2</td>
<td>1.5</td>
</tr>
<tr>
<td>Q9C</td>
<td>5.9</td>
<td>2.5</td>
</tr>
<tr>
<td>Q10A</td>
<td>7.3</td>
<td>2.9</td>
</tr>
<tr>
<td>Q10B</td>
<td>7.0</td>
<td>2.8</td>
</tr>
<tr>
<td>Q10C</td>
<td>7.5</td>
<td>3.0</td>
</tr>
<tr>
<td>Q10D</td>
<td>7.3</td>
<td>2.8</td>
</tr>
<tr>
<td>Q11A</td>
<td>3.7</td>
<td>2.8</td>
</tr>
<tr>
<td>Q12A</td>
<td>4.6</td>
<td>2.9</td>
</tr>
<tr>
<td>Q13A</td>
<td>3.2</td>
<td>2.6</td>
</tr>
<tr>
<td>Q14A</td>
<td>4.3</td>
<td>3.0</td>
</tr>
<tr>
<td>Q15A</td>
<td>5.3</td>
<td>3.0</td>
</tr>
<tr>
<td>Q15B</td>
<td>7.1</td>
<td>2.2</td>
</tr>
<tr>
<td>Q15C</td>
<td>4.6</td>
<td>3.0</td>
</tr>
<tr>
<td>Q15D</td>
<td>6.69</td>
<td>2.5</td>
</tr>
</tbody>
</table>
Table 9: Pattern Matrix for the Rotated Five-Factor Solution for the Attitude to Speeding and Self-Reported Behaviour Items of the Young Drivers and Speed Enforcement Survey

<table>
<thead>
<tr>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
<th>Factor 4</th>
<th>Factor 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q13A</td>
<td>-.89</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q11A</td>
<td>-.88</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q14A</td>
<td>-.86</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q12A</td>
<td>-.85</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q15A</td>
<td></td>
<td>.91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q15C</td>
<td></td>
<td>.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q9B</td>
<td></td>
<td></td>
<td>.89</td>
<td></td>
</tr>
<tr>
<td>Q9A</td>
<td></td>
<td></td>
<td>.77</td>
<td></td>
</tr>
<tr>
<td>Q9C</td>
<td></td>
<td></td>
<td>.76</td>
<td></td>
</tr>
<tr>
<td>Q10C</td>
<td></td>
<td></td>
<td></td>
<td>.88</td>
</tr>
<tr>
<td>Q10B</td>
<td></td>
<td></td>
<td></td>
<td>.88</td>
</tr>
<tr>
<td>Q10A</td>
<td></td>
<td></td>
<td></td>
<td>.84</td>
</tr>
<tr>
<td>Q10D</td>
<td></td>
<td></td>
<td></td>
<td>.84</td>
</tr>
<tr>
<td>Q15B</td>
<td></td>
<td></td>
<td></td>
<td>.89</td>
</tr>
<tr>
<td>Q15D</td>
<td></td>
<td></td>
<td></td>
<td>.87</td>
</tr>
</tbody>
</table>

(NB: Factor loadings less than 0.3 have been suppressed).

Factor 4 accounted for 11% of the variance and appears to measure the effect that the speed limit has on drivers' speed choice. Drivers who scored highly on this factor indicated that their driving was strongly influenced by the speed limit. The loading of four items on this factor suggests that drivers possess an underlying attitude towards the speed limit itself as a guide to speed selection, or that drivers tend to weight the speed limit as an input into their speed selection decisions relatively equally across different driving environments (main roads and residential streets) and different driving situations (daytime and nighttime). If actual speed selection is in part determined in this way for drivers, then programs to influence the effectiveness of speed limits as behaviour-control devices may have some potential as road safety measures. This is an issue for further research, although it should be noted that Harrison et al.'s (1998) study demonstrated that general attitudes towards illegal behaviour (including driving over the speed limit) were highly correlated with actual driving speed.

Factor 5 accounted for 7% of the variance and appears to measure drivers' perceived risk of detection by the police for speeding on main roads, highways and freeways. Drivers who scored highly on this factor believe that there is a high risk of detection by the police if they were to drive in excess of the speed limit when driving on main roads, highways and freeways, regardless of the time of day.

Table 10 shows the factor correlation matrix. Overall, the correlations between the factors were not high. The strongest correlations were between Factor 1 (comfort exceeding the speed limit) and Factor 4 (effect of the posted speed limit on speed choice) and between Factor 2 (perceived risk of detection by the police for speeding on residential backstreets)
and Factor 5 (perceived risk of detection by the police for speeding on main roads, highways and freeways).

Table 10: Factor Correlation Matrix

<table>
<thead>
<tr>
<th></th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
<th>Factor 4</th>
<th>Factor 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 2</td>
<td>0.02</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 3</td>
<td>-0.11</td>
<td>0.00</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor 4</td>
<td>0.37</td>
<td>0.21</td>
<td>-0.09</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Factor 5</td>
<td>0.11</td>
<td>0.29</td>
<td>-0.06</td>
<td>0.24</td>
<td>1.00</td>
</tr>
</tbody>
</table>

The correlation between factors 1 and 4 is consistent with the results reported by Harrison et al. (1998). They reported a strong correlation between their measures of comfortable driving speed and intolerance of illegal behaviours, both of which were strongly correlated with observed driving speed. The correlation between factors 2 and 5 suggests that drivers hold a general belief about the likelihood of detection for speeding that applies across environments as well as across times of the day, but that this belief is more strongly tied to the location of enforcement than to the time of enforcement. This specificity of the perceived risk of detection to road types is consistent with the discussion of the spatial halo effect noted earlier, but also suggests that the spatial halo effect of speed enforcement activity may be stronger than the temporal halo effect as beliefs about the perceived risk of detection for speeding were more likely to be consistent (within drivers) across times of the day than they were to be consistent across driving environments. It should be noted, though, that this result does not counter the widely-reported specificity of speed enforcement to the time of enforcement. It simply suggests that the location effect is stronger than the temporal effect.

Identification of Groups of Young Drivers

The attitude and belief items of the survey (in Table 7) were subjected to a cluster analysis in a bid to identify sub-groups of young drivers. Cluster members' scores on each of the five factor scores identified in the factor analysis were then used to describe members of each cluster according to the underlying structure of their attitudes and beliefs towards speeding.

The cluster analysis was conducted using the Hierarchical Cluster package of SPSS for Windows (Norusis, 1994) utilising the Wards Cluster method in conjunction with the Squared Euclidian Distance as a measure of similarity. Mojena's (1977, cited in Blashfield & Aldenderfer, 1988) method of determining the number of clusters was used and four clusters were extracted, based on the factor scores derived from the factor analysis involving drivers' attitude and belief ratings. Results of the cluster analysis are presented in Table 11.
Table 11: Results of the Cluster Analysis, Identifying the Number of Young Drivers in each Cluster and the Cluster Mean for each Factor

<table>
<thead>
<tr>
<th>No. of Drivers</th>
<th>Cluster Means for Each Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Factor 1</td>
</tr>
<tr>
<td>Cluster 1</td>
<td>38</td>
</tr>
<tr>
<td>Cluster 2</td>
<td>66</td>
</tr>
<tr>
<td>Cluster 3</td>
<td>85</td>
</tr>
<tr>
<td>Cluster 4</td>
<td>60</td>
</tr>
</tbody>
</table>

The significance of differences between the Factor scores of members of the four Clusters was assessed using analysis of variance. Cluster membership was used as the independent variable and significant effects were found for each of the factors. Post hoc pairwise comparisons were conducted between all the possible pairs of Clusters using the Bonferroni correction for inflation of the Type I error rate.

Table 12 shows the pattern of significant differences between clusters on each attitude and belief factor.

Table 12: Significant Differences between Cluster Means for Each Factor

<table>
<thead>
<tr>
<th>Factor</th>
<th>Differences Between Clusters</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Discomfort Exceeding Limit</td>
<td>C3 &gt; C4 C1 &gt; C2</td>
</tr>
<tr>
<td>II Perceived Risk - Residential</td>
<td>C4 &gt; C1 &gt; C2 C3</td>
</tr>
<tr>
<td>III Self Calibration</td>
<td>C4 C3 C2 &gt; C1</td>
</tr>
<tr>
<td>IV Effect of Speed Limit</td>
<td>C3 &gt; C4 &gt; C1 C2</td>
</tr>
<tr>
<td>V Perceived Risk - Main Roads</td>
<td>C4 &gt; C1 &gt; C2 C3</td>
</tr>
</tbody>
</table>

Cluster 1 consisted of 38 young drivers (approximately 15% of the sample). When compared to drivers in the other Clusters, the drivers in this Cluster were less likely to believe that they could drive safely at the nominated speeds (Factor 3), reported that the speed limit doesn’t affect their speed choice (Factor 4), and believed there is a relatively high risk of detection by the police when exceeding the speed limit in residential backstreets (Factor 2) and on main roads, highways or freeways (Factor 5).
Cluster 2 consisted of 66 respondents (approximately 26% of the sample). When compared to drivers in the other Clusters, the drivers in this Cluster felt very comfortable exceeding the speed limit (Factor 1), believed there is a very low risk of detection by the police when exceeding the speed limit on residential back streets (Factor 2), believed they could drive at the nominated speeds without crashing (Factor 3), reported that the speed limit had little effect on their speed choice (Factor 4), and believed there is little risk of detection by the police when exceeding the speed limit on main roads, highways and freeways (Factor 5).

Cluster 3 consisted of 85 respondents (approximately 34% of the sample). When compared to drivers in the other Clusters, the drivers in this Cluster did not feel at all comfortable exceeding the speed limit (Factor 1), believed there is a very low risk of detection by the police when exceeding the speed limit on residential back streets (Factor 2), believed they could drive safely at the nominated speeds (Factor 3), reported that the speed limit has a strong effect their speed choice (Factor 4) and believed there is very little risk of detection by the police when exceeding the speed limit on main roads, highways and freeways (Factor 5).

