Abstract

RACV commissioned Eastern Professional Services Pty Ltd to investigate the potential involvement of fatigue in young driver crashes. The aim of this research was to collect information about fatigued driving amongst young drivers within the broader context of attempting to understand this problem more fully.

An extensive literature review, a telephone survey of younger drivers, and focus groups were conducted and the results emphasised the importance of lifestyle and motivational factors in fatigued driving. The high-risk groups identified in the survey had a higher risk of fatigued driving not because they had a less-risky perception of driving when tired, but because they spent more time driving at night to meet their social needs. They recognised that they were tired at times, but did not feel motivated to change their behaviour to reduce the risk. This most likely relates to a combination of a perception that the risk is manageable (based on their experience and habitual behaviours), motivational pressures to go on doing the things they have to do and that they enjoy, and a belief that the “fatigue” of concern in road safety publicity is much more extreme than they would normally experience.

Based on these findings a range of communication strategies and key messages were discussed as potentially effective methods for addressing the issue of fatigue and young drivers.

Keywords

Young driver, adolescent, age, human fatigue, driving hours, human stress, human tolerance, physiology, sleep patterns, driving experience, driver performance, driver characteristics, driver behaviour, rest period, accident cause, drink driving, risk, risk assessment, attitude, telephone survey, field study, publicity, education.

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EXECUTIVE SUMMARY

There is increasing interest in fatigue as an important problem for road safety. Similarly, the young or novice driver is widely regarded as a focus for road safety research and programs. Largely unaddressed, however, is the intersection between these issues – there is little evidence specifically relevant to the potential involvement of fatigue in young-driver crashes, and few fatigue-related programs targeting young drivers in particular. Eastern Professional Services Pty Ltd was commissioned by the Royal Automobile Club of Victoria Ltd to undertake an investigation of this issue.

The first reason for this study was to collect information about fatigued driving amongst young drivers within the broader context of attempting to understand this problem more fully. The second reason for the study followed from the first – it was thought important to consider how a community-based organisation such as the RACV could contribute to reducing the potential road safety consequences of fatigued driving amongst younger drivers.

The key issues that need to be taken into account in considering potential action in the fatigued driving area appear to be as follows:

- The broader scientific literature suggests that:
  - Partial sleep deprivation is a widespread phenomenon that has cumulative effects on cognitive processes, but self-awareness of partial sleep deprivation may not reflect the actual level of impairment.
  - Lifestyle-related fatigue may be an important contributor to crashes, and drivers are generally poor at recognising fatigue-related symptoms.
  - Young people in their late teens and early twenties are particularly prone to partial sleep deprivation, and some subgroups may be more affected than others.
  - Decision making when fatigued is likely to be based on motivational and habit-related factors and on the accrued experiences of the driver and their normative beliefs.

- A telephone survey of younger drivers was undertaken to investigate their attitudes and beliefs concerning fatigue and driving, and to collect information about their sleeping and driving patterns. The results of this survey suggested the following:
  - Participants believed that the effects of longer-term sleep deprivation and serious short term sleep deprivation were similar to drink driving, and that these were more serious than physical or mental tiredness when driving.
  - These beliefs were unrelated to fatigue-related crash involvement or patterns of sleeping and driving.
  - Almost half of participants admitted to driving when tired in the preceding week, and almost one third admitted to having had a near miss that may have related to fatigue.
  - Participants appeared to self-regulate their sleep such that they countered the effects of going to sleep late by waking later the following morning.
  - Driving trips were mostly undertaken for commuting purposes and to complete chores, or for social purposes.
  - Almost all trips were undertaken with one or no passengers, although almost one quarter of trips undertaken for social reasons by less-experienced drivers involved carrying two or more friends as passengers.
- It was possible to identify a subset of participants based on their driving and sleeping patterns that were at a higher risk of driving when fatigued and who were more likely to admit a role for fatigue in any of their crashes.

- These high-risk drivers undertook a substantial amount of night-time driving for social purposes compared to other survey participants.

The focus groups conducted with a small sample of survey participants selected as having a relatively high risk of driving when fatigued suggested the following:

- Fatigued driving appears to be a consequence of lifestyle-related motivational factors that over-ride any concerns about the potential negative consequences of doing so. Participants had busy lifestyles and largely-unstructured social lives and valued the flexibility provided by driving, and they reacted to short-term increases in workload or social demands by sacrificing sleep.

- The motivational pressures of work, study, and social life appear to take priority over participants' sleep, leading to participants having a low level of ongoing sleep deprivation.

- Participants believed that the effects of tiredness on driving were manageable at all but the most extreme levels and that they could habituate to tiredness with experience. Participants experiences of driving when tired had probably reinforced this belief.

- The vocabulary of fatigue amongst participants was not the same as that used in road safety communications – participants reserved the word “fatigue” for the most extreme state of tiredness and as a result did not believe that the current approach to fatigued-driving publicity related to their day-to-day experiences of sleep debt and driving while tired.

The results of the literature review, survey, and focus groups together emphasise the importance of lifestyle and motivational factors in fatigued driving. The high-risk groups identified in the survey had a higher risk of fatigued driving not because they had a less-risky perception of driving when tired, but because they spent more time driving at night to meet their social needs. They recognised that they were tired at times, but did not feel motivated to change their behaviour to reduce the risk. This most likely relates to a combination of a perception that the risk is manageable (based on their experience and habitual behaviours), motivational pressures to go on doing the things they have to do and that they enjoy, and a belief that the “fatigue” of concern in road safety publicity is much more extreme than they would normally experience.

The challenge for road safety agencies is to develop and implement programs that might address this problem. It is argued here that any successful intervention will need to address one or more of the following:

- It will need to change the perception that fatigue is manageable,

- It will need to counter or reduce the motivational pressures to drive when tired to meet the work, study, and social demands of day to day life, and/or

- It will need to communicate the fatigue message (and the benefits of alternative behaviours) in a way that matches the vocabulary of the audience.

Given that young drivers appear to recognise that there is some risk associated with driving when tired, and that they continue to do so regardless of this risk, the key issues are likely to be the first two.

It will not be possible to influence fatigue amongst young drivers using legislative or enforcement methods as there is still no objective measure of fatigue that could be used to assess drivers who are impaired by low levels of sleep debt. This means that any involvement in this area by road safety
agencies will need to focus on communications strategies. In the lobbying area, agencies could use the results of this study as the basis for discussions with authorities in Victoria that are able to invest funds in mass media programs. The key messages underlying any lobbying effort here would be:

- Low levels of sleep debt are common amongst young drivers and present a road safety risk for these drivers and other road users.

- Driving when tired amongst high-risk young drivers appears to relate to motivational factors, such that any mass media program needs either to reduce these lifestyle-related motivations or to provide a significant counter-motivation to encourage behaviour change. Alternatively it might be possible to suggest behaviour changes that are consistent with existing motivations that also reduce the amount of driving when tired.

- Publicity that deals with the perception that fatigue is manageable when driving is likely to be more effective than publicity that leaves this perception in place.

- Any publicity in this area needs to use the vocabulary of the audience. Current publicity programs do not do this.

More specifically, programs with a communications focus might include the following:

- Media releases based on the outcomes of this study, focusing on the potential problems associated with low levels of sleep debt.

- Development of communications materials (brochures, booklets, and perhaps videos) and distribution through channels that provide good access to young drivers – such as schools, youth-oriented community groups, TAFE colleges, and perhaps Universities.

- Development of suitable communications materials and distribution through social venues frequented by younger drivers – such as nightclubs, selected hotels, etc. These materials could include wall posters, coasters, etc designed to suit the audience and the likely venues.

- Development of communications materials and distribution through sporting clubs and venues. This might be a particularly useful approach in rural areas where sporting clubs are an important social venue for young adults.

- Development of communications materials and distribution through businesses that employ young adults in a part-time capacity – such as some of the fast-food chains and supermarkets.

- Development and placement of publicity on youth-oriented radio programs. Radio is still a relatively inexpensive channel for communications programs and would provide an opportunity to place relevant messages at times when young drivers might be returning (fatigued) from social outings.

Communications developed for a young-driver fatigued-driving campaign would need to take the following issues into account:

- It is important to note that young drivers will continue to drive when fatigued. Under the recognition primed decision-making (RPD) model described in the literature review, it is clear that young drivers will respond to the motivational pressures arising from their lifestyles by choosing to drive and are unlikely (given their broadly positive experiences with driving) to consider using alternatives when they are tired. This means that an effective strategy will focus on minimising the potential negative consequences of driving when tired.

- It will not be possible to counter the motivational pressures that lead young drivers to have busy lifestyles. It would not be sensible, for example, to suggest curtailing social activities after a busy day at work. This would damage the credibility of any message about fatigue.
Suggestions about power naps are not likely to be well-accepted by young drivers.

Suggesting the use of public transport or taxis may be appropriate, but the results of the discussion groups raise some concerns about the acceptability of this to the target high-risk audience.

It may be more constructive to take a harm minimisation approach, where the ongoing fatigued driving of the target audience is acknowledged, but the communications strategy aims to raise awareness about the increased risk associated with this and advises a driving strategy that reduces this risk and that minimises the potential effects of fatigue-related cognitive impairment on decision-making while driving. Young drivers could be advised to manage their speed more carefully when tired, or to take more time making decisions at intersections, may provide an effective alternative to a more-negative approach. There would need to be some caution used in developing this approach, however, as the literature review indicated that people are generally poor at recognising their own fatigue. It might be worth considering a harm minimisation approach where it is known that young drivers are already tired as a result of their social or work situation or the time of driving – so they do not have to recognise the development of fatigue – and to use other methods for fatigue that develops over the course of a driving trip as might be the case in long distance driving.

Any communications strategy will need to emphasise that the impairment resulting from fatigue is present even when the driver thinks they can handle it – that its effects are subtle. It will also be important to communicate the message that it can be difficult to detect tiredness and its effects – self-awareness of impairment is an executive cognitive function that is itself affected by fatigue.

It might be sensible to draw on the reasonably widespread near-miss experiences of high-risk young drivers – many admitted that fatigue had played a role in a near miss, so it might be possible to use this as part of a message that aims to increase the perceived risk of driving when fatigued as a way to then motivate behaviours that minimise the potential harm.

Any communications strategy should avoid the use of the term “fatigue” and focus instead on words that reflect the day-to-day experiences of young drivers, such as “tired”.

An important focus of a communications strategy will need to be drivers’ perceptions of normative behaviour amongst their peers. A strategy that encourages a belief that other young drivers are more sensitive to the effects of fatigue and are taking precautions to avoid some of the negative consequences of fatigued driving (again using a harm minimisation approach rather than attempting to stop young people driving when they may be tired) may have a long term effect on behaviour.
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1. Introduction

1.1 Background

Concern about the potential for fatigue to influence the safety of drivers is not new. Ryan & Warner (1936) investigated the effect of a long day of driving on performance on a number of cognitive and physical tasks. They reported that there were significant long-distance-driving related reductions in performance (and increases in variability) on most of their measures, and concluded that accident proneness may be affected by fatigue. There is now increasing interest in fatigue as an important problem for road safety, particularly as there are already intensive countermeasure programs in place for drink driving and speeding. Victorian road safety strategies include fatigue as one of the key target areas for research and program development and implementation, and there is evidence that fatigue is an important causal factor in crash involvement.

Similarly, the young or novice driver is widely regarded as a focus for road safety research and programs. The Victorian road safety strategy includes programs aimed at novice drivers, and there is consistent international evidence that youthful age and inexperience are both associated with higher-than-average risks of crash involvement.

Largely unaddressed, however, is the intersection between these issues – there is little evidence specifically relevant to the potential involvement of fatigue in young-driver crashes, and few fatigue-related programs targeting young drivers in particular. There is some anecdotal evidence that young drivers do not respond as positively as older drivers to rest-stop related fatigue programs during holiday-driving periods (Gunatillake, 2003), leading the Royal Automobile Club of Victoria (RACV) to take an interest in fatigue and young drivers. Eastern Professional Services Pty Ltd was commissioned to undertake an investigation of this issue, and this report is the result of that investigation.

1.2 Scope

The study involved three components. The first was a review of relevant literature. This was not intended to be a broad review of literature in the fatigue and young driver areas. It was necessary, however, to draw together some of the central themes in these two areas to assess the potential interaction between the effects of fatigue and young age. For this reason, the report includes brief discussions of the fatigue literature as it relates to safety-related driving skills.

Section 2.2 of the report discusses the skills that underlie safe driving and the effects of fatigue on those skills. Section 2.3 focuses more specifically on the limited literature concerning the effects of fatigue on younger adults. Section 2.4 discusses how fatigue might influence the safety of younger drivers as a specific target group. Section 2.5 discusses decision making and fatigue. Section 2.6 presents some broad conclusions and some recommendations based on the literature reviewed here.

The second component was a survey of a sample of young drivers with a focus on fatigue-related issues. This included a detailed examination of sleeping and driving patterns in the two days prior to the survey, designed to provide reliable information about actual patterns of behaviour. The method and results of the survey are presented in Section 3 of the report.