Cluster 4 consisted of 60 respondents (approximately 24% of the sample). When compared to drivers in the other Clusters, the drivers in this Cluster believed there is a very high risk of detection by the police when exceeding the speed limit on residential back streets (Factor 2), believed they could easily drive at the nominated speeds without crashing (Factor 3), reported that the speed limit has a relatively strong effect on their speed choice (Factor 4) and believed there is a very high risk of detection when exceeding the speed limit on main roads, highways and freeways (Factor 5).

The participants' responses to the items not included in the factor analysis were compared between Clusters. This allowed some more-specific conclusions to be drawn about the characteristics of participants in each cluster.

Initially the data were analysed to identify any exposure differences between members of the four Clusters. The members of the four Clusters differed significantly in the total number of hours they reported driving over the previous week ($F_{(3,245)} = 3.7, p < .05$). Bonferroni-corrected post hoc tests indicated that members of Cluster 4 drove significantly more (14.1 hours) than members of Clusters 1 and 3 (7.1 and 8.5 hours respectively). Further, this total was disaggregated by trip purpose, and members of the Clusters only differed in the number of hours they had spent driving to/from sporting activities, hobbies, and interests over the previous week ($F_{(3,245)} = 11.3, p < .05$). Post Hoc tests, using the Bonferroni correction for an inflated Type I error indicated that members of Cluster 4 spent more time driving to/from sporting activities, hobbies, and interests (2.2 hours) than Clusters 1, 2, and 3 (.34, .41. and .60 hours respectively).

The Clusters were found to differ significantly in their composition of males and females ($\chi^2_{(3)} = 12.1, p < .05$). There was a higher percentage of males in Clusters 2 and 3 and a higher percentage of females in Clusters 1 and 4 (see Figure 9).

Respondents were asked whether they owned their own car. As Figure 10 indicates, there were significant differences between Clusters on this item ($\chi^2_{(3)} = 14.8, p < .05$). Members of Clusters 2 and 4 were more likely to own their own car than members of Clusters 1 and 3.

There was no significant relationship between cluster membership and having been caught speeding by the Police, or between cluster membership and crash involvement. There was, however, a significant difference between the clusters on the amount of time that had elapsed.
since the participant had last been detected speeding ($F(3,72) = 3.5, p < .05$). This is shown in
Figure 11, where it is clear that members of Cluster 2 have the most recent speeding
offences.

![Figure 9: Number of Males and Females in Each Cluster](image)

![Figure 10: Number of Car Owners in each Cluster](image)
Drivers were asked to indicate the number of times they had seen police activity related to traffic enforcement over the past month. There were no significant differences between clusters in their perception of the level of enforcement activity.

![Figure 11: Time Since the Last Experience of Being Caught Exceeding the Speed Limit (Since Obtaining Their Licence) in Each Cluster](image)

**Figure 11**: Time Since the Last Experience of Being Caught Exceeding the Speed Limit (Since Obtaining Their Licence) in Each Cluster

**Discussion**

The factor analysis of the attitude and belief items confirmed that similar items in the survey measured similar characteristics. The survey measured comfort exceeding the speed limit, self-calibration of driving skill at different speeds, the perceived risk of detection separately on backstreets and on main roads, and the effect of the speed limit on driving behaviour.

The structure of these factors suggests that general attitudes and beliefs in each of these areas apply similarly to daytime and nighttime driving. The comfort, effect of speed limit, and perceived risk items all included items relating separately to daytime and nighttime, but in each case the underlying structure revealed in the factor analysis suggested that the responses to daytime and nighttime items were highly correlated. This is particularly apparent in the case of the items relating to the perceived risk of detection for speeding. The factor analysis results suggested that the correlation between the daytime/nighttime items was greater than the correlation between the backstreets/main roads items. It is important to note that this does not mean that participants believed there were similar risks of detection during the daytime and at night, only that people who perceived one time to be relatively risky also tended to believe the other time to be risky.
The factor analysis results also suggest that the perceived risk of detection is relatively independent of the other attitudes to speeding measured here. This is important in an enforcement context as it implies that drivers with a high perceived risk of detection do not necessarily have safety-oriented attitudes in the other areas. They may, for example, feel comfortable exceeding the speed limit, believe themselves to be relatively safe, and not be influenced by the speed limit. Assuming that underlying attitudes have some effect on driving behaviour, and given that the two “perceived risk” factors account for only 20% of the variation in responses, this result suggests that the road use behaviour of young drivers may not be under the close control of enforcement-related factors. The uncertainty about the general relationship between attitudes and behaviour, though, suggests the need for caution here. These results do at least suggest that there is a need to develop enforcement and public education strategies that:

- Take into account the likely impact of other factors on behaviour;
- Are intense or powerful enough to over-ride the effect of other factors, and/or
- To target the other factors more directly.

The results reported here, especially in the context of Harrison et al.'s (1998) results concerning the relationship between speeding and a number of attitudinal variables, suggest that intra-personal factors such as comfort exceeding the speed limit may be powerful causal agents in speed selection that act independently of perceptions about the risk of detection. If this is the case, then incorporating some of this complexity into the development of speed countermeasures is essential. Resistance to the effect of enforcement programs in the speed area may relate, therefore, to the strength of other causal factors that have generally not been taken into account.

There is a need to more-fully understand the way respondents interpreted “comfort” when responding to items concerning their comfort exceeding the speed limit. The results of the factor analysis suggest that responses to the comfort item were related to responses to items about the effect of the speed limit on behaviours in such a way that discomfort exceeding the speed limit was associated with a strong effect of the speed limit on behaviour. The discomfort items were not correlated with the other factors, suggesting that (across the sample) there was no consistent relationship between comfort exceeding the speed limit and the perceived risk of detection or drivers’ self calibration. This suggests that comfort exceeding the speed limit is not a product either of perceptions about enforcement or self-perceptions of driving ability.

Perceived comfort exceeding the speed limit may reflect the general attitude of drivers towards speeding in a moral sense, with discomfort reflecting a moral attitude opposed to speeding. This would explain the relationship between comfort and the effect of the speed limit on drivers’ behaviour, and would be consistent with the lack of relationship between comfort and the other factors. This interpretation is also consistent with Harrison et al. (1998) where decisions about comfortable driving speeds were strongly correlated with general ratings of the “wrongness” of a range of illegal behaviours.

An alternative interpretation of this result is that comfort ratings reflect the driver’s perception of the mental workload involved in driving above the speed limit. Drivers who perceive exceeding the speed limit to be difficult in this way would rate their comfort as lower than other drivers. This interpretation is also consistent with the correlations reported in the factor analysis. In the case of self-calibration, drivers may have a general perception that they can handle the discomfort associated with high workloads while speeding (self-calibration) but may prefer not to (discomfort).
Whether either or both of these interpretations are correct is an empirical question that needs to be addressed. The importance of comfort exceeding the speed limit in speeding behaviour (see Harrison et al., 1998) suggests that it may be a suitable target for public education material.

The cluster analysis and the subsequent analyses of the clustered data suggest that there are two groups of young drivers who are more likely to represent a road safety risk than other drivers (Clusters 2 and 1). Cluster 2 was particularly concerning. Members of Cluster 2 were more likely to be male, were likely to own their own car, had the most recent experience of detection for speeding, were the most comfortable exceeding the speed limit, believed there to be a low risk of detection in residential areas and on main roads, reported that the speed limit had relatively little effect on their driving behaviour, and were relatively confident about their ability to drive. Further research into the attitudes of this group could help in the development of appropriate targeting of enforcement and public education strategies for this specific group of drivers.

RESULTS AND DISCUSSION: ATTITUDE DIFFERENCES

This section details analyses of differences between attitudes and beliefs within the sample. It serves to provide a more-detailed analysis of the results of the survey in addition to the previous analyses that focused on similarities within groups of items and respondents.

Analysis Design

A number of measures of drivers' perceptions of speeding and speed enforcement were included in the survey. These items used a rating scale of one through ten where the end points were anchored with labels expressing extreme beliefs about the item. The measures and their rating scale anchors are shown in Table 13.

Four types of measures were obtained. These were drivers' perceived safety when driving at a variety of speeds ("Self-Calibration"), the effect that the speed limit has on drivers' speed choice ("Speed Limit"), drivers' comfort exceeding the speed limit by 15 km/h ("Comfort") and drivers' perceived risk of detection by the police when exceeding the speed limit by 10 km/h ("Risk").

For the questions measuring "Speed Limit" and "Risk", a low score represented relatively unsafe driving attitudes (eg: "The speed limit does not affect my driving speed") and higher scores represented relatively safe driving attitudes (eg: "I would never allow myself to exceed the speed limit"). For the items measuring drivers' "Comfort" exceeding the speed limit, a low score indicated that drivers didn't feel at all comfortable exceeding the speed limit (a safer driving attitude) and a score of ten indicated that drivers felt very comfortable exceeding the speed limit (a relatively unsafe driving attitude).

The items measuring young drivers' safety when travelling at 60 km/h, 100 km/h and 130 km/h were thought to be measures of self-calibration and it was considered that these responses did not clearly translate into safe/unsafe road safety attitudes. For example, it would be considered a "safe" attitude for a young driver to feel they could drive safely at 60 km/h however it would be considered "unsafe" for a young driver to report that they felt that they could drive safely at 130 km/h.
Table 13: Measures of Drivers Attitudes Towards Speeding and Road Safety and the Rating Scale Anchors

<table>
<thead>
<tr>
<th>Rating Scale Anchors</th>
<th>1</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Items measuring drivers’ perceived safety when driving at a variety of speeds</strong></td>
<td>“I could not drive safely at that speed even for a short distance”</td>
<td>“I could drive safely at that speed without the risk of crashing”</td>
</tr>
<tr>
<td><strong>Items measuring the effect that the speed limit has on drivers’ speed choice</strong></td>
<td>“The speed limit does not effect my driving speed”</td>
<td>“I would never allow myself to exceed the speed limit”</td>
</tr>
<tr>
<td><strong>Items measuring drivers’ comfort exceeding the speed limit by 15 km/h</strong></td>
<td>“I do not feel at all comfortable exceeding the speed limit by 15 km/h”</td>
<td>“I feel very comfortable exceeding the speed limit by 15 km/h”</td>
</tr>
<tr>
<td><strong>Items measuring drivers’ perceived risk of detection by the police for exceeding the speed limit by 10 km/h</strong></td>
<td>“There is no risk of getting caught by the police for exceeding the speed limit by 10 km/h”</td>
<td>“There is a definite risk of getting caught by the police for exceeding the speed limit by 10 km/h”</td>
</tr>
</tbody>
</table>

The data were analysed using analyses of variance (ANOVA) in SPSS for Windows (Norusis, 1994). Four separate analyses were conducted - one for each of the four measures outlined above. Each analysis involved an investigation of the effect of a number of variables on the particular attitude or belief measure. In the case of the “Self-Calibration” measure, the analysis involved five between subject factors and one within-subjects factor. For the other measures, the same five between-subjects factors were used and two within-subjects factors. The design of the analyses is shown in Table 14. ANOVA was selected for the analyses, as it is robust under moderate violations of assumptions of normality (Keppel, 1982; Montgomery, 1976).

Interactions involving four or more variables were not considered due to the difficulties associated with interpreting results at this level of complexity, and a relatively conservative type I error rate for each statistical test ($p = .01$) was used.
Table 14: Design of Multivariate Analysis

<table>
<thead>
<tr>
<th>Factors</th>
<th>Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Between-Groups Comparisons (Included in each analysis):</strong></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>2</td>
</tr>
<tr>
<td>Cluster Membership</td>
<td>4</td>
</tr>
<tr>
<td>Been Caught Speeding by the Police</td>
<td>2</td>
</tr>
<tr>
<td>Number of Times Have Seen Traffic Enforcement During the Daytime (Over the Past Month)</td>
<td>2</td>
</tr>
<tr>
<td>Number of Times Have Seen Traffic Enforcement During the Nighttime (Over the Past Month)</td>
<td>2</td>
</tr>
<tr>
<td><strong>Within-Subjects comparisons (Separate Analyses):</strong></td>
<td></td>
</tr>
<tr>
<td>“Self-Calibration”</td>
<td>Driving Speed</td>
</tr>
<tr>
<td>“Speed Limit”</td>
<td>Road Type</td>
</tr>
<tr>
<td>Time of Day</td>
<td>2</td>
</tr>
<tr>
<td>“Comfort”</td>
<td>Road Type</td>
</tr>
<tr>
<td>Time of Day</td>
<td>2</td>
</tr>
<tr>
<td>“Risk”</td>
<td>Road Type</td>
</tr>
<tr>
<td>Time of Day</td>
<td>2</td>
</tr>
</tbody>
</table>
Self Calibration

Drivers were asked to rate their own safety when driving at speeds of 60 km/h, 100 km/h, and 130 km/h. The statistically significant main effects from the analysis of this self-calibration measure are shown in Table 15.

Table 15: Main Effects of the Analysis of Variance using the Self-Calibration Measure

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean &quot;Self-Calibration&quot; Ratings</th>
<th>Statistical Test Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speeding Offence History</td>
<td>Have been caught 8.3  Have not been caught 7.5</td>
<td>$F_{(1,212)} = 9.9, p &lt; .01$</td>
</tr>
<tr>
<td>Cluster Membership</td>
<td>C1 5.6  C2 8.1  C3 7.8  C4 8.5</td>
<td>$F_{(3,147)} = 40.1, p &lt; .01$</td>
</tr>
<tr>
<td>Driving Speed</td>
<td>60 km/h 9.0  100 km/h 8.2  130 km/h 5.9</td>
<td>$F_{(2,211)} = 93.9, p &lt; .01$</td>
</tr>
</tbody>
</table>

Averaged across these speeds there were significant self-calibration differences between those young drivers who had and those who hadn’t been caught exceeding the speed limit (since obtaining their licence). Drivers who had been caught speeding reported that they felt safer driving compared with those drivers who hadn’t been caught speeding.

Members of the four Clusters were found to differ in their self-calibration. Averaged across the three speeds, the members of Cluster 4 reported that they felt the safest and members of Cluster 1 the least safe.

Driving speed was found to have a significant effect on young drivers’ self calibration ratings, with young drivers reporting that they felt they could drive more safely (with less of a risk of crashing) at lower speeds than at higher speeds.

Self-calibration was not significantly related to recent exposure to speed enforcement activity in either daytime or nighttime, or to the sex of the driver.

A significant interaction influencing drivers’ self-calibration ratings was found between driving speed and sex ($F_{(2,211)} = 5.8, p < .01$). As can be seen in Figure 12, the reduction in perceived safety, as speed increased, was greater for females than for males.
Effect of the Speed Limit

Participants were asked to rate the effect the speed limit has on their speed choice on different types of roads (main/backstreets) and at different times of the day (day/night). The significant main effects from this analysis are shown in Table 16.

Table 16: Main Effects of the Analysis of Variance using the Effect of the Speed Limit Measure

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean &quot;Effect of the Speed Limit&quot; Ratings</th>
<th>Statistical Test Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster Membership</td>
<td>C1  7.2  C2  4.3  C3  8.6  C4  8.8</td>
<td>$F_{(3,245)} = 82.5, p &lt; .01$</td>
</tr>
<tr>
<td>Road Type</td>
<td>Backstreets  7.4  Main Roads  7.2</td>
<td>$F_{(1,245)} = 10.1, p &lt; .01$</td>
</tr>
</tbody>
</table>

The members of the four Clusters reported that the speed limit had a different effect on their speed choice, with the members of Cluster 2 indicating that their speed choice was the least influenced by the speed limit compared to members of the other three Clusters.
The type of road was also found to have a significant influence on the effect of the speed limit on drivers' speed choice. Drivers indicated that the speed limit had more of an influence on their speed choice on backstreets than on main roads.

The effect of the speed limit on driving behaviour was not significantly related to recent exposure to daytime or nighttime enforcement activity, sex, having been caught speeding, or to the time of day driving took place. It is important to note the implications of the failure to find a significant effect of exposure to enforcement on the effect of the speed limit on driving behaviour. It suggests that the impact of the speed limit on speed selection may be less a result of potential negative consequences of speeding such as detection and punishment, and more a result of intra-personal factors such as attitudes and motivational factors.

A significant interaction influencing the effect of the speed limit on behaviour was found between road type and whether the driver had been caught speeding ($F_{(1,245)} = 12.4, p < .01$). This is shown in Figure 13, where it is clear that the difference between the effect of the speed limit on main and residential roads occurred only for those drivers who had been caught speeding. As this is likely to have occurred on a main road rather than a residential road, this underscores the suggestion above that relationships between the effect of the speed limit and contact with enforcement may not be simple. Here, those who had been caught speeding said that the speed limit had less of an effect on their behaviour on main roads than those who had never been caught speeding.

![Figure 13: Mean Ratings of the Effect of the Speed Limit on Speed Choice by Road Type and Speeding Offence History](chart.png)
Comfort Exceeding the Speed Limit

Young drivers were asked to rate how comfortable they felt exceeding the speed limit by 15 km/h on different types of roads (main/backstreet) and at different times of the day (day/night). Table 17 shows the significant main effects.

Averaged across the type of road and time of day, young male drivers reported feeling more comfortable exceeding the speed limit by 15 km/h compared with young female drivers.

The members of the four Clusters were found to differ in their level of comfort when exceeding the speed limit by 15 km/h. The members of Cluster 2 reported feeling more comfortable exceeding the speed limit by 15 km/h compared with the members of Clusters 1, 3, and 4.

Drivers reported feeling more comfortable exceeding the speed limit by 15 km/h on main roads than backstreets. The time of day was found to have a significant influence on drivers’ comfort exceeding the speed limit by 15 km/h. Drivers reported that they felt less comfortable exceeding the speed limit by 15 km/h during the nighttime hours.

Comfort exceeding the speed limit was unrelated to the participants' recent contact with daytime or nighttime enforcement activity or having been detected speeding in the past. There were no significant interaction effects.

Table 17: Main Effects of the Analysis of Variance using the Comfort Exceeding the Speed Limit Measure

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean &quot;Comfort Exceeding the Speed Limit&quot; Ratings</th>
<th>Statistical Test Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>Male 4.7, Female 3.1</td>
<td>$F_{(1,245)} = 10.3, p &lt; .01$</td>
</tr>
<tr>
<td>Cluster Membership</td>
<td>C1 3.8, C2 5.8, C3 2.7, C4 3.7</td>
<td>$F_{(3,245)} = 20.9, p &lt; .01$</td>
</tr>
<tr>
<td>Road Type</td>
<td>Backstreets 2.5, Main Roads 4.5</td>
<td>$F_{(1,245)} = 37.4, p &lt; .01$</td>
</tr>
<tr>
<td>Time of Day</td>
<td>Daytime 4.2, Nighttime 3.8</td>
<td>$F_{(1,245)} = 9.2, p &lt; .01$</td>
</tr>
</tbody>
</table>
Perceived Risk of Detection

Young drivers were asked to rate the perceived risk of detection by the Police when exceeding the speed limit by 10 km/h. Table 18 shows the significant main effects.

Averaged across road type (main roads/backstreets) and the time of day (day/night), cluster membership was found to have a significant effect on drivers’ perceived risk of detection by the Police when exceeding the speed limit by 10 km/h. The members of Cluster 4 perceived the highest risk of detection by the Police when exceeding the speed limit by 10 km/h.