The third component was a series of focus group discussions conducted to collect some additional information from a small sub-sample of survey participants. The results of this component are presented in Section 4 of the report.

Section 5 presents a general discussion of the results of the study and implications for future policy and program development and research.
2. Young Drivers and Fatigue – Relevant Literature

2.1 Definition Related Issues

This study was conducted to bring together information relevant to two areas of road safety research and practice. As some of the issues likely to arise from this relate to how some terms are defined, it was considered important to indicate how some terms and concepts are to be understood in this report.

2.1.1 Youth and Inexperience

References to inexperience do not necessarily imply a reference to young age, but references to young drivers do imply a low level of experience. It is widely accepted that crash risk is elevated for young drivers and for inexperienced drivers independently. While it is most likely true that experiential issues are more important for road safety in Victoria than are age-related issues, this may be less true for the effects of fatigue and for the decision-making mechanisms that underlie the response of drivers to fatigue-related programs. For this reason, this report focuses more strongly on the effects of developmental factors associated with young adulthood than on the effects of inexperience.

2.1.2 Fatigue and Driving

Lyznicki, Doege, Davis, & Williams (1998) define fatigue as a complex phenomenon incorporating a reduction in the ability to do mental or physical work, or a subjective state in which a person is less able to perform a task effectively. They note that fatigue is related to time on a task, circadian rhythms, and inadequate sleep.

Under this definition, driving while fatigued will include driving under the effect of inadequate sleep, driving at times of the day when normal circadian rhythms would have the driver asleep, and driving without a break over a long time period. Fatigue may or may not, therefore, involve a subjective state of sleepiness, and may or may not involve total or partial sleep deprivation.

As will become apparent, the bulk of literature concerning fatigue relates to sleep deprivation rather than time on task, while road safety programs are sometimes concerned with prolonged periods of driving in addition to interrupted patterns of sleep. In the road safety area, then, it might be possible to distinguish between driving-related fatigue, and driving while fatigued, although this is rarely done.

2.2 Fatigue and Safe Driving Skills

2.2.1 Skills for Safe Driving

There is a large body of research concerning factors that are associated with safe or unsafe outcomes for drivers and other road users. For the most part, this research is concerned with describing the driver and situational characteristics associated with relatively high risks of crash involvement.

The value of this type of research is limited, however, as it provides little information about factors that have a causal role in safe and unsafe outcomes. While it is of some interest that some drivers and some situations are more likely than others to be associated with a crash outcome, it is more important to understand why those drivers and situations are a problem. This is particularly important when attempting to understand the effects of fatigue on a high-risk group of drivers. Understanding the mechanism by which fatigue may increase the already high crash risk of inexperienced drivers will help direct the development and implementation of countermeasures.

Crashes can be viewed as the result of behavioural decisions that are inappropriate for the driving situation. When viewed this way, the difference between safe and unsafe driving relates to accurate
recognition of the driving context, and the selection and generation of behaviours that match the context. Thus, safe driving relies on the action of a number of cognitive mechanisms. Behaviours must be generated by drivers to meet their broad motivational needs while also ensuring that appropriate responses are generated to meet the changing demands of the dynamic driving environment. This requires the cooperative action of mechanisms such as the following:

- Mechanisms that detect and recognise hazards in the driving environment.
- Mechanisms that detect and recognise cues that signal hazards based on experience.
- Learning mechanisms that detect and store information about predictive relationships in the driver’s environment to help the driver recognise and respond to potential hazards.
- Learning mechanisms that detect and store information about the consequences of driving behaviours in specific situations to help the driver generate safer responses in a broad range of situations.
- Mechanisms that generate fast behavioural decisions or responses to hazards or hazard-signalling cues based on prior experience.

Driving is largely self-paced and the driver is therefore able to adapt to changes in the complexity of the driving environment and changes in the effectiveness of cognitive mechanisms. Drivers who are aware of an increase in the complexity of the driving environment, or a reduction in their information processing capability, can potentially adjust their driving to reduce the risk of negative consequences – perhaps by reducing their speed or increasing the distance between their vehicle and others. Another mechanism that would be expected to contribute to safe driving, therefore, would be one that tracks the effectiveness of information processing to help the driver adapt to those situations where their cognitive skills are inadequate for the driving environment.

### 2.2.2 The Effects of Fatigue on Cognitive Processes

Before attempting to understand the effect of fatigue on driving, it is necessary to discuss the more general effects of fatigue on the cognitive processes that are likely to play a role in driving.

The effects of fatigue relating to total sleep deprivation are well understood, although there is still some debate about their time course. Research in this area is generally laboratory based, and relies on keeping research participants awake for a long period of time while assessing skills at regular intervals. Research using this approach indicates that sleep deprivation results in impaired performance on tasks that require vigilance, fast reaction time, attentional control, cognitive processing, and memory (e.g., Binks, Waters, & Hurry, 1999; McCarthy & Waters, 1997). Performance decrements are especially clear in tasks that are monotonous, that have a long duration, that demand constant attention, and that have low predictability (Gillberg & Torbjoern, 1998).

McCarthy & Waters (1997) noted evidence that the effect of sleep deprivation is to impair performance gradually and unevenly, taking this as support for the notion that the performance decrement under sleep deprivation relates to the intrusion of brief periods of non-responsiveness relating to reduced levels of arousal and the effects of increasingly frequent microsleeps. They suggested that the ability of arousing stimuli to counter fatigue supports this view. It might also be argued that the above mentioned finding that fatigue-related performance decrements are strongest for monotonous, lengthy tasks also supports the view that fatigue has a general effect on arousal levels, as does the general finding that fatigue is often accompanied by subjective sleepiness. In addition to a general effect on cognitive skill, McCarthy & Waters (1997) reported that sleep deprivation resulted in a reduction in the strength of the electrodermal orienting response, an increased latency in responsiveness, and faster habituation of the orienting response to novel stimuli – together suggesting that fatigue has an effect on neuropsychological responsiveness to events around the person.
Jennings, Monk, & van der Molen (2003) noted, however, that research in this area is primarily descriptive – rather than driven by theoretical interest in the mechanisms that underlie the effects of fatigue. They reviewed some evidence that suggests that sleep deprivation is most likely to affect tasks requiring divergent processes or performance that is not automated. They suggested that cognitive processes that have a supervisory role over other processes – such as the executive functions included in most cognitive models (eg. Logan, 1988) – are likely to be affected more than other cognitive processes. Their study supported this notion – they concluded that sleep deprivation has specific effects within the supervisory system, and that participants were less able to plan behavioural response strategies when under the influence of sleep deprivation.

Of some interest in the road safety area, Dawson & Reid (1997) compared the effect of sleep deprivation and alcohol consumption on a simple hand-eye coordination task. They reported that performance declined linearly after 12 hours of wakefulness, and that performance levels after 17 hours of wakefulness were similar to those recorded when participants had blood alcohol concentrations of .05 g/100ml.

Extended periods of total sleep deprivation beyond this are unlikely to be a significant problem outside the commercial transport industry and, perhaps, amongst a small subgroup of younger drivers who are also likely to have an elevated crash risk for other reasons. Partial sleep deprivation – where people have restricted or inadequate sleep patterns over a longer time period – is likely to be more common. Drake, Roehrs, Burduvall, Bonahoom, Rosekind, & Roth, (2001) cited epidemiological research suggesting, despite the natural requirement for eight hours of sleep each night, that the average amount of sleep is between six and seven hours. There is some research concerning the effects of this type of sleep restriction.

Dinges, Pack, Williams, Gillen, Powell, Ott, Aptowicz, & Pack (1997) focused on cumulative sleep debt rather than acute sleep deprivation. They reviewed earlier evidence that cumulative sleep restrictions lead to performance decrements across a broad range of skills. Their study involved restricting the sleep time of participants to 4.5 - 6.5 hours per night – about 60 to 80 percent of the normal sleep requirement of 8 hours (Drake et al., 2001) – for seven days. Their results were consistent with earlier research – showing a significant reduction in performance on a psychomotor vigilance task. The relationship between cumulative sleep debt and the decrement in performance was cubic – a fast decline in performance over the first two days of sleep restriction, a performance plateau for two or three days, and then a further, fast decline in performance as sleep restrictions were extended beyond five days.

The Dinges et al. (1997) study was extended by Van Dongen, Maislin, Mullington, & Dinges (2003), who investigated the effect of three levels of partial sleep deprivation (with sleep periods of 4, 6, and 8 hours) over a 14-day period, compared to the effect of a total sleep deprivation condition over three days. Van Dongen et al. reported dose-related cumulative decrements in all assessed cognitive skills. The skill decrement resulting from restriction to four or six hours sleep per night over fourteen nights was equivalent to that resulting from one to two days of total sleep deprivation. They concluded that even moderate restrictions on sleep can influence cognitive mechanisms substantially if the partial restriction is maintained for some time.

The Van Dongen et al. (1997) study was interesting in one other important respect. They collected information about participants’ self-ratings of sleepiness over the duration of the study – this being one measure of the participants’ awareness of their own fatigued state. Despite the cumulative decrement in performance over the period of interest, self-ratings of sleepiness did not increase cumulatively. They increased for the first two or three days and then remained relatively constant. This was not the result of a ceiling effect in the rating scale, and therefore suggests that perceptions of fatigue over a long period of partial sleep restriction do not reflect actual decrements in performance.
The final study to be mentioned here is one that attempted to compare the effects of short-term total sleep deprivation, long-term total sleep deprivation, and partial sleep deprivation over an extended period of time. Using meta-analysis techniques, Pilcher & Huffcutt (1996) combined the reported effect sizes in 19 studies and concluded that the effect of a period of partial sleep deprivation is larger than the effect of either short- or long-term total sleep deprivation (effect sizes of 2.04, 1.21, and 1.27 respectively). The effect of partial sleep deprivation on cognitive skills was about three times the effect of long term total sleep deprivation (effect sizes of 3.01 and 1.04 respectively).

The fatigue literature therefore suggests the following:

- Fatigue resulting from sleep deprivation results in poorer performance on cognitive tasks, especially those involving vigilance, fast reaction time, attentional control, cognitive processing, and memory. Its effects are strongest in those tasks that are monotonous, that have a long duration, that demand constant attention, and that have low predictability.
- Fatigue appears to act by reducing general arousal levels and by increasing the frequency of microsleeps. Its effect is generalized, but it especially appears to influence the cognitive executive mechanisms involved in response planning and general oversight of other cognitive mechanisms.
- Partial sleep deprivation is a widespread phenomenon.
- Partial sleep deprivation has substantial effects on cognitive processing that are cumulative over the period of deprivation and that may exceed the size of effects reported for periods of total sleep deprivation.
- Self-awareness of the fatigue resulting from partial sleep restrictions may not reflect the level of cognitive deficit.

### 2.2.3 Fatigue and Driving

Sleepiness when driving is an important contributor to crash involvement. Maycock (1997) conducted a survey of about 4,600 males to assess the relationship between daytime sleepiness and road safety outcome measures, hypothesising that the known effect of sleepiness on vigilance should translate into higher levels of crash involvement for drivers with higher levels of daytime sleepiness. He reported that daytime sleepiness (assessed using the Epworth Sleepiness Scale – a common measure in sleep and fatigue research) was associated with younger age, higher annual driving exposure, and higher exposure to motorway driving. He concluded that removing sleepiness as a causal factor would result in a reduction of about seven percent in the number of crashes, and he estimated that sleepiness is the main causal factor in about ten percent of crashes.

Sagberg (1999) reported the results of a large survey of 9,000 crash-involved drivers where there were insurance data identifying the underlying causes of their crashes. Only four percent of crashes in which the driver was at fault were reported by drivers as having involved fatigue. Sagberg investigated the involvement of fatigue given other variables, and concluded that about eight percent of run-off-road crashes involved fatigue, that about eighteen percent of crashes between midnight and six in the morning involved fatigue, and that about eight percent of crashes in which the driver had driven more than 150 km before the crash involved fatigue.

Fatigue and sleepiness do not necessarily cause crashes, and may be more prevalent amongst drivers than the crash data suggest. Sagberg (1999) reported that 27 percent of drivers in his large-sample survey who were not judged to be at fault in their crash reported that they had fallen asleep while driving at some time in their driving career. For eight percent of drivers, this had occurred in the preceding twelve months. Sixty percent of drivers who had fallen asleep indicated that this had resulted in their vehicle leaving its correct driving lane (either to drift into another lane or to leave the roadway), but only 0.5 percent of drivers in this group had been involved in a crash as a result of falling asleep.
The prevalence of fatigue amongst drivers was assessed by Connor, Norton, Ameratunga, Robinson, Wigmore, & Jackson (2001), who sampled drivers in a road-side survey and as part of this had them complete the Epworth Sleepiness Scale. They reported that ten percent of drivers had sleepiness scores outside the normal range. They also reported that three percent of drivers in their sample had less than three hours sleep in the preceding twenty-four hours, and that twenty two percent of their drivers had four or less full nights of sleep in the preceding week.