Drivers’ perceived risk of detection (by the Police for speeding) was found to differ according to the type of road drivers were using. Drivers indicated that they perceived the risk of detection by the Police for speeding 10 km/h over the limit to be greater on main roads than on backstreets.

The time of day was found to alter drivers’ perceived risk of detection by the Police when speeding. Drivers perceived a greater risk of detection by the Police for speeding 10 km/h above the speed limit during the daytime hours.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean &quot;Perceived Risk of Detection&quot; Ratings</th>
<th>Statistical Test Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster Membership</td>
<td>C1  6.5</td>
<td>F(3,245) = 94.1, p &lt; .01</td>
</tr>
<tr>
<td></td>
<td>C2  4.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C3  4.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C4  8.4</td>
<td></td>
</tr>
<tr>
<td>Road Type</td>
<td>Backstreets 4.9</td>
<td>F(1,245) = 49.5, p &lt; .01</td>
</tr>
<tr>
<td></td>
<td>Main Roads 6.9</td>
<td></td>
</tr>
<tr>
<td>Time of Day</td>
<td>Daytime 6.2</td>
<td>F(1,235) = 17.8, p &lt; .01</td>
</tr>
<tr>
<td></td>
<td>Nighttime 5.6</td>
<td></td>
</tr>
</tbody>
</table>

The perceived risk of detection for speeding was not related to driver sex, having been caught speeding in the past, or the level of exposure to enforcement activity.

There was a significant interaction between Cluster membership and road type such that the difference between the perceived risk of detection on main and residential roads was small for members of Cluster 4 and larger for members of Clusters 1, 2, and 3. This interaction is shown in Figure 14.
Figure 14: Mean Ratings of the Perceived Risk of Detection by Cluster and Road Type

The results of the analyses described above are summarised in Table 19.
Table 19: Summary of Results (Interactions in italics)

<table>
<thead>
<tr>
<th>Effect of the Within-Subjects Factor</th>
<th>Self-Calibration</th>
<th>Effect of the Speed Limit on Speed Selection</th>
<th>Comfort Exceeding the Speed Limit</th>
<th>Perceived Risk of Detection for Speeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect of the Within-Subjects Factor</td>
<td>Drivers reported that they could drive more safely at lower speeds</td>
<td>Drivers reported that the speed limit had more of an influence on their speed choice on backstreets than on main roads <em>The effect of road type occurred only for drivers who had been caught speeding in the past</em></td>
<td>Drivers reported feeling more comfortable exceeding the speed limit on main roads than on backstreets</td>
<td>Drivers reported a greater risk of detection by the Police for speeding on main roads compared with backstreets (<em>but not for members of Cluster 4</em>)</td>
</tr>
<tr>
<td>Sex</td>
<td><em>Males felt safer than females at higher speeds</em></td>
<td></td>
<td>Male drivers reported feeling more comfortable exceeding the speed limit compared with female drivers</td>
<td></td>
</tr>
<tr>
<td>Cluster Membership</td>
<td>Cluster 4 members felt safer driving and members of Cluster 1 felt the least safe.</td>
<td>The driving speed of the members of Cluster 2 was significantly less influenced by the speed limit than the driving speed of the members of the other three Clusters</td>
<td>Members of Cluster 2 indicated that they felt more comfortable speeding than the members of the other Clusters</td>
<td>The members of Cluster 4 perceived the greatest risk of detection for speeding by the Police.</td>
</tr>
<tr>
<td>Having Been Caught Speeding</td>
<td>Young drivers who had been caught speeding reported feeling safer driving compared with those who hadn’t been caught speeding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amount of Traffic Enforcement Seen During the Daytime</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amount of Traffic Enforcement Seen During the Nighttime</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Discussion

The results presented above and summarised in Table 19 describe the pattern of attitudes towards speeding and speed enforcement held by young drivers.

Participants were asked to make judgements about their ability to drive safely at three speeds (60 km/h, 100 km/h, and 130 km/h). These ratings were considered important as a measure of the self-calibration or safety-related judgement of participants' own driving skill. It is known that younger drivers are more prone than other groups to rate themselves as safer than their age-group peers and than other drivers in general (Matthews and Moran, 1986). It has been suggested that unrealistic levels of self confidence may play a part in the elevated crash risk of younger or inexperienced drivers (Brown and Groeger, 1988; Harrison, Triggs, Wheeler, and Fitzharris, 1997), and Job (1990) in particular has argued that experience as a driver acts initially to increase the self-confidence of drivers as the road environment loses the ability to invoke a fear response in the absence of any near misses or similar events which would act to reinforce the potential risks involved in driving. This speed with which self-confidence develops has been demonstrated by Harrison (1999), who showed that confidence peaked within a few months of starting to learn to drive.

Generally, drivers indicated that they could drive more safely at lower speeds than at higher speeds. Young drivers therefore believe themselves to be safe within the domain of driving speeds allowed within Victoria, but perceive themselves to be less so at speeds above this.

Although young male drivers reported feeling no safer driving than did young female drivers, there were differences between males and females at higher speeds. This indicates that at higher speeds, young male drivers believe themselves to be safer drivers than young female drivers. This may reflect a general over-confidence in driving ability among young male drivers. This result is consistent with a number of reports in the literature which suggest that the self-calibration problems thought to be associated with elevated crash involvement in this group are particularly prevalent in male drivers compared to female drivers (DeJoy, 1992).

Young drivers who had been caught speeding reported higher self-calibration ratings than those drivers who hadn't been caught speeding. These differences suggest an over-confidence in the group of drivers who had been caught speeding. This may reflect the impact of social and psychological factors on speed-related attitudes and behaviours. In this case, it is possible that drivers who engage in risky speed-related behaviours more often, and who are therefore more likely to be detected speeding, are also those drivers who are confident of their own safety.

The members of Cluster 4 gave the highest self-calibration ratings of all participants with members of Cluster 1 feeling the least safe as drivers. These results indicate that the members of Cluster 4 (and perhaps Cluster 2) believe that they can drive more safely (averaged across the three speeds) than the members of the other clusters. This difference between clusters is consistent with the earlier suggestion that Cluster 4 (and perhaps 2) represent potential targets for road safety programs.

Thus, the data suggest the possibility that young male drivers, the members of Cluster 4, and those who have been caught speeding may be more overconfident than other drivers. While it is widely accepted that male drivers are more likely to make self-calibration errors than are female drivers, the data analysed above suggest (in addition) that cluster membership and having been detected offending in the past are also associated with self calibration,
independently of the effect of sex.

It was considered that the speed limit itself might influence the speed behaviours of drivers, and that this effect might differentiate amongst younger drivers. Harrison, Fitzgerald, Pronk, & Fildes (1998) have argued that general attitudes towards legal and illegal behaviour influence the speed behaviours of drivers, so the presence of a speed limit might be expected to affect some young drivers more than others. Participants were asked to rate the effect of the speed limit on their driving behaviour on backstreets and on main roads, and for each driving context in the daytime and at night.

In general, participants reported that the speed limit had a stronger effect on their behaviour when driving on residential backstreets than it did when driving on main roads. Given that the perceived risk of detection for speeding was stronger on main roads than on backstreets, it is unlikely that this difference reflects the effect of deterrence mechanisms.

Members of Cluster 2 were less influenced by the speed limit than were members of the other clusters.

Evidence presented by Harrison et al. (1998) suggests that speed choice may reflect (in part) the comfort level of drivers with their driving speed. This is consistent with the model of speed choice outlined in the Introduction to this report, where it is argued that a number of intrapersonal factors contribute strongly to speed-related behaviours. Participants in the present study were asked to indicate their level of comfort exceeding the speed limit by 15 km/h on backstreets and on main roads, during the daytime and at night in each context.

Participants generally felt more comfortable exceeding the speed limit on main roads than they did on backstreets, in spite of the greater perceived risk of detection on main roads. This result is similar to the result discussed above concerning the effect of the speed limit on driver behaviour, where it was noted that the speed limit had a greater effect on behaviour on backstreets than on main roads. Together these results suggest that there is a general perception that it is inappropriate to drive fast on backstreets or residential areas, perhaps reflecting the perception that there are more potential hazards in those environments than on main roads. In the case of the reported comfort exceeding the speed limit, it may also in part reflect a perception that 15 km/h over the speed limit is more serious in a 60 km/h speed zone than the same offence in an 80 or 100 km/h zone.

Drivers also reported feeling more comfortable exceeding the speed limit during daytime hours, again underscoring the lack of relationship between perceived risk of detection for speeding (higher in daytime) and other speed-behaviour attitudes. One possible explanation for this difference between daytime and nighttime attitudes is that it reflects the lesser cognitive workload and ease of hazard perception in daylight driving conditions. Harrison et al. (1997) noted that there is ample evidence that young drivers are more likely to suffer from the effects of increasing workload associated with degradation of the perceptual driving environment which would be expected to occur in inclement weather and nighttime driving. Under the zero-risk model proposed by Summala (1988), novice drivers in conditions of relative uncertainty (such as while driving at night) would be expected to reduce the riskiness of their driving by reducing their speed, perhaps accounting for the results here relating to daytime and nighttime comfort exceeding the speed limit. This is consistent with the cognitive workload interpretation of the comfort items discussed earlier.

Young male drivers reported feeling significantly more comfortable exceeding the speed limit by 15 km/h compared with young female drivers. This suggests that young male drivers hold less safe driving attitudes, and is consistent with earlier results reported above.
The members of Clusters 2 indicated that they were more comfortable exceeding the speed limit than were the members of Clusters 1 and 3. This result fits the profile of Cluster members discussed in the previous section, where the members of Clusters 2 held less safe driving attitudes than the members of the other Clusters.

Deterrence models (Harrison, 1998; South, 1998) emphasise the perceived risk of detection as a critical factor mediating enforcement strategies and behaviour change. For this reason, it was considered important to seek information concerning the perceptions of participants concerning the risk of detection for speeding. Participants were asked to indicate their beliefs about the likelihood of detection for speeding on backstreets and main roads, while driving at night and during the day.

In general, participants indicated a stronger perceived risk of detection for speeding on main roads (compared to backstreets) and for driving during the day (compared to night). These perceptions reflect the general enforcement activity of the Victoria Police.

The members of Cluster 4 indicated that they perceived a greater risk of detection by the Police for speeding compared with the members of the other three Clusters.

The analysis of differences between groups of young drivers presented in this section of the report suggests that exposure to enforcement activity has an effect on the perceived risk of detection for speeding, but that the perceived level of enforcement activity and the perceived risk of detection are not then related to other attitudes to speeding in any substantial way amongst younger drivers. This leads to a conclusion that speed enforcement programs need to be seen in the context of a range of factors that may contribute to speed selection, that may themselves have powerful effects on driving speed that are independent of the effect of enforcement activity.

Deterrence-related factors may influence driver behaviour, as has been demonstrated consistently for speed and drink-driving programs in Victoria, but they do so in the context of a broader range of factors that influence behaviour and which appear to be unrelated to the deterrence-related factors. These factors will have stronger or weaker effects depending on many things, and may (for some drivers on some occasions) counter the behavioural effect of the perceived risk of detection.

The possibility that factors other than the level of enforcement may play an important role in speed behaviours has not been considered in the development of speed enforcement strategies, and the results reported here suggest that there is a need to do so. This was implied in the Introduction when it was suggested that the effect of speed enforcement may depend on its relationship to the action of other variables such as the social and psychological or attitudinal variables discussed here.

Where there are opposite influences from exposure to enforcement (reducing the likelihood of speeding behaviour) and comfort, self-calibration, and speed limit related attitudes (increasing the likelihood of speeding behaviour in some young drivers), there is no reason to assume that the effect of exposure to enforcement will have a stronger effect on behaviour. The multi-causal model of speed behaviour discussed in the Introduction stresses the combined effect of many variables on speed choice, with an emphasis on the likely effect of factors immediate to the driving context such as trip motivation, social influences, attitudes, and personality. In the context of this model, and given the results presented here which suggest a weak relationship between perceived risk of detection and other speed-related attitudes, it is suggested that there is a need to consider the interaction between exposure to...
enforcement and other speed-related factors in developing enforcement programs to target groups such as younger drivers.

GENERAL DISCUSSION

This Section of the report has presented a detailed analysis of the results of a survey of young drivers conducted to investigate the attitudes and self-reported behaviour of this group of road users in the speed domain. Some important findings have emerged from the analyses reported here:

• Attitudes to speeding and the perceived risk of detection in a number of driving contexts are related in a way that suggests the perceived risk of detection for speeding is uncorrelated with young drivers' self calibration, their comfort exceeding the speed limit, or the effect of the speed limit on their driving behaviour. This is not surprising, but it does emphasise the need to consider a range of causal factors when discussing speed behaviour.

• These attitudes were related in a way which suggested that the perceived risks of detection for daytime and nighttime speeding were more highly correlated than the perceived risk for speeding in different driving contexts, and that the effect of the speed limit on driving behaviour was moderately inversely related to drivers' comfort exceeding the speed limit.

• The pattern of responses to the attitude items suggested that there are four identifiable groups of young drivers.

• Two groups are relatively high-risk groups differentiated by the influence of the speed limit on driving behaviour. One of the high-risk groups (Cluster 4) reported that the speed limit did affect their speed choice, suggesting that this group may be more amenable to enforcement and public-education programs than the other high risk group (Cluster 2).

• The high-risk groups included more car owners than the other groups, more drivers with recent offence histories, and more drivers who drove for non-work/education reasons.

• Analysis of differences between respondents suggested that exposure to enforcement influenced the perceived risk of detection but not the effect of the speed limit on driving behaviour, self-calibration, or the drivers' comfort exceeding the speed limit.

It is clear that the failure to detect a relationship between perceived risk and the other attitude variables, the failure to detect an effect of exposure to enforcement on those variables, and the results in a number of analyses which suggest that prior offences were correlated to current unsafe attitudes rather than safe attitudes argues strongly for the continued application of enforcement and education strategies that go beyond reliance on high levels of enforcement as the only method of control. It is clear that the factors determining driving speed are relatively complex, and that they need to be considered more fully in the development of strategies targeting young drivers.
Harrison (1998a,b) has argued similarly in the context of drink-driving, suggesting that the involvement of a range of causal factors in this unsafe behaviour argues against an assumption that high levels of enforcement and supporting publicity will influence all high-risk drivers all of the time. Based on his analysis of the characteristics of a large sample of drink-drivers, Harrison suggested that there was a need to consider the full range of causal factors in the development of better countermeasures. The same argument has been applied to countermeasure development in general (Harrison, 1989, 1998). Harrison (1998) has most recently suggested that reliance on the deterrence theory in road safety fails to recognise the complexity of human behaviour.
IMPLICATIONS FOR ENFORCEMENT ACTIVITY

The purpose of this project was the provision of recommendations concerning the development of enforcement methods or procedures that will better target excessive speed amongst younger drivers. It was considered important to examine the pattern of crashes involving younger drivers and to collect data concerning the attitudes and perceptions of this group of road users. Thus, the second section of this report presented an analysis of the crash data for the two most recent years available at the time of the project, and the third section presented the results of a survey of a sample of younger drivers concerning a range of issues associated with road use and speeding. This section of the report examines the implications of the results, combined with the general issues raised in the first section which introduced some issues relating to speeding and enforcement.

The analysis of the crash data reported in Section 2 confirmed general predictions that young drivers, and young males in particular, are more likely to be involved in crashes defined as speed-related than are older drivers. This underscores the potential benefits that may still result from the application of targeted countermeasures directed specifically towards younger (male) drivers engaged in excessively fast driving.

Young drivers may be involved in loss-of-control crashes for a number of reasons. It may be the case, for example, that they do not possess sufficient skill to cope with the demands of driving at higher speeds, with crashes therefore the result of poor cognitive or information-processing skills. The over-involvement in these crashes may also result from a number of factors which act together to increase the driving speed of younger drivers but which do not act as strongly on older drivers. It is likely, of course, that both factors contribute to the over-involvement of younger drivers in speed-related crashes. It is assumed here, however, that enforcement and public education programs are unlikely to influence the experience-related cognitive skills of inexperienced drivers, and instead that the focus of these programs should be the many factors which contribute to the speed choices of younger drivers.

The lack of high-intensity speed enforcement programs at night, combined with evidence that younger drivers are more likely to engage in nighttime road use than are older drivers, and that road use patterns for younger drivers at night are related to motivations that are associated with a higher risk of crashing (Gregersen and Bjurulf, 1996), suggests that it may be necessary to increase the amount of nighttime speed enforcement substantially to have an impact on the driving behaviour of younger drivers. Certainly, recent evidence from another MUARC study conducted for the TAC suggests that small changes in enforcement intensity may not be detected by drivers, and evidence from Europe (Ostvik & Elvik, 1990) suggests that quite large increases in enforcement intensity are necessary before drivers increase their perceived risk of detection for speeding. In light of these results, and given the crash and driving-pattern data presented above, any recommendations for better-targeted speed enforcement will most likely need to include a recommendation for large increases in nighttime speed enforcement and an accompanying public-education program to support the enforcement effort.

The pattern of speed-involvement in crashes also argues for an enforcement method and supporting public education which links enforcement activity to wet-weather driving and driving on curves, as both presented problems for younger drivers. As discussed below, the road-use data presented earlier argue for the use of public education materials oriented towards sub-groups of road users driving in these contexts.
The attitude data presented earlier are ambiguous with respect to the likely effect of an increased enforcement program. It is clear that exposure to enforcement has an effect on the perceived risk of detection for speeding, suggesting that an increase in the level of enforcement should at least increase the perceived risk of detection for this offence. It is also clear, however, that the perceived risk of detection was not related to other speed-related attitudes such as the driver's comfort exceeding the speed limit or the effect of the speed limit on driving behaviour. This suggests that increased enforcement levels are unlikely, on their own, to impact on the actual behaviour of younger drivers, primarily because enforcement and the perceived risk of detection for speeding is only one of a number of factors that may impact on speed selection. This is consistent with evidence that changes in enforcement levels need to be substantial to impact on driver perceptions.

This represents the largest potential problem confronting speed enforcement in general and speed enforcement for younger drivers in particular. Deterrence-based accounts of the effect of enforcement on driving behaviour tacitly assumed that the perceived risk of detection (in the context of significant penalties) would over-ride the potential effect of the many factors with causal roles in behaviours such as speed-choice. More recent accounts of the effect of enforcement on behaviour which rely on a naturalistic decision-making model (see Harrison, 1998) assume that the perceived risk of detection is just one of the many causal factors operating at each point in time to change driver behaviour. In the context of this understanding of enforcement, and in light of the data presented here which suggest that there is unlikely to be a relationship between the perceived risk of detection and other speed-related attitudes, it is suggested here that particular attention needs to be given to ensuring that enforcement techniques (and accompanying public education programs) are developed in a way that maximises the potential impact of the program against the background of other factors with a causal role for driver behaviour.

Some characteristics of a successful enforcement program in this context might include:

- A focus on the personal risk of detection as opposed to a focus on the theoretical risk of detection. It is likely that one of the key components of the speed camera program has been the high level of detection and punishment for speeding, which either through direct experience or as a consequence of word-of-mouth experience has increased drivers' perceptions that there is a personal risk of being caught which would be expected to have greater controlling influence on behaviour in the presence of other factors than a less-concrete general perceived risk. This characteristic argues for a high-detection approach to the targeted enforcement program, perhaps using automated enforcement techniques.