Fatigue appears to have a strong effect on safety related driving skills. Arnedt, Wilde, Munt, & MacLean (2001) compared long periods of wakefulness and different blood alcohol concentrations on a simulator task. The results led them to equate the effects of eighteen hours of wakefulness with those of a blood alcohol level of .05 g/100 ml.

Lifestyle factors appear to be important in understanding the fatigue problem. Williamson, Feyer, and Friswell (1996), for example, investigated the effect of different regimes of long-distance driving on fatigue and concluded that drivers’ pre-drive fatigue levels had a stronger influence on the level of long-distance driving fatigue than did the pattern of driving over that distance. Their results suggest that the key to managing fatigue amongst long-distance drivers may be to manage lifestyle-related fatigue.

The importance of lifestyle was confirmed in a more recent study conducted by Stutts, Wilkins, Osberg, & Vaughn (2003). This study compared survey results from three groups of drivers – drivers involved in a collision where Police considered them to be asleep or fatigued, drivers involved in a collision where this was not considered to be the case, and drivers not involved in a collision. They reported that fatigue was more likely to be reported as a factor where drivers had two jobs, worked long hours, worked night shift, had less than seven hours sleep at night, commonly had disturbed sleep patterns, drove more each year and on a daily basis, admitted driving when drowsy in the year preceding the crash, and were awake for more than ten hours before the crash.

In their review of literature relevant to fatigue and driving, Lyznicki, Doege, Davis, & Williams (1998) concluded that drivers with the highest risk for involvement in fatigue-related crashes are younger drivers (as a result of their lifestyle and poor sleep habits), shift workers, alcohol and drug users, and those with sleep disorders.

Fatigue-related problems are not restricted to long-distance driving, and may be more prevalent amongst drivers in urban areas. Fell & Black (1997) noted that earlier reports suggested that fatigue-related crashes were common in urban areas, and conducted a survey of 300 drivers who reported an “incident” related to fatigue – either a crash or a near miss. Sixty percent of the incidents occurred in an urban area, and 57 percent of these were preceded by a night without full sleep – often related, in turn, to work. Twenty-nine percent of the urban fatigue-related incidents were related to inadequate sleep that occurred as a result of the driver’s social life. The results suggested that many fatigue-related incidents in urban areas are the result of chronic sleep debt. Thirty percent of the urban fatigue-related incidents were associated with more than 17 hours of wakefulness preceding them, and 66 percent of the fatigue-affected sample had normal waking days of over 17 hours.

Drivers do not appear to be able to recognise fatigue-related symptoms. In Fell & Black’s (1997) survey of drivers who reported fatigue-related incidents, twenty-seven percent of participants indicated that they did not feel at all tired at the commencement of the trip during which the incident occurred.

Drivers are generally poor at managing their fatigue in the context of driving. Maycock (1997) reported that 68 percent of respondents to his survey on daytime sleepiness and driving opened their car window(s) to prevent sleepiness affecting their driving. Fell & Black (1997) reported that fifteen percent of drivers who reported a fatigue-related incident felt very tired at the start of the
relevant driving trip, but drove anyway. The beliefs of drivers about the effects of fatigue in this situation were investigated by Dalziel & Job (1997), who reported that taxi drivers often recognised their own high fatigue levels but had a high level of optimism bias. They believed that they were skilled enough to overcome the effects of fatigue.

Recognising the symptoms of fatigue may be an important countermeasure that has not been fully explored. Nilsson, Nelson, & Carlson (1997) measured the fatigue associated with long-distance driving by having participants drive a simulator until they asked to be allowed to stop. Their results showed that fatigue-related quitting occurred at a relatively constant level of subjectively-reported fatigue symptoms across participants, but that this level of fatigue developed at different rates for different participants. They suggest that it may be more effective to teach drivers how to recognise fatigue and respond accordingly than to encourage regular (say two-hourly) rest stops, because recommending a specific time period between breaks does not take into account the large variability across drivers.

Horne & Rayner (2001) considered fatigue and driving from a policy perspective, suggesting that key issues were that fatigue-related crashes peaked early in the morning, alcohol increased the effect of fatigue, the effects of sleep loss are greater for younger and older drivers, and that many drivers are most likely unaware of the early signs of fatigue and sleepiness (and may not be aware that they are falling asleep when it occurs). They suggest programs to increase drivers’ awareness of the precursors to sleep and associated risk factors.

The following conclusions can be drawn about fatigue and driving:

- Fatigue and sleepiness are common amongst drivers.
- Fatigue is an important contributor to crash involvement.
- Fatigue develops at different rates for different drivers, and some subgroups of drivers are at higher risk of fatigue-related problems.
- Lifestyle-related fatigue and sleepiness may be more important contributors to fatigued driving than other factors.
- Drivers are generally poor at recognising the symptoms of fatigue, and will continue to drive when they do recognise them.

### 2.3 Fatigue and Age

The focus of this study was the potential relationship between fatigue and crash involvement amongst younger drivers. This concern rests on an assumption that fatigue is a general problem for young people that can therefore influence their safety as drivers. There is some material in the published literature concerning fatigue amongst young people, but most of it concerns the prevalence of fatigue and sleepiness amongst adolescents. There is enough relevant research, however, to draw some useful conclusions about fatigue and young adults.

There have been some epidemiological studies conducted (including young people) using survey methods and widely accepted survey instruments to assess fatigue, sleep patterns, and sleepiness. The results of these are generally consistent, suggesting that young people in their late teens and early twenties suffer fatigue-related problems as a result of an accumulated sleep debt arising from increasingly-late bed times to meet their lifestyle demands.

Thorleifsdottir, Bjoernsson, Benediktsdottir, Gislason, & Kristbjarnarson (2002), for example, reported the results of a longitudinal study that showed that the length of sleep declined with age through the teenage years, and that sleep time was less on week nights than on weekend nights from the early teen years. Akerstedt, Fredlund, Gillberg, & Jansson (2002) reported the results of a large
sample survey and noted that the prevalence of disturbed sleep increased generally with age, but that the prevalence of self-reported fatigue in the two weeks prior to the survey was significantly greater for 16-29 year old participants than for older participants. Mercer, Merritt, & Cowell (1998) reported that 63% of their sample of teenagers felt that they needed more sleep than they were currently getting.

The most likely cause of fatigue amongst young people appears to be a combination of lifestyle and the general demands of education and work. Vinha, Cavalcante, & Andrade (2002) reported survey results showing that inadequate sleep amongst students aged in their late teens was associated with involvement in part-time work in addition to other lifestyle factors.

Mercer, Merritt, & Cowell (1998) conducted a survey of mid-teen students and reported that there may be a subgroup of young people who are more strongly sleep deprived than others. Of some interest here, Mercer et al. also reported that the amount of sleep achieved by young people who felt they were not getting enough sleep was not substantially different to the amount achieved by those who felt they were getting enough. This suggests that young people do not differ greatly in the amount of sleep they achieve, but that there are some young people who need more sleep than others.

This is consistent with more recent evidence reported by Giannotti, Cortesi, Sebastiani, and Ottaviano (2002) who were interested in the possibility that biologically determined circadian rhythms played a role in the increase in fatigue amongst older teenagers. They divided their large survey sample into morning-types and evening-types based on responses to survey items designed to assess the type of circadian rhythm that dominates waking and sleeping patterns. In addition to a general shift towards increasing dominance by an evening-type circadian rhythm with increasing age though the teenage years, Giannotti et al. reported that the sleep debt experienced by young people increased most strongly for those who had an evening-type rhythm. They suggested that fatigue amongst young adults may be the result of an interaction between the dominant circadian rhythm and lifestyle patterns, further suggesting that there may be a subgroup of young people who are more likely to accumulate a sleep debt and therefore suffer the effects of fatigue.

The effects of fatigue amongst young adults appear to be the same as those for older adults. Wolfson & Carskadon (1998) reported that inadequate sleep on weeknights amongst teenagers (up to 19 years) was associated with poor educational performance, depressed mood, and sleepiness during the daytime. Mercer et al. (1998) reported that sleep deprived young people were more likely than others to report sleepiness that interfered with performance in other areas. Alapin et al. (2000) reported that disrupted sleep in college aged students was associated with perceived fatigue, sleepiness, and poor concentration. Roberts, Roberts, & Chen (2001) reported that sleep disturbance in teenagers was associated with a number of measures of psychological functioning as well as perceived fatigue levels.

Finally, Carskadon's (1990) review of then current literature concluded that the sleep debt resulting from lifestyle changes during adolescence contributed to daytime sleepiness, accident involvement, and mood and behaviour problems.

The limited literature concerning the effect of fatigue on young people therefore suggests the following:

- Fatigue is a problem for people in their late teenage years and early twenties, mostly resulting from sleep debt accumulating because of increasing lifestyle demands and later bed times.
- There may be a subgroup of young people with evening-type circadian rhythms who are more likely to suffer from fatigue and its consequences.
- Fatigue in young people has similar psychological and cognitive consequences as it has for older adults.
2.4 Fatigue and Young Driver Safety

The research literature concerning fatigue and young drivers is limited, but there are reasons to believe that fatigue is a larger problem for this group of drivers than for others. Lyznicki et al. (1998), for example, concluded (based on their review of the literature) that younger drivers are a high-risk group for fatigue related crashes. They suggested that this relates primarily to chronic sleep debt accumulated through poor sleep habits related to the young person's lifestyle.

Akerstedt & Kecklund (2001) investigated the factors associated with involvement in early-morning crashes (from midnight to 6 am), controlling for driving exposure. They reported that the highest risk for early-morning crashes was for younger drivers, and that their risk of involvement in a crash when driving at this time was at least five times higher than their risk when driving at other times. The high risk for younger drivers was greatest for young males.

When discussing aspects of the decisions that underlie fatigued driving (see Section 2.5), Summala & Mikkola (1994) reported the results of an in-depth study of fatal crash data collected over a five-year period in Finland. They noted that fatigue was more likely to be assessed as a causal factor in crashes in younger drivers than in other age groups, and that falling asleep as a causal factor was most likely for young drivers between midnight and six in the morning. Of some interest, this was different for older drivers, where the most common time for sleep-related crashes was in the afternoon.

The higher risk of sleepiness-related problems in younger drivers was also confirmed by Benbadis, Perry, Sundstadt, & Wolgamuth (1999), who estimated the level of sleepiness amongst 620 drivers using the Epworth Sleepiness Scale. They reported that younger drivers tended to be sleepier than other age groups, and that males were sleepier than females.

A study of crashes identified by the police as involving the driver falling asleep was reported by Pack, Pack, Rodgman, and Cucchiara (1995). The police identified falling asleep as a causal factor in 0.5 percent of crashes. Compared to other crashes and to crashes involving alcohol, sleep-related crashes were more likely to involve running off the road and high speeds. Of interest here, the median age of drivers involved in sleep-related crashes was 23 years, compared to median ages of 28.5 for alcohol-related crashes, and 31.5 for crashes in general.

Carskadon (2002) discussed the results of two surveys of high school and college students. She noted that 67 percent reported that they drove when impaired by fatigue, and that twenty percent of one sample reported falling asleep when driving.

Younger drivers report that tiredness is a factor in crashes. Geuna, Ravazzani, & Perassi (1995), for example, surveyed 500 nineteen year old males and reported that eleven percent of those drivers involved in crashes admitted in the survey to feeling tired before the crash. The potential involvement of lifestyle-related fatigue in young driver crashes needs to be emphasised. Corfitsen (1996) concluded that alcohol and tiredness interact, based on a study of night time drivers under and not under the influence of alcohol. This study used a reaction time task and concluded that the effects of alcohol on reaction time were increased when participants were also tired, and therefore that alcohol affected young male drivers are likely to be at greater risk early in the morning as a result of lifestyle-related fatigue.

Philip, Ghorayeb, Stoohs, & Menny (1996) conducted a road-side survey of over 550 drivers during a popular holiday period. They emphasised the importance of lifestyle and sleep schedules as causal factors for driver fatigue, and that drivers under 30 years of age were more likely to be sleep deprived than older drivers.

In the broader context of a review of the limitations of graduated licensing schemes, Ferguson (2003) discusses fatigue and younger drivers and concludes that lifestyle-related fatigue is a
potential problem for younger drivers. Apart from the beneficial effects of night-time restrictions on driving, licensing schemes are unlikely to have any positive effects on fatigue-related problems as the problem is less related to driving development and more related to the busy lifestyles of young adults.

The involvement of fatigue as a causal factor in young driver crashes appears to be well accepted, as is the importance of lifestyle-related factors as a cause for fatigue and sleepiness in this group of drivers. There appears to be no research specifically relevant to the role of long-distance-driving-related fatigue and crashes in young adults.

2.5 Fatigue Related Decision Making and Young Drivers

2.5.1 Decision Making and Driving Behaviour

There is considerable uncertainty about the best way to understand decision making processes in driver behaviour. There has been a general bias towards rational models of decision making (both in road safety and more generally across decision making). In road safety, for example, Wilde, Gerszke, & Paulozza (1998) assumed that drivers should be taught how to make rationally-optimal decisions to enhance their safety and developed (and trialled) a training system for optimising decision making. Rational models of decision making are characterised by their assumption that humans possess a decision making system that seeks the best possible outcome in any situation based on a comparison of possible behaviours in terms of their potential positive and negative consequences, most often weighted according to their relative value to the person. This type of decision-making model is widely assumed in road safety when driver behaviour is considered in the context of enforcement programs – the deterrence model, for example, generally assumes a decision making process that uses the subjective expected utility of various outcomes to select an appropriate behaviour.