- A reliance on uncertainty in the placement of enforcement activity. MUARC research suggests that the effect of drink-driving enforcement can be weakened by the predictability of enforcement placement (e.g. Harrison, 1996). The clear halo effects associated with the effects of speed enforcement (see Zaal, 1994) suggest that any predictability in the spatial or temporal placement of enforcement activity is likely to weaken the potential strength of the perceived risk of detection as a behaviour-control factor. The use of predictable enforcement locations and times would be expected to maximise the perceived risk of detection at those locations and times, but would do little to increase the ability of perceived risk of detection to control behaviour in a general sense. Unpredictable, high-intensity enforcement operations would maximise the likely impact of enforcement on behaviour across the road system. The randomised enforcement program evaluated by Leggett (1988) in Tasmania and Newstead, Cameron, & Leggett (1999) in Queensland, or some variation on this approach, might assist in the increasing the unpredictability of enforcement activity. The potential value of Leggett's
work is that it suggests that it is possible to allocate enforcement resources in time and space to maximise the perceived risk of detection for offences and which, in turn, has been shown to have an impact on crash frequencies. The potential for this type of operation has not been investigated widely outside Queensland.

- The use of visible and covert enforcement. Highly visible enforcement would act to reinforce any public education programs that focus on the perceived risk of detection. Less visible or covert Police operations allow the direct punishment-related effects of enforcement to operate. There is an increasing need to assess the optimal level of overt and covert enforcement in the speeding domain.

The cluster analysis provides additional data that may be useful in the development of any accompanying public education program to support an increase in targeted enforcement. There were some specific characteristics of the high-risk groups that could be used as the basis for characters in any public-education material to assist in the apparent relevance of this material to the target audience. These characteristics included biases towards:

- Males rather than females
- Car owners
- People who drive for social reasons at night (nightclubs and parties)
- People with offence histories

The apparent importance of other factors in addition to enforcement-related factors leads to the suggestion that there is an ongoing need for the development and targeting of public education programs in addition to enforcement programs. A public education program in this context might use some of the characteristics identified here for high-risk drivers and driving behaviours and incorporate them into public education materials either as role models or as the basis for decisions about targeting.

The development of road safety public education materials that result in the internalisation of speed-related road safety messages and motivations is unlikely to be easy. Unlike commercial product marketing, where publicity material generally seeks to meet the needs or wants of the wider population with a particular product, road safety publicity material (especially in the speed area) seeks to reverse audience behaviour in the context of behaviours that are generally rewarding and rarely unsafe (from the perspective of the audience). It is possible that new approaches to developing and promoting road safety messages in the speed domain that particularly target younger drivers might be appropriate.
REFERENCES


APPENDIX
Good tel. My name is (SAY NAME) and I am calling from Roy Morgan Research on behalf of the Monash University Accident Research Centre to conduct a survey of young drivers on road safety issues. The survey will take between ten and fifteen minutes to complete and the information you give is entirely confidential.

Would you or someone in your household be a driver between 18 and 21 years of age?
If YES SAY: May I speak to them?

If NOT AVAILABLE MAKE AN APPOINTMENT WITH ANY OF THE RESPONDENTS WHO ARE AGED 18-21 IN THE HOUSEHOLD

IF CURRENT RESPONDENT IS BETWEEN 18 AND 21 YEARS OF AGE SAY: Would you be willing to take part in this survey?

IF NO THANK AND TERMINATE, IF YES CONTINUE

IF CHANGE RESPONDENT RE-INTRODUCE

QSEX. RECORD SEX OF RESPONDENT

MALE........... 1

FEMALE........... 2

IF SEX QUOTA IS FULL SAY:

Thank you for your time but we have interviewed enough 233 males/females/ for this survey.

QAGE. Firstly, would you mind telling me your age in years please?

Under 18........... 1

18................... 2

19................... 3

20................... 4

21................... 5

Over 21........... 6

Refused........... 7

IF AGED UNDER 18, OVER 21 OR REFUSED (CODE 1 OR 6 OR 7 ON QAGE) ABANDON USER2 AND SAY

Thank you for your help but we were hoping to speak to people who were aged 18 to 21.

QA. Do you have a current full or provisional drivers’ licence?

YES............. 1

NO............. 2

IF DO NOT HAVE A CURRENT FULL OR PROVISIONAL DRIVERS’ LICENCE (CODE 2 ON QA) ABANDON TO USER2 AND SAY

Thank you for your help but we were hoping to speak to people who have a current drivers’ licence.

Q1. Do YOU own a car?

YES............. 1

NO............. 2

IF OWN A CAR (CODE 1 ON Q1), ASK Q1A:

Q1A. For how many months have you owned a car?

RECORD TO THE NEAREST MONTH

IF LESS THAN 1 MONTH RECORD AS 1 MONTH

IF CAN’T SAY SAY: What would be your best guess?

IF STILL CAN’T SAY TYPE ESC-D

Q3. In the last 7 days, for which of the following reasons have you personally DRIVEN a vehicle?

READ OUT

Driving to or from work or school/college/university........ 1,

Driving FOR your work........... 2,

Driving to or from parties, nightclubs or pubs........... 3,

Driving to or from sporting activities or hobbies........... 4,

Or have you not driven in the last 7 days........... 5,

(DO NOT READ) NONE OF THE ABOVE........... 6,

(DO NOT READ) CAN’T SAY........... 7,
DATE 11-SEP-97  SPEED ENFORCEMENT AND YOUNG DRIVERS  PAGE 2

IF DRIVEN A CAR IN LAST SIX MONTHS OR NONE OF THE LISTED REASONS (CODE 1 OR 2 OR 3 OR 4 OR 6 ON Q3) CONTINUE ELSE GOTO Q9A

Q3B. %247/Apart from the reasons you have just mentioned, // %247/for/For/what other reasons have you DRIVEN a vehicle in the last 7 days?

IF OTHER, HIGHLIGHT OTHER AND TYPE IN RESPONSE

SOCIAL REASONS... 1,

DOMESTIC REASONS... 2,

RECREATIONAL REASONS... 3,

OTHER (PLEASE SPECIFY)... 97,

CAN'T SAY... 98,

NO OTHER REASON... 99,

IF DRIVEN TO OR FROM WORK OR SCHOOL/ COLLEGE/UNIVERSITY (CODE 1 ON Q3) ASK Q4A AND Q4B

Q4A. Approximately how many HOURS in total in the last 7 days have you spent as a driver

TO OR FROM WORK OR SCHOOL/ COLLEGE/UNIVERSITY? %253/Don't include any time spent driving FOR work.//

RECORD TO THE NEAREST HOUR IF LESS THAN 1 HOUR RECORD AS 1 HOUR

IF CAN'T SAY SAY: What would be your best guess?

IF STILL CAN'T SAY TYPE ESC-D

Q4B. In the last 7 days, during which of the following times of day did you drive

TO OR FROM WORK OR SCHOOL/ COLLEGE/UNIVERSITY?

%255/Don't include any time spent driving FOR work.//

Was it in the ...

READ OUT

Morning - 6am to 12 Noon............. 1,

Afternoon and evening - 12 Noon to 8pm............. 2,

Night-time but before midnight - 8pm to Midnight............. 3,

After Midnight - Midnight to 6am............. 4,

(DO NOT READ)

CAN'T SAY............. 5,

IF DRIVEN TO OR FROM PARTIES, NIGHTCLUBS OR PUBS (CODE 3 ON Q3) ASK Q6A AND Q6B

Q6A. Approximately how many HOURS in total in the last 7 days have you spent as a driver

TO OR FROM PARTIES, NIGHTCLUBS OR PUBS?

%265/Don't include any time spent driving FOR work.//

RECORD TO THE NEAREST HOUR IF LESS THAN 1 HOUR RECORD AS 1 HOUR

IF CAN'T SAY SAY: What would be your best guess?

IF STILL CAN'T SAY TYPE ESC-D

Q6B. In the last 7 days, during which of the following times of day did you drive

TO OR FROM PARTIES, NIGHTCLUBS OR PUBS?

%267/Don't include any time spent driving FOR work.//

Was it in the ...

READ OUT

Morning - 6am to 12 Noon............. 1,
Q8B. In the last 7 days, during which of the following times of day did you drive (to/for) %96.?

READ OUT:

Morning - 6am to 12 Noon ........... 1,
Afternoon and evening - 12 Noon to 8pm ........... 2,
Night-time but before midnight - 8pm to Midnight ....... 3,
After Midnight - Midnight to 6am ........... 4,
(DO NOT READ) CAN’T SAY ........... 5,

Q7B. In the last 7 days, during which of the following times of day did you drive

TO OR FROM SPORTING ACTIVITIES OR HOBBIES?

%271. Don’t include any time spent driving FOR work.//

READ OUT:

Morning - 6am to 12 Noon ........... 1,
Afternoon and evening - 12 Noon to 8pm ........... 2,
Night-time but before midnight - 8pm to Midnight ....... 3,
After Midnight - Midnight to 6am ........... 4,
(DO NOT READ) CAN’T SAY ........... 5,

Q7A. Approximately how many HOURS in total in the last 7 days have you spent as a driver

TO OR FROM SPORTING ACTIVITIES OR HOBBIES?

%271. Don’t include any time spent driving FOR work.//

READ OUT:

Morning - 6am to 12 Noon ........... 1,
Afternoon and evening - 12 Noon to 8pm ........... 2,
Night-time but before midnight - 8pm to Midnight ....... 3,
After Midnight - Midnight to 6am ........... 4,
(DO NOT READ) CAN’T SAY ........... 5,

Q7B. In the last 7 days, during which of the following times of day did you drive

TO OR FROM SPORTING ACTIVITIES OR HOBBIES?

%271. Don’t include any time spent driving FOR work.//

READ OUT:

Morning - 6am to 12 Noon ........... 1,
Afternoon and evening - 12 Noon to 8pm ........... 2,
Night-time but before midnight - 8pm to Midnight ....... 3,
After Midnight - Midnight to 6am ........... 4,
(DO NOT READ) CAN’T SAY ........... 5,

Q7A. Approximately how many HOURS in total in the last 7 days have you spent as a driver

TO OR FROM SPORTING ACTIVITIES OR HOBBIES?