Application of this type of model to fatigued driving would have the driver assessing the potential consequences of driving or using other transportation methods when fatigued, or assessing the consequences of continuing to drive compared to stopping for a rest break. The consequence of this approach would be a decision that maximises the positive outcomes for the driver. This approach is attractive because of its emphasis on seeking the most positive outcomes, and because it relies on the notion that human information processing is fundamentally rational.

The problem for understanding decision making in driving, however, is that there is now good evidence that rational models of decision making fail to describe either the processes or outcomes of decision making, especially in high-workload situations such as driving. Beach & Lipshitz (1993) argue, for example, that there is a need to discard rational decision-making models (in general) in light of recent evidence that these models may be inappropriate for real-world behaviour. Discussion of the relevance of rational decision-making models in the context of decisions in ordinary activities (Beach & Lipshitz, 1993; Klein, 1989; Klein, 1993) suggests the following:

- The computational intensiveness of rational decision-making models (which require that the likely consequences of every behavioural option be determined, valued, and compared before a decision is made) argues strongly against their application to most behaviours. The human information processing system simply does not have the capacity to process information this intensively while the person is engaged in other behaviours.
- People trained to use rational decision-making are reluctant to use it, using intuitive or subjective approaches even in situations where a rational approach might prove beneficial.
- There is evidence that people with experience in the decision-making context do not usually compare alternative behaviours. Instead, they evaluate the likely outcome of a single behaviour selected as the most likely to meet the situational demands. Where this option is satisfactory, it
is acted upon. Alternative behavioural options appear to be generated only when the first generated behavioural response is unsatisfactory.

An alternative approach to decision making has been applied to driver behaviour with some success. This approach is the recognition-primed decision-making model – one of a number of naturalistic decision making models that focus on real-world evidence rather than studies undertaken in laboratories. One strength of naturalistic models in the driving context is that they are best applied to behaviours that occur in an environment that is poorly structured, uncertain, dynamic, and associated with competing goals, time-stress, and behaviour that is partly controlled by feedback from earlier decisions (Orasanu & Connolly, 1993). Driving decisions occur in this type of environment.

The recognition-primed decision-making (RPD) model (Klein, 1989; Klein, 1993) emphasises the role of the recognition of situational cues and the application of previously learned behaviours associated with those cues. The model’s application to driving has been described elsewhere (Fitzgerald & Harrison, 1999; Harrison, 2001; Klein, Vincent, & Isaacson, 2001). The important issue here is how this model might be applied to the decision-making process that leads drivers to drive when fatigued, when an objective analysis of the riskiness of this behaviour would suggest that a better decision might be to take a break or not drive at all.

The RPD model has the driver assess the situation and make a behavioural decision based on their experience in that situation. If the situation is new, then the behavioural decision is based on experience in similar situations. The evidence reviewed earlier suggests that most drivers have most likely driven when tired, many have driven when very tired or sleepy, and a sizeable minority admit to falling asleep when driving. These experiences appear, for the most part, to have no negative consequences for drivers. Very few drivers who admit to driving when tired crash as a result, and one study (Sagberg, 1999) has only 0.5 percent of drivers who admit to falling asleep when driving in the preceding twelve months having a crash as a result of their sleepiness.

If the majority of drivers have prior experiences of driving when tired or sleepy, and these experiences have positive consequences, then the RPD model will have them making a decision to drive when tired or sleepy in the future. The RPD model suggests that drivers in this situation will not even consider the possibility of not driving or of having a rest break because the decision-making process under RPD does not consider alternative behaviours when an acceptable behaviour is available.

It is only when the behavioural decision to continue (or start) driving is assessed as unacceptable for some reason that the driver will consider an alternative – such as not driving or taking a break. This means that the key focus for fatigue programs must be finding a way to ensure that the driver recognises their fatigue and then assesses the decision to drive as unacceptable for some reason that counters his or her experience of successful instances of fatigued driving in the past, or alternatively accepting that tired drivers will drive and use a harm-minimisation approach as the basis for a communication strategy.

The RPD model is consistent with other models of behaviour that stress the development of automatic responses based on prior experience (e.g. Logan, 1988; Ohlsson, 1996). More importantly here, the RPD model is consistent with a broader view of behaviour that emphasises the importance of motivational factors – behavioural decisions for drivers occur in a general context in which the driving occurs to meet broader goals or motivations – such as the desire to get to a destination as quickly as possible. Where similar motivational factors have been present in the past and are present now, the driver’s decision is more likely to reflect successful prior behaviours – such as continuing to drive when tired as it meets the goal of completing the trip as quickly as possible. Consistent with the primacy of motivational factors, Pedersen (1998) reported that drivers rated trip purpose and an absence of hindrances as more important than safety when selecting a route.
2.5.2 Decision Making and Young People

There is little research relevant to decision making amongst late teenagers and early adults – perhaps reflecting the traditionally low level of interest in this age group from a cognitive or information-processing perspective. The major developmental stages during which there are large shifts in cognitive skill have passed, and the main developmental challenges in this age group related to familial, social, and community issues.

It is therefore difficult to draw any clear conclusions about the decision-making process in younger drivers as it relates to fatigued driving. Nevertheless, there is some research that could inform the planning of further research, and the RPD model is relevant.

The key issue that arises from this research is that motivational factors appear to have a central role in decision making amongst younger adults, and that habit or patterns of behaviour already in place also play an important role. The effect of motivational factors can be subtle - Elsbach and Barr (1999) attempted to teach graduate students to use structured approaches to decision making and found that a moderately positive mood state made them less inclined to make use of the structure of a set decision-making process and to resort to less structured decision making processes. The possibility that motivation and habit are important in young person decision making is consistent with the RPD view.

The largest body of research concerning decision making amongst young adults appears to relate to condom use – most likely a consequence of the increasing levels of sexual activity in the late teenage years and the associated risk of HIV/AIDS infection. The importance of motivational and other factors in decision making in this area is well understood, and the fact that risky decisions in this area and in relation to fatigue can have serious health consequences gives this body of research some relevance here.

The failure of rational decision making is clear in relation to condom use, where there is consistent evidence that the decision of young adults to use or not use condoms is not closely related to knowledge about HIV/AIDS (e.g. Lieberthal & Beckman, 1997; Winfield & Whaley, 2002).

There is evidence that past patterns of behaviour play an important role in current behavioural decision making concerning condom use amongst young adults, as would be predicted under the RPD model outlined earlier. Baker, Morrison, Carter, & Verdon (1996) reported that prior condom use improved the relationship between attitudes, normative beliefs and current intention to use condoms – suggesting that the effect of attitudes and beliefs on decision making in this domain depends on already existing habitual behaviour.

Similar results were reported by Trafimow (2000) who reported the results of two studies in which a total of 120 college undergraduates responded to questions concerning their attitudes, normative beliefs about the behaviour of others, their history of (or habitual) condom use, and their intention to do so. The results suggested that attitudes and normative beliefs predicted current use, but that participants' habitual condom use was an independent predictor of current use. Trafimow concluded that young people's habitual use of condoms is not related to their attitudes about the use of condoms.

Rise (1992) investigated decision making in relation to condom use amongst over 1,000 Norwegian adolescents. He reported that attitudes towards condoms and related issues were poor predictors of behavioural intention and actual use, but that normative beliefs about others’ use of condoms did predict behavioural intentions. Beliefs about the long-term consequences of condom use or non-use were also poor predictors, while short term factors such as feelings associated with use and non-use were better predictors. For young adults, therefore, Rise recommended that public education programs to encourage condom use would do better to focus on social norms and psychological factors.
The relevance to fatigue is clear. Assuming that similar decision-making processes and factors are relevant across different areas of risky decision making by young people in the context of potential health outcomes, the likelihood of fatigued driving may be more strongly related to habitual patterns of fatigue related behaviour and driving, normative beliefs, and the motivational state of the young driver, and less strongly related to the actual or even perceived risk of the behaviour when assessed against potential health consequences. If so, this gives strong guidance to further research and, ultimately, to the development and implementation of anti-fatigue programs in road safety. The focus of further research and program development will need to be on habitual behaviours, perceived norms, and the motivational factors that underlie driving.

There is at least some research in the driving domain that focuses on decision making and younger drivers. Cvetkovich & Earle (1988), for example, focused on some of the theoretical issues involved in understanding decision-making processes amongst younger drivers – attempting to understand their decision making about risk within a rational decision-making model. Noting that young driver decisions do not appear to maximise positive outcomes in relation to riskiness, they suggested that the decision frame of the young driver may not allow them to make safe decisions. The frame is the personal context within which a decision is made, and in the case of young drivers their limited driving experience, motivations, and developmental stage may put them in an impoverished decision frame – where there is insufficient information and experience available to make a safe decision in some circumstances.

Delhomme & Meyer (1998) reported the results of two experiments in which they investigated factors that influenced speed related decisions by young drivers. Their results suggested that young drivers are influenced more strongly than experienced drivers by motivational factors when making decisions about safe and unsafe driving speeds.

The separation between judgment and behavioural decision in young driver decision making was demonstrated by Calisir & Lehto (2002) in a study of decision making in relation to seat belt use. The decision-making process that people used to rate the potential risks of crash involvement and seat belt use was largely rational, taking into account a number of relevant variables. Actual use of seat belts was not associated with these relevant variables, but was associated with variables that were unrelated to rational decision-making processes – such as age and sex. The authors concluded that public education programs targeting seat belt use should not address issues such as the perceived usefulness of seat belts as these do not appear to predict actual behaviour.

In the seat belt domain, Harrison, Senserrick, & Tingvall (2000) demonstrated that current seat belt use was primarily related to seat belt habits, and that the decision to wear or not wear a seat belt was cued by events in the driver's environment rather than his or her beliefs about the value of seat belt use.

Decision making concerning route selection also seems to be strongly influenced by factors other than safety. Pedersen (1998) had about 340 undergraduate students complete a questionnaire concerning route selection when driving. The questionnaire results were subjected to a factor analysis and further statistical analysis of the factor scores suggested that although women were more likely than men to make route decisions that took safety into account, both men and women were much more likely to be influenced by trip purpose and likely hindrances to trip completion (than other factors) when making route decisions. This suggests that motivational factors outweigh safety-related factors when choosing the best way to get to a destination.

The limited body of young driver research relevant to decision making is consistent with the broader decision-making literature and the literature concerning decision making in relation to condom use – young drivers are more likely to make their decisions under the influence of motivational factors and habit than they are to make decisions that reflect actual crash risks associated with their behavioural decisions.
2.6 Concluding Comments and Recommendations

The literature review presented here suggests the following:

- In relation to fatigue in general:
  - Fatigue resulting from sleep deprivation results in poorer performance on cognitive tasks, especially those involving vigilance, fast reaction time, attentional control, cognitive processing, and memory. Its effects are strongest in those tasks that are monotonous, that have a long duration, that demand constant attention, and that have low predictability.
  - Fatigue appears to act by reducing general arousal levels and by increasing the frequency of microsleeps. Its effect is generalised, but it especially appears to influence the cognitive executive mechanisms involved in response planning and general oversight of other cognitive mechanisms.
  - Partial sleep deprivation is a widespread phenomenon.
  - Partial sleep deprivation has substantial effects on cognitive processing that are cumulative over the period of deprivation and that may exceed the size of effects reported for periods of total sleep deprivation.
  - Self-awareness of the fatigue resulting from partial sleep restrictions may not reflect the level of cognitive deficit.

- In relation to fatigue and driving:
  - Fatigue and sleepiness are common amongst drivers.
  - Fatigue is an important contributor to crash involvement.
  - Fatigue develops at different rates for different drivers, and some subgroups of drivers are at higher risk of fatigue-related problems.
  - Lifestyle-related fatigue and sleepiness may be more important contributors to fatigued driving than other factors.
  - Drivers are generally poor at recognising the symptoms of fatigue, and will continue to drive when they do recognise them.

- In relation to fatigue and young people:
  - Fatigue is a problem for people in their late teenage years and early twenties, mostly resulting from sleep debt accumulating because of increasing lifestyle demands and later bed times.
  - There may be a subgroup of young people with evening-type circadian rhythms who are more likely to suffer from fatigue and its consequences.
  - Fatigue in young people has similar psychological and cognitive consequences as it has for older adults.

- In relation to fatigue and crashes involving young people:
  - The involvement of fatigue as a causal factor in young driver crashes appears to be well accepted.
  - Lifestyle-related factors are an important cause of fatigue and sleepiness in this group of drivers.

- In relation to decision making in general:
  - Rational models of decision making are generally unhelpful in understanding decision making in the real world.
Naturalistic models that emphasise the role of habit and situation recognition are better.

Drivers in a fatigued state are unlikely to consider alternatives to driving if their experience has taught them that fatigued driving does not result in negative consequences – unless there is some other reason to judge the decision to drive as unacceptable.

In relation to decision making and young people:

- Young people are more likely to be influenced by motivational and habit-related factors than others when making decisions.
- Normative beliefs about the behaviours of others may also play a role in safety-related behaviours.

Drawing these points together leads to a recommendation that fatigue-related programs for younger drivers need to focus on fatigued driving in the context of lifestyle-related accumulated sleep debt and a decision-making process that is likely to make them immune to public education messages that focus on the potential risk of crash involvement and related consequences. Programs may be more successful if they focus on the motivational factors that underlie fatigued driving in this group, and their beliefs about common behaviour patterns amongst their peers.

However, the greatest blockage to the development and implementation of programs to reduce the effect of fatigue on the safety of young drivers is the lack of directly relevant research. There is still little certainty about:

- The amount of driving undertaken when fatigued by young drivers in different driving contexts in Australia;
- The response of young drivers to current fatigue campaigns and programs;
- The decision-making processes (and associated factors) that underlie young drivers’ decisions to drive when fatigued or to continue driving when fatigue develops; and
- The best way to encourage decisions that lead to better safety outcomes.

It is clear that decision making in general is based on underlying processes that are not rational and that do not take into account the potential consequences of a broad range of behavioural options in a given situation. For the young driver attempting to get from one place to another when fatigued, the main influences are likely to be their motivation to get to their destination and their previous experiences of driving when fatigued, or driving on that route for that purpose. Under these circumstances rational consideration of the potential crash consequences of fatigued driving is unlikely to enter into consideration – even if the young driver is aware of the risk in a knowledge sense.

The need now is for the development of fatigue programs that tap motivational and habit-related factors rather than knowledge about the potential risks of driving when fatigued. Programs of this type require additional research, however, to respond to the issues outlined above. The remaining two components of this study aimed to do this.
3. Survey of Young Drivers

3.1 Introduction

The literature review reported in Section 2 was conducted in the absence of a substantial body of Australian evidence concerning the exposure of young drivers in Australia to driving situations where fatigue might contribute to crash involvement. This means that there is still some uncertainty about the size of the fatigue problem amongst young Australian drivers and little is known about the characteristics of young drivers who drive when fatigued, or the situations under which this driving takes place. Without this information it would not be sensible to develop and implement programs targeting fatigued driving amongst young drivers.

A survey of young drivers was undertaken as part of this study to provide this type of information. The survey aimed to collect the following type of information from a sample of young drivers in Victoria:

- Demographic data including age, sex, employment, and educational status.
- Driving-related information such as experience, crash involvement, and broad estimates of the amount of driving undertaken at different times of the day.
- Sleep-pattern information over the two weeks preceding the survey.
- Information about the participants’ beliefs about the effects of fatigue relative to alcohol, and things they have done to minimise the effect of fatigue – either when planning a trip or once underway.
- Information about trip purpose and length.

3.2 Method

The survey was conducted by telephone using a CATI system. Participants were drawn from a database of RACV customers aged between 18 and 25 years. The sample of 400 participants was selected using a quota system to give about-equal numbers of male and female participants and about-equal numbers of participants in each yearly age group. The characteristics of the sample are discussed in the next section. Interviewing was staged over a three week period to ensure inclusion of a variety of weekend and weekday driving across different weather conditions.

The survey items are in Appendix A. Potential participants were contacted by telephone and invited to take part in the survey. The survey took less than 15 minutes to administer. It was constructed so that items were presented in the following order:

- General demographic items – age, employment and licence status, and whether the participant drove as part of their occupation. Participants were excluded at this stage if they were unlicensed or if their age was outside the 18-25 year range.
- General driving questions – participants were asked if they had driven one and two days before the survey, and if not whether they normally did so. These items were used to reduce the length of the survey for some participants.
- Beliefs about fatigue and driving – a series of items concerning the participants’ beliefs about the effect of different levels of fatigue and alcohol consumption on their ability to drive safely. These

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1 Development of items for the survey was undertaken by Warren Harrison (Eastern Professional Services Pty Ltd), Dean McDonald (Market Access Consulting and Research Pty Ltd), Robyn Seymour (RACV), and Anne Harris (RACV). Additional assistance was provided by Stephanie Christie (RACV) and Tony Carrucan (RACV). The telephone survey was undertaken by the Social Research Centre, who also provided the data file for analysis. Data analysis and interpretation, and preparation of this section of the report, were undertaken by Warren Harrison.
items used a unipolar, eleven-point rating scale with the endpoints anchored as “0 – no effect on safe driving” and “10 – a very significant effect on safe driving.”

- Sleep patterns – participants were asked to describe their sleep pattern over the preceding two weeks.
- Driving experience – a series of items concerning the participants’ driving patterns in the preceding two weeks, especially as they related to late-night driving and driving when potentially fatigued.
- Strategies – participants were asked to nominate the things they had done in the past to reduce the impact of fatigue on their driving. They responded in terms of things they had done prior to driving, and things they had done once underway. These responses were unprompted.
- Consequences – participants reported on their crash involvement and their involvement in fatigue-related near misses.
- Diary – this section of the survey collected sleep and nap information for the preceding two days, and driving-trip information over the same time period. Participants provided information for up to ten driving trips on each of the last two days, including start time, length of trip (time), trip purpose, and who was with them in the car. Those participants who drove as part of their work also gave more general information about the start and finish times of their work-related driving. A driving trip was defined in the survey as a single journey where the participant turned their vehicles’ ignition off at the end.
- Additional demographic items – relating to educational status, sex, and living situation.

The data were saved into a single data file, along with information about the date and day of the week the survey was conducted. The data were analysed using the Statistica software package (Statsoft Inc., 2004). Initial data analysis focused on a detailed description of the sample and responses to survey items. Multivariate techniques were then used to provide a more detailed description of fatigued driving and potential targets for road safety programs.

3.3 Results

3.3.1 The Sample

There were 200 male and 200 female respondents. Their mean age was 21 years. Table 1 shows the sample disaggregated by age and sex. The interaction was not statistically significant. There was a slight bias towards 18-year old respondents at the expense of 25 year old respondents, most likely reflecting the focus on younger respondents during recruitment.

Table 1 Sample disaggregated by age and sex

<table>
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<th>Sex</th>
<th>Age 18</th>
<th>Age 19</th>
<th>Age 20</th>
<th>Age 21</th>
<th>Age 22</th>
<th>Age 23</th>
<th>Age 24</th>
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<td>74</td>
<td>56</td>
<td>49</td>
<td>57</td>
<td>46</td>
<td>46</td>
<td>44</td>
<td>28</td>
<td>400</td>
</tr>
</tbody>
</table>

Table 2 further disaggregates the data in Table 1 by place of residence. The interactions between place of residence and age, and between sex and place of residence were not statistically significant. The data in Table 2 are a close approximation to the Victorian population data for young people between 15 and 24 years of age (Australian Bureau of Statistics, 2004). Based on a sample of 400 participants, it would be expected that there would be 148 male respondents in the metropolitan area, 52 males in the rest of the State, 147 female respondents in the metropolitan area, and 48 females in the rest of the State. The similarity between the survey sample and the population led to a decision to conduct all analyses using raw data rather than weighted data.
Eighty-three percent of respondents (N=334) were working in some capacity. Forty-seven percent of respondents (N=187) were in full-time, permanent positions, 16 percent (N=66) in part-time, permanent positions, and the remainder (N=80, or 20 percent) in casual positions (either full- or part-time). These are also consistent with ABS data (Australian Bureau of Statistics, 2004b). Between 47 percent (metropolitan) and 49 percent (rest of the State) of 20 to 24 year-old Victorians were in full-time employment in July 2004, and about 24 percent were in part-time employment of any type. If it assumed that most casual employment is part-time, the sample appears to be representative of the broader population in relation to employment status.

Table 3 shows the numbers of respondents in each employment category (using categories used by the Australian Bureau of Statistics – eg ABS, 2004). As might be expected for this age group, the majority of respondents were employed in elementary or intermediate work, and there was a strong bias towards clerical, sales, and service positions (48 percent of the sample were in roles of this type). Five percent of respondents (N=21) indicated that they drove as part of their employment.

Respondents were asked to indicate when they first obtained their probationary driver licence. This variable was used to calculate the length of time they had held a licence – a surrogate measure of driving experience. The distribution of this variable is shown in Figure 1.

The data shown in Figure 1 suggest a bias in the sample towards less-experienced drivers. This is most likely the result of two factors. The first is the slight bias towards younger drivers in the sample (see Table 1). The second factor is shown in Figure 2, which shows the number of months since licensure for participants in each yearly age group. Some young drivers delay obtaining their licence beyond the minimum licensing age in Victoria, with the result that the sample includes more less-experienced drivers than would be expected if all drivers obtained their licence as soon as possible.
Figure 1  Frequency distribution of number of months since respondents obtained a licence

Figure 2  Months since licensure by age
Forty-nine percent (N=197) of respondents were studying at the time of the survey. Forty percent (N=158) were in full-time study, and 10 percent (N=39) in part-time study. The majority of those studying were at a university (N=125). Fifty-three respondents were studying at TAFE colleges or similar institutions, and 18 were still at secondary school.

Table 4 shows the living situation of respondents. The majority (N=252, or 63 percent) lived with their parents. The next largest group (N=56, or 14 percent) was living with a partner or spouse.

Respondents were sampled from a database of people known to RACV. Twenty-two percent of respondents (N=89) had a comprehensive vehicle insurance policy with RACV. Eighty-eight percent of respondents (N=353) were roadside assistance members of RACV – giving them access to roadside mechanical assistance and other benefits in the event of a breakdown. Only thirteen respondents had house or similar insurance with RACV.

### Table 4 Sample disaggregated by living situation

<table>
<thead>
<tr>
<th>Living Situation</th>
<th>Count</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Living with parents</td>
<td>252</td>
<td>63.0</td>
</tr>
<tr>
<td>Living with friends</td>
<td>29</td>
<td>7.3</td>
</tr>
<tr>
<td>Living in a shared house</td>
<td>29</td>
<td>7.3</td>
</tr>
<tr>
<td>Living alone</td>
<td>13</td>
<td>3.3</td>
</tr>
<tr>
<td>Living with partner</td>
<td>56</td>
<td>14.0</td>
</tr>
<tr>
<td>Living with other family members</td>
<td>17</td>
<td>4.3</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>1.0</td>
</tr>
</tbody>
</table>

### 3.3.2 Fatigue Related Beliefs

Respondents were asked to provide a rating to a series of items to reflect their belief about how some situations would affect their ability to drive safely. The means (and 95% confidence intervals) are shown in Figure 3. High ratings indicated that the behaviour was considered likely to influence the participant’s safety when driving.

The differences between ratings given to the eight items were tested using analysis of variance followed by post hoc pairwise comparisons using the Bonferroni correction for potential inflation of the Type I error rate. The overall ANOVA indicated that there were significant differences between the ratings given to the items ($F_{(7,2604)} = 220.6, p < .05$). Pairwise comparisons between all possible pairs of items indicated that all differences were statistically significant except for the differences between:

- The perceived effect of driving after 24 hours of wakefulness and the perceived effect of driving after 5 days of insufficient sleep.
- The perceived effect of driving after 24 hours of wakefulness and the perceived effect of driving with a BAC that could be over .05 g/100ml.
- The perceived effect of driving after 5 days of insufficient sleep and the perceived effect of driving with a BAC that could be over .05 g/100ml.
- The perceived effect of driving between 2am and 5am and the perceived effect of driving after having one or two alcoholic drinks.

The similarity in the perceived effect of mild intoxication and fatigue on driving is noteworthy and will be discussed later, as will the relatively low rating given to the perceived effect of driving between 2am and 5am.
The possibility that the ratings given to eight items might be related to respondents’ sex or place of residence was tested by expanding the ANOVA reported above to include two categorical variables in addition to the within-subjects variable. This analysis, therefore, was a 2 (male, female) by 2 (metropolitan, rest of State) by 8 (the items) analysis with the last term analysed within groups.

The main effect of sex was statistically significant ($F_{(1,369)} = 5.3, p < .05$), with the average rating given by females being significantly higher (6.2) than that given by males (5.8). On average, therefore, female respondents believed the issues discussed in the eight items had a stronger effect on their ability to drive safely than did the males.

The only significant interaction in this analysis was that between sex and item ($F_{7,2583} = 4.7, p < .05$). This is shown in Figure 4, and was further assessed with comparisons between male and female respondents’ ratings for each item. Although it was noted above that males’ average responses across all items suggested that they believed they were less likely to be affected by the situations described by them, this was only true for some of the items. The responses of males and females were significantly different for:

- Their beliefs about the effect of one or two alcoholic drinks on their ability to drive safely.
- Their beliefs about the effect of driving after midnight on their ability to drive safely.
- Their beliefs about the effect of driving between 2am and 5am on their ability to drive safely.

In each case, males believed that these situations would have less of an effect than did females. In the other items, males and females were statistically indistinguishable.