%271. Don’t include any time spent driving FOR work.//

READ OUT:

Morning - 6am to 12 Noon ........... 1,
Afternoon and evening - 12 Noon to 8pm ........... 2,
Night-time but before midnight - 8pm to Midnight ....... 3,
After Midnight - Midnight to 6am ........... 4,
(DO NOT READ) CAN’T SAY ........... 5,
Q9A. How would you rate your own driving safety when driving at 100 kilometres an hour? (On a scale of 1 to 10, where 1 means that you could NOT drive safely at that speed even for a short distance and 10 means you could easily drive at the speed without the risk of crashing?)

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</tbody>
</table>

Q9B. How would you rate your own driving safety when driving at 130 kilometres an hour? (On a scale of 1 to 10, where 1 means that you could NOT drive safely at that speed even for a short distance and 10 means you could easily drive at the speed without the risk of crashing?)

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</table>

Q10A. (Now using this scale of 1 to 10 and thinking about driving)

IN DAYLIGHT BETWEEN 6AM TO 6PM IN RESIDENTIAL BACK STREETS, (how would you rate the effect of the speed limit on your choice of driving speed?)

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</tbody>
</table>

Q10B. (Now using this scale of 1 to 10 and thinking about driving)

IN DAYLIGHT BETWEEN 6AM TO 6PM ON MAIN ROADS, HIGHWAYS OR FREEWAYS, (how would you rate the effect of the speed limit on your choice of driving speed?)

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</tr>
</tbody>
</table>

Q10C. (How would you rate your own driving safety when driving at 130 kilometres an hour? (On a scale of 1 to 10 where 1 means that you could NOT drive safely at that speed even for a short distance and 10 means you could easily drive at the speed without the risk of crashing?)

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</tbody>
</table>

(C) The Roy Morgan Research Centre Pty Ltd. 1997.
I would now like to ask you some questions about how comfortable you feel with exceeding the speed limit. For each situation I describe, could you please respond with a rating between 1 and 10 where 1 means you would not feel at all comfortable exceeding the speed limit in that situation and 10 means you would feel very comfortable exceeding the speed limit in that situation.

Q10C. (Now using this scale of 1 to 10 and thinking about driving)

AT NIGHT-TIME BETWEEN 6PM TO 6AM IN RESIDENTIAL BACK STREETS,

(how would you rate the effect of the speed limit on your choice of driving speed?)

(On a scale of 1 to 10 where 1 means that the speed limit has no effect on your choice of driving speed and 10 means that you would never allow yourself to exceed the speed limit.)

1 - THE SPEED LIMIT DOES NOT EFFECT YOUR DRIVING SPEED.... 1
2 ................. 2
3 ................. 3
4 ................. 4
5 ................. 5
6 ................. 6
7 ................. 7
8 ................. 8
9 ................. 9
10 - WOULD NEVER ALLOW MYSELF TO EXCEED THE LIMIT. 10
CAN'T SAY........ 11

Q11A. (Now using this scale of 1 to 10 and thinking about driving)

IN DAYLIGHT (BETWEEN 6AM TO 6PM) IN RESIDENTIAL BACK STREETS,

(how would you rate your level of comfort in exceeding the speed limit by 15 kilometres an hour?)

(1 means you would not feel at all comfortable exceeding the speed limit in that situation and 10 means you would feel very comfortable exceeding the speed limit in that situation.)

1 - FEEL NOT AT ALL COMFORTABLE WITH EXCEEDING THE SPEED LIMIT BY 15 KM/HR...... 1
2 ................. 2
3 ................. 3
4 ................. 4
5 ................. 5
6 ................. 6
7 ................. 7
8 ................. 8
9 ................. 9
10 - FEEL VERY COMFORTABLE WITH EXCEEDING THE SPEED LIMIT BY 15 KM/HR..... 10
CAN'T SAY........ 11

Q10D. (Now using this scale of 1 to 10 and thinking about driving)

AT NIGHT-TIME BETWEEN 6PM TO 6AM ON MAIN ROADS, HIGHWAYS OR FREEWAYS,

(how would you rate the effect of the speed limit on your choice of driving speed?)

(On a scale of 1 to 10 where 1 means that the speed limit has no effect on your choice of driving speed and 10 means that you would never allow yourself to exceed the speed limit.)

1 - THE SPEED LIMIT DOES NOT EFFECT YOUR DRIVING SPEED.... 1
2 ................. 2
3 ................. 3
4 ................. 4
5 ................. 5
6 ................. 6
7 ................. 7
8 ................. 8
9 ................. 9
10 - WOULD NEVER ALLOW MYSELF TO EXCEED THE LIMIT. 10
CAN'T SAY........ 11
EXCEEDING THE SPEED LIMIT BY 15 KILOMETERS AN HOUR WHEN DRIVING IN DAYLIGHT (BETWEEN 6AM TO 6PM) IN MAIN ROADS, HIGHWAYS OR FREEWAYS, (CODES 1-4 ON Q11A.) ASK Q11B.

Q11B. Still thinking about driving IN DAYLIGHT (BETWEEN 6AM TO 6PM) IN RESIDENTIAL BACK STREETS, what would make you feel uncomfortable about driving 15 kilometres an hour over the speed limit?

IF OTHER, HIGHLIGHT OTHER AND TYPE IN RESPONSE

RISK OF CRASH...... 1,
RISK OF DETECTION BY POLICE...... 2,
RISK OF HURTING SELF...... 3,
RISK OF HURTING OTHERS...... 4,
ENVIRONMENT...... 5,
OTHER (PLEASE SPECIFY)...... 97,
CAN'T SAY...... 98,

Q12A. (Now using this scale of 1 to 10 and thinking about driving)

IN DAYLIGHT (BETWEEN 6AM TO 6PM) ON MAIN ROADS, HIGHWAYS OR FREEWAYS,

(how would you rate your level of comfort in exceeding the speed limit by 15 kilometres an hour?)

(1 means you would not feel at all comfortable exceeding the speed limit in that situation and 10 means you would feel very comfortable exceeding the speed limit in that situation.)

1 - FEEL NOT AT ALL COMFORTABLE WITH EXCEEDING THE SPEED LIMIT BY 15 KM/HR...... 1
2.............. 2
3.............. 3
4.............. 4
5.............. 5
6.............. 6
7.............. 7
8.............. 8
9.............. 9
10 - FEEL VERY COMFORTABLE WITH EXCEEDING THE SPEED LIMIT BY 15 KM/HR...... 10
CAN'T SAY...... 11

Q12B. Still thinking about driving IN DAYLIGHT (BETWEEN 6AM TO 6PM) ON MAIN ROADS, HIGHWAYS OR FREEWAYS, what would make you feel uncomfortable about driving 15 kilometres an hour over the speed limit?

IF OTHER, HIGHLIGHT OTHER AND TYPE IN RESPONSE

RISK OF CRASH...... 1,
RISK OF DETECTION BY POLICE...... 2,
RISK OF HURTING SELF...... 3,
RISK OF HURTING OTHERS...... 4,
ENVIRONMENT...... 5,
OTHER (PLEASE SPECIFY)...... 97,
CAN'T SAY...... 98,

Q13A. (Now using this scale of 1 to 10 and thinking about driving)

IN DAYLIGHT (BETWEEN 6AM TO 6PM) IN RESIDENTIAL BACK STREETS, (CODES 1-4 ON Q11A.) ASK Q11B.

Q11B. Still thinking about driving IN DAYLIGHT (BETWEEN 6AM TO 6PM) IN RESIDENTIAL BACK STREETS, what would make you feel uncomfortable about driving 15 kilometres an hour over the speed limit?

IF OTHER, HIGHLIGHT OTHER AND TYPE IN RESPONSE

RISK OF CRASH...... 1,
RISK OF DETECTION BY POLICE...... 2,
RISK OF HURTING SELF...... 3,
RISK OF HURTING OTHERS...... 4,
ENVIRONMENT...... 5,
OTHER (PLEASE SPECIFY)...... 97,
CAN'T SAY...... 98,
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Q13B. Still thinking about driving at night-time (between 6pm to 6am) in residential back streets, what would make you feel uncomfortable about driving 15 kilometres an hour over the speed limit?

If other, highlight other and type in response:

Risk of crash .... 1,
Risk of detection by police .... 2,
Risk of hurting self .... 3,
Risk of hurting others .... 4,
Environment .... 5,
Other (please specify) .... 97,
Can't say .... 98,

Q14A. (Now using this scale of 1 to 10 and thinking about driving)

At night-time (between 6pm to 6am) on main roads, highways or freeways,

(how would you rate your level of comfort in exceeding the speed limit by 15 kilometres an hour?)

(1 means you would not feel at all comfortable exceeding the speed limit in that situation and 10 means you would feel very comfortable exceeding the speed limit in that situation.)

1 - Feel not at all comfortable with exceeding the speed limit by 15 km/hr.... 1
2.... 2
3.... 3
4.... 4
5.... 5
6.... 6
7.... 7
8.... 8
9.... 9
10 - Feel very comfortable with exceeding the speed limit by 15 km/hr.... 10
Can't say .... 11

Now I would like to ask you some questions about the risk of being caught by the Police for speeding. For each situation I describe, could you respond with a number between 1 and 10, where 1 means that you feel there is no risk of being caught and 10 means that you feel there is a definite risk of being caught.

Q15A. Now (using this scale of 1 to 10 and) thinking about driving

In daylight (between 6am to 6pm) in residential back streets,

(how would you rate the risk of getting caught by the Police for exceeding the speed limit by 10 kilometres?)

(1 means that you feel there is no risk of being caught and 10 means that you feel there is a definite risk of being caught.)