The order in which the eight items in this part of the survey were presented was randomised to minimise the potential effect of the order of presentation. It is possible, for example, that having one...
of the items at the end of the list could have influenced respondents’ ratings for that item. To ensure that no order effects were present, information about the order of presentation of the items was collected during the survey, and the order effects on ratings for each item was assessed using ANOVA with position (1st through to 8th) used as a categorical variable. This analysis was conducted for each item, with the null hypothesis being that there were no differences between ratings given to the item across the eight possible presentation positions in the series. The analyses confirmed that there were no presentation-order effects – there were no statistically significant effects of presentation position for any of the eight items.

The above analyses suggest that there were some differences and similarities between these items. A factor analysis was conducted to investigate the underlying pattern or structure of responses to the items. This technique makes use of the correlations between variables to identify groups of similar items. The factor analysis used principal components analysis to extract three factors that together accounted for 71 percent of the variance in the eight variables. These factors were rotated obliquely using the varimax method, with the resulting factor loadings given in Table 5.

The factor loadings provide an indication of the pattern of beliefs relating to the effects of fatigue and drink driving. The three factors identified in the factor analysis reflect the grouping of items. The items with high loadings on the first factor were those relating to driving when fatigued, suggesting that respondents with high scores on this factor were those who perceived fatigue to have a strong effect on their ability to drive safely. The items with high loadings on the second factor were those relating specifically to driving late at night. Respondents with high scores on this factor would be those who believed driving at these times has a relatively large effect on their ability to drive safely. The final factor appears to reflect perceptions of the effect of alcohol, with high loadings from the two drink-driving items. It also includes a high loading for the fatigue item relating to driving after 24 hours without sleep – suggesting that responses to this item were similar to responses to the drink driving items.
Consistent with the data shown in Figure 4, analysis of the three factor scores detected statistically significant differences between male and female respondents on Factors 2 and 3. Females believed that their ability to drive safely would be more affected when driving late at night and when affected by alcohol (or high levels of sleep deprivation) than did males. There was no statistically significant effect of place of residence.

### 3.3.3 Sleep and Driving in General

Respondents provided information concerning their sleep patterns over the preceding two weeks. Respondents reported that they needed an average of 7.9 hours of sleep each day, with estimates ranging from 4 hours to 12 hours. They reported an average of 7.5 hours sleep over the preceding two weeks – with estimates ranging from 3.5 hours to 14.5 hours – and reported that they had an average 4.1 nights (range 0 to 14 days) where they got less sleep than they thought they needed.

The difference between the amount of sleep needed and the estimate of the average amount of sleep over the preceding two weeks was calculated and is shown in Figure 5. This gives an indication of respondents’ beliefs about their general level of sleep debt – negative figures indicate that the respondent believes they have had less sleep, on average, than they require. The data in Figure 5 are slightly skewed towards negative values, and there are more extreme values at the negative end than at the positive – together suggesting a tendency towards less sleep than thought necessary. The mean difference (-0.36 hours) was significantly different from 0 ($t(399) = 4.6, p < .05$).

The difference between sleep needed and average sleep obtained was not related to sex or place of residence (metropolitan or non-metropolitan).

The longest time period without sleep in the preceding two weeks reported by respondents ranged from 12 hours to 72 hours, with a mean of 20.3 hours. The distribution of responses to this item is shown in Figure 6. Twenty-nine percent of respondents reported at least one instance of more than 20-hours without sleep.

Respondents were also asked, in relation to this item, if they had driven towards the end of this longest period of wakefulness. The distribution shown in Figure 6 is repeated in Figure 7, disaggregated by whether the respondent reported driving after the longest period without sleep. The resulting two distributions appear similar, but the longest period of wakefulness reported by those who drove afterwards was longer (mean of 21.7 hours) than that reported by those who did not (mean of 19.6 hours) ($t(384) = 2.9, p < .05$).

The survey included some general items about driving in the preceding two weeks. The responses are summarised in Table 6. Driving at night was common – all respondents had done so at least once in the preceding two weeks, and on average did so 8.8 times. Driving after midnight was less common, with
30 percent of respondents indicating that they had not done so in the preceding two weeks. The mean number of instances of driving after midnight in the previous two weeks (averaged across the whole sample) was 2.6. Thirty-seven percent of the sample indicated that they had driven between 2am and 5am in the preceding two weeks, with this occurring an average of once across the sample.

Figure 5  Difference between estimates of sleep needed and estimates of average sleep obtained over the preceding two weeks

Figure 6  Longest time without sleep in the preceding two weeks
Only 23 percent of the sample had driven more than two hours in one go, and ten percent of the sample admitted to driving after more than 24 hours without sleep in the preceding two weeks. Males were more likely than females to have driven after 24 hours of wakefulness (13.5 percent compared to 7 percent) ($\chi^2(1) = 4.6, p < .05$). The likelihood of having driven after 24 hours without sleep was not related to place of residence (metropolitan or non-metropolitan).

Table 6 Responses to general driving items

<table>
<thead>
<tr>
<th>In preceding 2 weeks:</th>
<th>Mean</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Std. Dev.</th>
<th>Percentage admitting behaviour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Times driven at night</td>
<td>8.77</td>
<td>1.00</td>
<td>14.00</td>
<td>4.09</td>
<td>100%</td>
</tr>
<tr>
<td>Times driven after midnight</td>
<td>2.57</td>
<td>0.00</td>
<td>14.00</td>
<td>2.92</td>
<td>70%</td>
</tr>
<tr>
<td>Times driven 2-5am</td>
<td>0.99</td>
<td>0.00</td>
<td>14.00</td>
<td>2.07</td>
<td>37%</td>
</tr>
<tr>
<td>Driven more than 2 hours in one go</td>
<td>1.14</td>
<td>0.00</td>
<td>14.00</td>
<td>2.27</td>
<td>23%</td>
</tr>
<tr>
<td>Times driven after 24 hrs without sleep</td>
<td>0.16</td>
<td>0.00</td>
<td>5.00</td>
<td>0.56</td>
<td>10%</td>
</tr>
</tbody>
</table>

Forty-three percent of respondents (N=171) indicated that they had driven in the preceding week when mentally tired or sleepy, and 40 percent (N=160) admitted to driving in the same period when physically tired or worn out. Responses to both items were statistically independent of sex and place of residence. Fewer respondents (14.5 percent, N=58) admitted to driving when they had insufficient sleep for five days in a row, and three percent (N=13) admitted to nodding off while driving in the preceding two weeks. Responses to these items were also statistically independent of sex and place of residence.
The general failure of attitudes to predict driving behaviour was confirmed – the responses to the eight items concerning the perceived effect of different driving situations on the ability to drive safely were analysed in relation to the items concerning driving when physically or mentally tired. There were no statistically significant differences between respondents who had and who had not driven when mentally or physically tired on any of these perceived-effect items, including those directly related to driving when mentally or physically tired.

### 3.3.4 Strategies to Avoid the Effects of Fatigue

Respondents were asked to nominate things they had done to avoid driving when fatigued (when planning a trip or before setting off) or to deal with fatigue when driving. Multiple responses were accepted, and respondents were not prompted with specific examples. The responses here therefore represent unprompted recall rather than recognition based on a checklist. Responses were placed into general categories, with some additional categories added at the end of the survey to accommodate responses that did not fit.

<table>
<thead>
<tr>
<th>Table 7</th>
<th>Things done when planning a trip or before setting off to reduce the likelihood of fatigue</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Before the trip:</strong></td>
<td>Count</td>
</tr>
<tr>
<td>Ensure well rested/good sleep night before</td>
<td>149</td>
</tr>
<tr>
<td>Drank coffee or some other caffeine drink</td>
<td>88</td>
</tr>
<tr>
<td>Ate something</td>
<td>75</td>
</tr>
<tr>
<td>Have done nothing</td>
<td>59</td>
</tr>
<tr>
<td>Had a nap before leaving</td>
<td>36</td>
</tr>
<tr>
<td>Delayed the trip</td>
<td>30</td>
</tr>
<tr>
<td>Had shower/freshened up before leaving</td>
<td>23</td>
</tr>
<tr>
<td>Planned route/planned where to have rest stops</td>
<td>19</td>
</tr>
<tr>
<td>Planned to share the driving</td>
<td>18</td>
</tr>
<tr>
<td>Other things</td>
<td>12</td>
</tr>
<tr>
<td>Got someone else to drive</td>
<td>8</td>
</tr>
<tr>
<td>Avoided drinking before driving</td>
<td>8</td>
</tr>
<tr>
<td>Exercise or stretch before leaving</td>
<td>8</td>
</tr>
<tr>
<td>Avoided driving when normally asleep</td>
<td>6</td>
</tr>
<tr>
<td>Took music</td>
<td>5</td>
</tr>
<tr>
<td>Planned to avoid driving when normally tired</td>
<td>4</td>
</tr>
<tr>
<td>Be packed or prepared for the trip</td>
<td>4</td>
</tr>
<tr>
<td>Planned to stop overnight</td>
<td>3</td>
</tr>
<tr>
<td>Wore comfortable clothes</td>
<td>3</td>
</tr>
<tr>
<td>Taken a cab/public transport</td>
<td>2</td>
</tr>
<tr>
<td>Stayed where they were</td>
<td>2</td>
</tr>
<tr>
<td>Planned to avoid driving after a long day at work</td>
<td>0</td>
</tr>
</tbody>
</table>
Table 7 shows the responses to the item concerning things done to reduce the likelihood of fatigue when planning a trip or before the trip commences. The table includes the number of times a response was made, the frequency expressed as a percentage of the total number of responses given, and the frequency expressed as a percentage of respondents – that is, what percentage of respondents reported doing each thing. A total of 562 responses were generated for this item. The most common responses were ensuring that they were well rested before the trip, using caffeine, or having something to eat. Fifteen percent of participants indicated that they had not done anything before a trip to reduce the risk of fatigue in the past.

Respondents also indicated what they had done in the past when driving to try to stay awake. The responses to this item are shown in Table 8. The most common strategies were turning on a radio, winding down a window, talking to a passenger, and increasing the volume of the music or radio. Nine percent of respondents indicated that they had pulled over to have nap when tired. It is interesting to note that many of the strategies employed to combat fatigue when driving are

<table>
<thead>
<tr>
<th>On the trip:</th>
<th>Count</th>
<th>Percent of Responses</th>
<th>Percent of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turned radio on/ listened to music</td>
<td>208</td>
<td>27.3</td>
<td>52.1</td>
</tr>
<tr>
<td>Wound down the window</td>
<td>163</td>
<td>21.4</td>
<td>40.9</td>
</tr>
<tr>
<td>Talked to a passenger</td>
<td>67</td>
<td>8.8</td>
<td>16.8</td>
</tr>
<tr>
<td>Increased music volume</td>
<td>57</td>
<td>7.5</td>
<td>14.3</td>
</tr>
<tr>
<td>Pulled over and had a nap</td>
<td>35</td>
<td>4.6</td>
<td>8.8</td>
</tr>
<tr>
<td>Pulled over and had something to eat/ drink</td>
<td>31</td>
<td>4.1</td>
<td>7.8</td>
</tr>
<tr>
<td>Drank coffee or caffeine drink</td>
<td>29</td>
<td>3.8</td>
<td>7.3</td>
</tr>
<tr>
<td>Had something to eat/ drink while driving</td>
<td>29</td>
<td>3.8</td>
<td>7.3</td>
</tr>
<tr>
<td>Stopped the car for a break</td>
<td>23</td>
<td>3.0</td>
<td>5.8</td>
</tr>
<tr>
<td>Have done nothing</td>
<td>22</td>
<td>2.9</td>
<td>5.5</td>
</tr>
<tr>
<td>Turned heating off</td>
<td>18</td>
<td>2.4</td>
<td>4.5</td>
</tr>
<tr>
<td>Turned air conditioning on</td>
<td>16</td>
<td>2.1</td>
<td>4.0</td>
</tr>
<tr>
<td>Concentrate more</td>
<td>15</td>
<td>2.0</td>
<td>3.8</td>
</tr>
<tr>
<td>Smoke a cigarette</td>
<td>15</td>
<td>2.0</td>
<td>3.8</td>
</tr>
<tr>
<td>Shared the driving</td>
<td>9</td>
<td>1.2</td>
<td>2.3</td>
</tr>
<tr>
<td>Sing or talk to self</td>
<td>8</td>
<td>1.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Other things</td>
<td>6</td>
<td>0.8</td>
<td>1.5</td>
</tr>
<tr>
<td>Turn the heating up</td>
<td>4</td>
<td>0.5</td>
<td>1.0</td>
</tr>
<tr>
<td>Made a phone call</td>
<td>2</td>
<td>0.3</td>
<td>0.5</td>
</tr>
<tr>
<td>Splashed water on face</td>
<td>2</td>
<td>0.3</td>
<td>0.5</td>
</tr>
<tr>
<td>Got someone else to drive</td>
<td>2</td>
<td>0.3</td>
<td>0.5</td>
</tr>
<tr>
<td>Stayed where they were</td>
<td>1</td>
<td>0.1</td>
<td>0.3</td>
</tr>
<tr>
<td>Delayed the trip</td>
<td>0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Stopped overnight to break the trip</td>
<td>0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Took a cab</td>
<td>0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>
strategies that are likely to reduce the amount of attention given to the driving task – e.g. the use of music or a radio, talking to passengers, eating or drinking while driving, and (for two people) making a telephone call while driving.

It was thought that responses to these items might be related to some other variables. Respondents were asked (earlier in the survey) to indicate whether they had driven when physically tired, or when mentally tired, in the preceding two weeks. Assuming this two-week period is a reasonably random sample of time for respondents, those who responded positively to one of these items might be viewed as more likely than other respondents to make a decision to drive when they are aware of their own fatigued condition.

Figure 8 shows the responses to the item concerning strategies used when planning a trip or before leaving to reduce the likely effect of fatigue, separately for those drivers that indicated that they had driven when physically or mentally tired in the preceding two weeks and those that did not admit to doing so. In both cases, each data point in Figure 8 expresses the number of times that response was given by participants as a percentage of the total number of responses given by that group of respondents. It therefore reflects the emphasis given to that item by respondents and allows comparison between the two groups.

The pattern of responses was similar for respondents who did and who did not indicate that they had driven when mentally or physically tired in the preceding two weeks. The largest difference was in relation to the most common response – ensuring that they are well rested or had a good sleep prior to the trip. Respondents who had not driven when tired were almost twice as likely as those who had driven when tired to nominate this response. They were less likely than those who did...
drive when tired to nominate using caffeine, food, or freshening up beforehand. They were also less likely to say that they had done nothing.

The same disaggregation by self-reported driving when tired is shown in Figure 9 for things respondents reported doing when driving. In this case the pattern of responses was similar for the two groups. Those who indicated that they had not driven when tired were less likely than those who had done so to increase the radio or music volume to combat fatigue, were more likely to pull over and have a nap, were more likely to have done nothing, and were more likely to have turned the air-conditioning on.

These differences, in part, reflect an exposure effect – those respondents who did not drive when tired in the preceding two weeks may be less likely to do so in general, and so will have less experiences of having to combat fatigue that they could draw on to respond to this item. This would explain, for instance, why this group of respondents was more likely to indicate that they have done nothing to combat the effects of fatigue once on a trip.

Figure 10 and Figure 11 show responses to the same two items disaggregated by respondents’ sex. The patterns of responses to the two items were similar. Compared to males, female respondents were more likely to ensure they were well-rested before a trip, less likely to use caffeine before a trip, less likely to do nothing or to have a nap, and were more likely to plan to share the driving. Once on the trip, they were less likely to use caffeine, less likely to try to concentrate more, and were more likely to turn the heating off to combat fatigue.
Figure 10  Things done when planning a trip or before setting off to reduce the likelihood of fatigue, disaggregated by sex

- Ensure well rested/good sleep night before
- Drank coffee or other caffeine drink
- Ate something
- Have done nothing
- Had a nap before leaving
- Delayed the trip
- Had shower/freshened up before leaving
- Planned route/planned where to have rest stops
- Avoided drinking before driving
- Other things
- Planned to share the driving
- Planned to stop overnight
- Avoided driving when normally asleep
- Took music
- Exercise or stretch before leaving
- Be packed or prepared for the trip
- Got someone else to drive
- Planned to avoid driving when normally tired
- Taken a cab/public transport
- Stayed where you were
- Planned to avoid driving after a long day at work
- Wore comfortable clothes

Response (as a percentage of all responses)

Figure 11  Things done when on a trip to try to stay awake, disaggregated by sex

- Turned radio on/listened to music
- Wound down the window
- Talked to a passenger
- Increased music volume
- Drank coffee or caffeine drink
- Pulled over and had something to eat/drink
- Pulled over and had a nap
- Had something to eat/drink while driving
- Have done nothing
- Stopped the car for a break
- Concentrate more
- Smoke a cigarette
- Turned air conditioning on
- Other things
- Turned heating off
- Turn the heating up
- Splashed water on face
- Shared the driving
- Sing or talk to self
- Got someone else to drive
- Stayed where they were
- Made a phone call
- Delayed the trip
- Stopped overnight to break the trip
- Took a cab

Response (as a percentage of all responses)
3.3.5 Safety Items

Respondents were asked about their crash experience, the role of fatigue, and their experiences of fatigue-related near misses.

Forty-five percent (N=180) of respondents reported that they had been involved in a crash as a driver. Twenty of these (11 percent of the crashed respondents, 5 percent of all respondents) indicated that fatigue may have been involved as a causal factor in their crash, and of these, eleven indicated that it was definitely involved. Twenty-seven percent (N=108) of all participants indicated that they had experienced a near miss that they felt was related to tiredness.

Males were more likely than females to report having been involved in a crash as a driver (52 percent compared to 38 percent) ($\chi^2 (1) = 7.9, p < .05$), but were equally likely to report a near miss that was related to tiredness. Respondents living in the metropolitan area were more likely than those living in the rest of the State to report involvement in a crash (48 percent compared to 37 percent) ($\chi^2 (1) = 4.1, p < .05$), but were equally likely to report a near miss that was related to tiredness. There were no sex or residence differences in the likelihood that respondents would assign fatigue as a cause in their crashes.

Respondents were divided into two groups based on whether they had been involved in a crash as a driver, and these groups were compared to investigate potential differences between crash involved and not-involved drivers.

There were differences between crash involved and not-involved drivers on only one of the eight items concerning beliefs about the effects of fatigue and alcohol on safe driving ability. Drivers who had been involved in a crash rated the effect of one or two alcoholic drinks as less likely to affect their ability to drive safely than did respondents who had not been involved in a crash (mean ratings of 5.5 and 4.4 respectively) ($F_{(1,293)} = 9.9, p < .05$). This was confirmed when crash involved and not-involved drivers were compared in terms of the three factor scores based on the eight items (see Table 5) – the two groups only differed on the third factor, which included the one-or-two-drinks item ($F_{(1,293)} = 8.4, p < .05$).

Crash involved drivers were more experienced than not-involved drivers (means of 45.2 months and 30.5 months respectively) ($F_{(1,293)} = 24.7, p < .05$). This most likely reflects the greater opportunity for crash involvement for more experienced drivers. Crash involved drivers also reported driving for a longer total time period in the two days preceding the survey (see Section 3.36) than did not-involved drivers (means of 2.8 hours and 2.3 hours respectively) ($F_{(1,293)} = 7.9, p < .05$). If the two-day travel diary reflects patterns of driving behaviour, this difference between crash involved and not-involved respondents may reflect the relationship between exposure and crash involvement.

The same pattern of differences was found when respondents who reported a fatigue-related near miss were compared with those who did not. Those who did have a fatigue-related near miss believed the effect of alcohol was less serious than those who did not, had more experience as a solo driver, and drove more in the two days before the survey.

3.3.6 Two-Day Driving and Sleep Diary

The survey included a series of items about the preceding two days that focused on respondents’ sleep and driving patterns. It was assumed that taking a two-day sample of time from respondents would provide a general reflection of driving and sleeping patterns amongst this age group. Respondents were asked for each day to assess whether the driving they reported during the survey was more, less, or about average for that day of the week. With two days of driving data provided by each respondent (a total of 800 person-days of driving information), 21 percent of days (N=167) were believed by respondents to involve less driving than normal for that day, and 11 percent (N=91) were believed to involve more. This suggests that the two-day driving diary data may slightly under-estimate the amount of driving undertaken by respondents.
The survey was planned to ensure that data were collected across the whole week. This aim was achieved, with about the same number of person-days of driving data collected for each day of the week (114 person-days, except for Friday and Saturday with 115 person days each). This means that any estimates of driving activity should not be biased towards weekday or weekend activity.

Respondents were asked about the time they went to sleep for each of the preceding three nights, and the time they woke up for each of the preceding two mornings. These data are shown in Figure 12. The mean times at which respondents went to sleep on the three nights for which data were collected were 11:30 pm, 11:36 pm, and 11:48 pm. The mean time at which they woke up was 8:00 am on both days.

Differences in typical weekday and weekend activities led to an expectation that sleeping and waking patterns would differ. This is confirmed in Figure 13 and Figure 14, which show the sleep time and waking time data (respectively) disaggregated by day of the week. Respondents appear to go to sleep later on Friday and Saturday nights than they do on other nights, and appear to wake later on Saturdays and Sundays than they do on other days.

The data concerning the time at which respondents went to sleep and woke up were used to calculate how much sleep they had on the two nights covered by the survey. Respondents reported a mean of 8.6 hours sleep per night. Analysis of variance was used to assess the relationship between the amount of sleep and the respondents’ sex, place of residence, occupational status, and student status, with night (the first or second night of data) included as a within-subjects factor. There were no significant interactions between any of these factors, and the only statistically significant main effect was that of place of residence. Respondents in non-metropolitan areas reported more sleep on average (9.1 hours) than did those in the metropolitan area (8.3 hours) (F(1,371) = 7.2, p < .05). The distribution of the amount of sleep reported on the two nights is shown in Figure 15.
Figure 13  Times at which respondents went to sleep disaggregated by day of week

Figure 14  Times at which respondents woke up disaggregated by day of week
It was noted earlier that respondents indicated that they went to sleep relatively late on Friday and Saturday nights, and that they woke later on Saturdays and Sundays. Figure 16 shows the amount of sleep reported by respondents disaggregated by day of the week (using the day on which the person went to sleep). It appears that the sleep distributions were similar across the week – suggesting that going to sleep later on the weekend was balanced by waking up later.

Respondents who slept relatively more on one of the days for which data were collected tended to do so on the other day ($r = 0.36, p < .05$), although the correlation was not strong. Sleep duration on the two days was also related to respondents’ estimates of the average amount of sleep they had achieved in the preceding two weeks ($r = 0.33$ and $r = 0.27, p < .05$). Respondents whose estimates of the amount of sleep they needed and the amount they had achieved in the preceding two weeks suggested that they were in sleep debt had shorter sleep durations on the two days the diary data were collected ($r = 0.16$ and $r = 0.17, p < .05$).

Only nine respondents reported any work-related driving (excluding commuting) in the two-day driving diary, totalling a maximum 87.8 hours out of the total 927.8 hours of driving activity (about nine percent) reported by respondents. It is important to note that this maximum figure is likely to overestimate the actual on-road time for these respondents as they were asked to provide the start and end times for their work-related driving. If, for example, they were involved in courier or taxi work, some of this time may have been spent in work activities other than driving. This group of respondents was too small to use as a distinct group in any further analyses. As there is some uncertainty about whether the time estimates for work-related driving are an accurate estimate of actual driving, and as they contributed only nine percent of the total driving time for respondents at most, this driving information was excluded from subsequent analyses. The following analyses therefore relate to the 840 hours of driving accrued for non-work reasons over the two days of data collected from respondents.
Figure 17 shows the amount of driving reported per day. Respondents drove an average of 65.6 minutes (1.1 hours) per day. This was the case for both days of the travel diary. The amount of reported driving by day of the week is shown in Figure 18. There were no statistically significant differences between the days of the week.
Figure 19 and Figure 20 show the number of trips undertaken by time of day and by both time of day and day of week. The data included information about 2,386 driving trips undertaken by respondents. The time-of-day data in Figure 19 suggest two peaks in motor vehicle use during the day that align approximately with the morning and evening peaks for traffic flow in general, although the evening peak in trips for this group of respondents was slightly earlier than might have been expected, perhaps reflecting their higher level of involvement in education.

Figure 20 presents the same time-of-day information about driving trips, but further disaggregates the data by day of week. Data for weekdays and weekends are presented separately. The weekday data show the clear peaks mentioned above, but the morning peak is missing from the weekend trip data – replaced by a gradual increase in vehicle use as the day progresses.

The pattern of driving trips shown in Figure 20 was used to divide the 24-hour day into four periods for further analysis to counter problems associated with low cell sizes, with the caveat that the time periods each had to be of equal length to facilitate interpretation of any analyses. These were an early morning period from midnight to 5:59 am, a morning period from 6:00 am to 11:59 pm, an afternoon period from noon to 5:59 pm, and a night-time period from 6:00 pm to 11:59 pm. Further analyses involving time use these time periods, and where time data are used they relate to the starting time of the drive.

The mean trip length was 0.37 hours, or 22 minutes. The length of driving trips undertaken by respondents was not significantly related to the day of the week, but was significantly related to the time of day ($F_{(3,2385)} = 6.5, p < .05$). This is shown in Figure 21. Post hoc tests using the Bonferroni correction for inflated Type I error indicated that the length of trips commenced between 1800 and 2359 hrs (a mean of about 18 minutes) was significantly less than the length of trips commenced between 0600 and 1159 hrs, and between 1300 and 1759 hrs (about 24 minutes and 22 minutes respectively). The interaction between day of week and time of day was not statistically significant.
Figure 19  Number of driving trips disaggregated by time of commencement

Figure 20  Number of driving trips by day of week and time of commencement
The failure to detect any effects of day of the week, and the apparent differences in driving patterns between weekdays and weekend noted in Figure 20 led to a decision to aggregate day-of-week data in subsequent analyses and to divide the data into weekday and weekend rather than the seven days of the week.