1 - No risk of getting caught by Police for exceeding the speed limit by 10 km/hr.... 1
2.... 2
3.... 3
4.... 4
5.... 5
6.... 6
7.... 7
8.... 8
9.... 9
10 - Feel very comfortable with exceeding the speed limit by 10 km/hr.... 10
Can't say .... 11

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Q15A. Now (using this scale of 1 to 10 and thinking about driving

IN DAYLIGHT (BETWEEN 6AM TO 6PM) ON
MAIN ROADS, HIGHWAYS OR FREEWAYS,
(how would you rate the risk of
getting caught by the police for exceeding the speed limit by 10 kilometres?)

(1 means that you feel there is no
risk of being caught and 10 means that
you feel there is a definite risk of
being caught.)

1 - NO RISK OF
GETTING CAUGHT BY
POLICE FOR
EXCEEDING THE
SPEED LIMIT BY 10
KM/HR............ 1
2.......................... 2
3.......................... 3
4.......................... 4
5.......................... 5
6.......................... 6
7.......................... 7
8.......................... 8
9.......................... 9
10 - DEFINITE
RISK OF GETTING
CAUGHT BY POLICE
FOR EXCEEDING THE
SPEED LIMIT BY 10
KM/HR............ 10
CAN'T SAY............. 11

Q15B. Now (using this scale of 1 to 10 and thinking about driving

IN DAYLIGHT (BETWEEN 6AM TO 6PM) ON
MAIN ROADS, HIGHWAYS OR FREEWAYS,
(how would you rate the risk of
getting caught by the police for exceeding the speed limit by 10 kilometres?)

(1 means that you feel there is no
risk of being caught and 10 means that
you feel there is a definite risk of
being caught.)

1 - NO RISK OF
GETTING CAUGHT BY
POLICE FOR
EXCEEDING THE
SPEED LIMIT BY 10
KM/HR............ 1
2.......................... 2
3.......................... 3
4.......................... 4
5.......................... 5
6.......................... 6
7.......................... 7
8.......................... 8
9.......................... 9
10 - DEFINITE
RISK OF GETTING
CAUGHT BY POLICE
FOR EXCEEDING THE
SPEED LIMIT BY 10
KM/HR............ 10
CAN'T SAY............. 11

Q15C. Now (using this scale of 1 to 10 and thinking about driving

IN DAYLIGHT (BETWEEN 6AM TO 6PM) ON
MAIN ROADS, HIGHWAYS OR FREEWAYS,
(how would you rate the risk of
getting caught by the police for exceeding the speed limit by 10 kilometres?)

(1 means that you feel there is no
risk of being caught and 10 means that
you feel there is a definite risk of
being caught.)

1 - NO RISK OF
GETTING CAUGHT BY
POLICE FOR
EXCEEDING THE
SPEED LIMIT BY 10
KM/HR............ 1
2.......................... 2
3.......................... 3
4.......................... 4
5.......................... 5
6.......................... 6
7.......................... 7
8.......................... 8
9.......................... 9
10 - DEFINITE
RISK OF GETTING
CAUGHT BY POLICE
FOR EXCEEDING THE
SPEED LIMIT BY 10
KM/HR............ 10
CAN'T SAY............. 11

Q15D. Now (using this scale of 1 to 10 and thinking about driving

AT NIGHT-TIME (BETWEEN 6PM TO 6AM) ON
MAIN ROADS, HIGHWAYS OR FREEWAYS,
(how would you rate the risk of
getting caught by the police for exceeding the speed limit by 10 kilometres?)

(1 means that you feel there is no
risk of being caught and 10 means that
you feel there is a definite risk of
being caught.)

1 - NO RISK OF
GETTING CAUGHT BY
POLICE FOR
EXCEEDING THE
SPEED LIMIT BY 10
KM/HR............ 1
2.......................... 2
3.......................... 3
4.......................... 4
5.......................... 5
6.......................... 6
7.......................... 7
8.......................... 8
9.......................... 9
10 - DEFINITE
RISK OF GETTING
CAUGHT BY POLICE
FOR EXCEEDING THE
SPEED LIMIT BY 10
KM/HR............ 10
CAN'T SAY............. 11

Q15E. Now (using this scale of 1 to 10 and thinking about driving

AT NIGHT-TIME (BETWEEN 6PM TO 6AM) ON
MAIN ROADS, HIGHWAYS OR FREEWAYS,
(how would you rate the risk of
getting caught by the police for exceeding the speed limit by 10 kilometres?)

(1 means that you feel there is no
risk of being caught and 10 means that
you feel there is a definite risk of
being caught.)

1 - NO RISK OF
GETTING CAUGHT BY
POLICE FOR
EXCEEDING THE
SPEED LIMIT BY 10
KM/HR............ 1
2.......................... 2
3.......................... 3
4.......................... 4
5.......................... 5
6.......................... 6
7.......................... 7
8.......................... 8
9.......................... 9
10 - DEFINITE
RISK OF GETTING
CAUGHT BY POLICE
FOR EXCEEDING THE
SPEED LIMIT BY 10
KM/HR............ 10
CAN'T SAY............. 11

Now looking at your experiences of
speed enforcement.

Q15A. In the last month, about how many times have you PHYSICALLY seen
speed cameras in daylight hours?
(by daylight we mean from 6am to 6pm)

IF CAN'T SAY SAY: What would be your
best guess?
IF STILL CAN'T SAY TYPE ESC-D

SPEED ENFORCEMENT AND YOUNG DRIVERS
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Q17A. Not including speed cameras, in the last month about how many times have you seen police activity related to traffic enforcement in daylight hours? (By daylight we mean from 6am to 6pm)

IF CAN'T SAY SAY: What would be your best guess?
IF STILL CAN'T SAY TYPE ESC-D

Q17B. Not including speed cameras, in the last month about how many times have you seen police activity related to traffic enforcement in night-time hours? (By night-time we mean from 6pm to 6am)

IF CAN'T SAY SAY: What would be your best guess?
IF STILL CAN'T SAY TYPE ESC-D

Q18A. Remembering that all the information you give me is confidential, since obtaining your probationary or full driver’s licence, have you ever been caught for driving over the speed limit? This does not necessarily mean you have been fined or prosecuted.

YES ............ 1
NO ............... 2
CAN'T SAY ....... 3

IF HAS COMMITTED SPEEDING OFFENCES (CODE 1 ON Q18A), ASK Q18A1 - Q18A2:

Q18A1. Since obtaining your probationary or full driver’s licence, approximately how many times have you been caught driving over the speed limit?

IF CAN'T SAY SAY: What would be your best guess?
IF STILL CAN'T SAY TYPE ESC-D

Q18A2. Could you please tell me the length of time in months that has passed since you had your last accident?

RECORD IN MONTHS
IF 1 MONTH OR LESS, RECORD AS 1

IF CAN'T SAY SAY: What would be your best guess?
IF STILL CAN'T SAY TYPE ESC-D

Q18B. Since obtaining your probationary or full driver’s licence, have you had ANY ACCIDENTS whilst driving a car? An accident can be either minor or major, and not necessarily caused by you.

YES ............ 1
NO ............... 2
CAN'T SAY ....... 3

IF HAS ANY ACCIDENTS (CODE 1 ON Q18B), ASK Q18B1 - Q18B2:

Q18B1. Since obtaining your probationary or full driver’s licence, approximately how many accidents have you had?

IF CAN'T SAY SAY: What would be your best guess?
IF STILL CAN'T SAY TYPE ESC-D

Q18B2. Could you please tell me the length of time in months that has passed since you had your last accident?

RECORD IN MONTHS
IF 1 MONTH OR LESS, RECORD AS 1

IF CAN'T SAY SAY: What would be your best guess?
IF STILL CAN'T SAY TYPE ESC-D

To make sure we have a true cross-section of people, I'd now like to ask you a few questions about yourself:

Q19A. What is your MAIN occupation - the position and industry?

IF OTHER, HIGHLIGHT OTHER AND TYPE IN RESPONSE

PROFESSIONAL ...... 1
OWNERS OR EXECUTIVES ...... 2
OWNERS OF SMALL BUSINESSES ...... 3
<table>
<thead>
<tr>
<th>Occupation</th>
<th>Code</th>
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<tbody>
<tr>
<td>COLLAR</td>
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<tr>
<td>SKILLED</td>
<td>5</td>
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<td>SEMISKILLED</td>
<td>6</td>
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<tr>
<td>UNSKILLED</td>
<td>7</td>
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<tr>
<td>FARM OWNERS</td>
<td>8</td>
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<tr>
<td>FARM WORKERS</td>
<td>9</td>
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<tr>
<td>NO OCCUPATION RECORDED</td>
<td>10</td>
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<tr>
<td>SALES</td>
<td>11</td>
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<tr>
<td>SEMI-PROFESSIONAL</td>
<td>12</td>
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<tr>
<td>UNEMPLOYED</td>
<td>13</td>
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<tr>
<td>STUDENT</td>
<td>14</td>
</tr>
<tr>
<td>OTHER (PLEASE SPECIFY)</td>
<td>97</td>
</tr>
<tr>
<td>CAN'T SAY</td>
<td>98</td>
</tr>
</tbody>
</table>

**Q.** Are you currently studying at secondary school, TAFE/technical school or commercial college or university? If at TAFE/technical/commercial college or university ask: And are you studying full time or part time?

- **SECONDARY STUDENT** 1
- **FULL TIME** TAFE/TECHNICAL SCHOOL/COMMERCIAL COLLEGE (OR SIMILAR) 2
- **PART TIME** TAFE/TECHNICAL SCHOOL/COMMERCIAL COLLEGE (OR SIMILAR) 3
- **FULL TIME** UNIVERSITY 4
- **PART TIME** UNIVERSITY 5
- **NOT CURRENTLY STUDYING** 6

This completes the survey. Thank you for your time and assistance. You have been talking to (SAY NAME) from Roy Morgan Research.

Q. RECORD YOUR NAME FOR A TRUE AND HONEST INTERVIEW.

__________________________