The mean trip length measure includes only those who drove during the time of interest. In addition to considering trip length, it is also possible to consider the amount of time spent in the vehicle averaged across all participants rather than just those who were driving. This incorporates data from

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**Figure 21**  
Mean trip length (and 95% confidence intervals) by time of day

![Graph showing mean trip length by time of day](image1)

**Figure 22**  
Mean time spent driving (minutes) (and 95% confidence intervals) during each six-hour period and disaggregated by day of the week, averaged across all survey participants

![Graph showing mean time spent driving by day of the week](image2)
people who did not drive in a particular time period, and is therefore more representative of driving behaviour across the survey sample. Respondents drove for an average of 65.7 minutes per day. Figure 22 shows the mean number of minutes spent driving averaged across all participants for each six-hour time block through the week, separately for weekdays and weekend days.

Respondents did not drive significantly more or less on weekends compared to weekdays. There was a significant effect of Time Period ($F_{(3,342)} = 33.3$, $p < .05$). Post hoc tests indicated that respondents drove significantly more between midday and 6 pm than they did in either the morning or the night, and they drove significantly more in these periods than during the early morning period. There was no significant interaction between time period and the day-of-week variable.

Further analysis indicated that the amount of time spent driving was not related to respondents’ sex or place of residence, or any interaction between these, time of day, and day of week. It was also not significantly related to the respondents’ employment or study status or any interaction between these and time of day or day of week. Together these results suggest that the driving pattern of respondents across the sample were similar, with more driving in the afternoons than at other times, and less in the early morning.

For each trip, respondents provided information about the purpose of the trip. Figure 23 shows the pattern of responses to this item for both days of data collection from each person. Thirty-five percent of trips were originally coded as the respondent going home from some other activity. As this did not provide any information about the actual nature of the activity that necessitated the trip, the “go home” responses for trip purpose were recoded to take on the trip purpose of the immediately preceding driving trip. Thus, if the fourth trip of the day involved visiting friends and the fifth was coded as going home, the going-home trip was recoded to have “visiting friends” as its purpose. This ensured that each driving trip was coded as having a purpose that related to the outing rather than the destination of that particular trip. This method may not have been perfectly reliable, but it was considered more helpful than attempting to interpret the original “going home” code. A small number of “go home” trips (N=41) could not be recoded in this way as they were recorded as the first trip of the day.

![Figure 23 Purpose of trips undertaken by respondents](image-url)
The largest number of driving trips related to commuting (29 percent of trips, N=694) and to shopping or chores (26 percent, N=615). The purpose of driving trips changed across the week. Figure 24 shows trip purpose by day of the week, where it appears that driving for work, commuting, and education declined on the weekend, while driving for other reasons may have increased towards the end of the week.

Figure 25 further disaggregates the day-of-week trip-purpose data (summarised into weekdays and weekends) by time of day. The implications of these data include the following:

- Employment and education related driving is relatively rare on weekends. Driving of this type on weekends was almost entirely for commuting purposes.
- Driving as part of an occupation is relatively rare.
- Most driving trips recorded in the survey, even those for social and similar purposes, commenced before 9 or 10 pm. Those that commenced after this time generally involved purposes other than education, work, or commuting.
- Driving to visit friends or to go out socially most often commenced early in the evening.

Respondents were also asked to indicate who accompanied them on each trip they recalled in the two-day travel diary component of the survey. Their responses to this, disaggregated by trip purpose, are shown in Figure 26. Seventy percent of driving trips (N=1661) were undertaken by the driver alone. Trips that were for going out socially were the least likely to be undertaken alone (38 percent of these trips), and those for commuting purposes were the most likely (92 percent).
Figure 25  Trip purpose disaggregated by day of the week and time of day
Figure 26 Accompanying passengers on each trip disaggregated by trip purpose

- **Education**
- **Commuting**
- **Work**
- **Visit friends**
- **Out socially**
- **Sport**
- **Family outing**
- **Shop/chores**

No-one | Partner/spouse | Friend | Two or more friends | Older family member | Other family member | Workmate
---|---|---|---|---|---|---

0 | 600 | 400 | 300 | 200 | 100 | 0

Figure 27 Proportion of driving trips in which the driver was accompanied by two or more friends, disaggregated by trip purpose and years since licensing

- **Education**
- **Commuting**
- **Work**
- **Visit friends**
- **Out socially**
- **Sport**
- **Family outing**
- **Shop/chores**

Under 3 Years Experience

Proportion of Trips

- 0.26
- 0.24
- 0.22
- 0.20
- 0.18
- 0.16
- 0.14
- 0.12
- 0.10
- 0.08
- 0.06
- 0.04
- 0.02
- 0.00

Over 3 Years Experience

Proportion of Trips

- 0.26
- 0.24
- 0.22
- 0.20
- 0.18
- 0.16
- 0.14
- 0.12
- 0.10
- 0.08
- 0.06
- 0.04
- 0.02
- 0.00
These data have some relevance for policy development in the novice driver area that is taken up in the discussion. It is of some interest that 10 percent of trips were undertaken with one friend as a passenger, and only 3.4 percent of driving trips included two or more friends in the car with the driver. Figure 27 shows the proportion of trips in which there were two or more friends with the driver, disaggregated by solo driving experience and trip purpose. It is clear that newer drivers were more likely to drive with two or more peers in the car, and that this was more common for social-outing-related driving than for other trip purposes. Twenty-three percent of driving trips undertaken as part of a social outing by drivers with less than three years experience involved carriage of two or more passengers. Only ten percent of similar trips for more experienced young drivers involved two or more peers in the car with the driver.

### 3.3.7 Identification of High-Risk Drivers

One reason for undertaking the survey was to investigate the potential value of identifying some driver characteristics associated with high-risk behaviour in relation to fatigue and driving. These characteristics would then inform the development of programs targeting fatigue.

Identifying a group of relatively-high-risk respondents was not straightforward. It was decided to use variables concerning sleep-related behaviours and driving exposure to attempt to identify groups of respondents who achieved relatively low levels of sleep but who continued to drive at similar or greater levels when compared to other respondents. To this end a cluster analysis was undertaken using a two-stage process. The data were subjected to an initial clustering using Ward’s method and squared Euclidian distances to determine the best number of clusters. Assessment of the linkage distances for clusters formed using this procedure suggested a solution with five clusters. K-means clustering was then undertaken with the five-cluster solution.

The variables included in the cluster analysis, and the results of the univariate analyses of variance for each variable over the five clusters, are shown in Table 9. Only one of the variables (the number of times the respondent had driven more than two hours in one go) did not discriminate between the five clusters. The means of the five clusters on each of the variables included in the cluster analysis are shown in Figure 28.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Between SS</th>
<th>df</th>
<th>Within SS</th>
<th>df</th>
<th>F</th>
<th>Signif. P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Est. of nightly hours sleep (last 2 weeks)</td>
<td>121.2</td>
<td>4</td>
<td>525.8</td>
<td>364</td>
<td>20.97</td>
<td>0.00</td>
</tr>
<tr>
<td>No. of nights with less sleep than needed (last 2 weeks)</td>
<td>3955.3</td>
<td>4</td>
<td>1443.1</td>
<td>364</td>
<td>249.41</td>
<td>0.00</td>
</tr>
<tr>
<td>Times driven at night (last 2 weeks)</td>
<td>4413.2</td>
<td>4</td>
<td>1813.0</td>
<td>364</td>
<td>221.51</td>
<td>0.00</td>
</tr>
<tr>
<td>Times driven after midnight (last 2 weeks)</td>
<td>1674.4</td>
<td>4</td>
<td>1347.7</td>
<td>364</td>
<td>113.07</td>
<td>0.00</td>
</tr>
<tr>
<td>Times driven 2-5am (last 2 weeks)</td>
<td>593.3</td>
<td>4</td>
<td>834.9</td>
<td>364</td>
<td>64.66</td>
<td>0.00</td>
</tr>
<tr>
<td>Driven 2hrs+ in one go (last 2 weeks)</td>
<td>7.8</td>
<td>4</td>
<td>1500.0</td>
<td>364</td>
<td>0.47</td>
<td>0.75</td>
</tr>
<tr>
<td>Times driven after 24 hrs without sleep (last 2 weeks)</td>
<td>6.3</td>
<td>4</td>
<td>116.6</td>
<td>364</td>
<td>4.90</td>
<td>0.00</td>
</tr>
<tr>
<td>Total hours driven yesterday</td>
<td>45.1</td>
<td>4</td>
<td>356.8</td>
<td>364</td>
<td>11.51</td>
<td>0.00</td>
</tr>
<tr>
<td>Total hours driven day before yesterday</td>
<td>36.2</td>
<td>4</td>
<td>317.0</td>
<td>364</td>
<td>10.38</td>
<td>0.00</td>
</tr>
<tr>
<td>Time asleep two nights ago</td>
<td>85.4</td>
<td>4</td>
<td>1188.5</td>
<td>364</td>
<td>6.54</td>
<td>0.00</td>
</tr>
<tr>
<td>Time asleep last night</td>
<td>109.8</td>
<td>4</td>
<td>1286.6</td>
<td>364</td>
<td>7.76</td>
<td>0.00</td>
</tr>
<tr>
<td>No. of driving trips yesterday</td>
<td>169.9</td>
<td>4</td>
<td>1189.7</td>
<td>364</td>
<td>12.99</td>
<td>0.00</td>
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<tr>
<td>No. of driving trips day before yesterday</td>
<td>149.9</td>
<td>4</td>
<td>1102.2</td>
<td>364</td>
<td>12.38</td>
<td>0.00</td>
</tr>
</tbody>
</table>

2 Some of the variables do not meet the assumptions for ANOVA. The differences between clusters are explored in more detail below with a view to confirming the results presented in this table.
If it is possible to define the risk of having problems with fatigue during driving according to sleeping patterns and driving patterns, the results of the cluster analysis suggest that members of Cluster 2 (N=137) should be a low-risk group. This cluster was characterised by relatively low levels of driving at night, low levels of driving in general, and a pattern suggestive of sufficient sleep – they believe they average about 8 hours sleep each night, and their sleep data from the two-day diary confirm this.

Identifying a high-risk cluster is more difficult. Members of Cluster 1 (N=114) reported driving at night in the preceding two weeks an average of 12.1 times, but did not report driving after midnight or after 2 am very often. Although members of Cluster 1 drove relatively often, they do not appear to be sleep deprived. Members of Cluster 3 (N=39) reported that they did not get enough sleep on an average of 7.8 nights in the preceding two weeks, although they claimed an average of 7.1 hours over that period and achieved 8.1 hours and 7.9 hours on the two preceding nights. Although potentially deprived of sleep, members of Cluster 3 did not drive at night very often compared to other respondents.

The data in Figure 28 suggest that the members of Cluster 4 (N=40) may have a relatively high risk of fatigue-related problems. In the two weeks preceding the survey, they reported driving an average of 12.3 times at night, 8.3 times after midnight, and 4.4 times between 2am and 5am. They spent more time driving during the two days preceding the survey than other respondents (means of 1.6 and 1.8 hours), took more driving trips (4.3 and 4.1 trips), and reported an average of 7.0 hours sleep over the preceding two weeks and means of 7.5 and 7.9 hours sleep on the preceding two nights.
Members of Cluster 5 (N=39) may also be of some concern. They were the most likely to drive after 24 hours without sleep and reported high levels of driving at night (mean of 11.0 times in the preceding two weeks). They were less likely than members of Cluster 4 to drive after midnight or 2 am, but were more likely to do so than members of the other clusters. They also appeared to be the most strongly sleep deprived – reporting a mean of 12.3 nights with insufficient sleep in the last two weeks, a two-week average of 6.1 hours sleep each night, and 7.0 and 8.0 hours sleep on the preceding two nights.

Members of Clusters 4 and 5 were compared (as a single, high-risk group (N=79)) to other respondents to assess the extent to which they appeared to be at risk of fatigue-related problems using variables that were not included in the cluster analysis.

The two groups (Clusters 1, 2, and 3, and Clusters 4 and 5) were not significantly different in their ratings of the effect of fatigue and drink-driving related situations on their ability to drive safely. There were no statistically significant differences in age or solo driving experience.

The risky group (Clusters 4 and 5) reported significantly greater sleep deficit over the preceding week. Respondents estimates of the amount of sleep required were subtracted from their estimate of the amount of nightly sleep they had obtained over the preceding week. Respondents in the high risk clusters reported a mean deficit of 1.5 hours, compared to a mean deficit of 0.1 hours for the members of the three low-risk clusters ($F_{(1,367)} = 63.3, p < .05$).

Respondents in the high and low risk clusters differed in their pattern of actual driving activity recorded in the two-day diary. This confirms the two-week pattern reported for the variables included in the cluster analysis. Figure 29 shows the amount of driving reported by members of the two groups disaggregated by time of day and day of week. All differences between the two groups of respondents were statistically significant (using univariate ANOVAs) except for the differences between the two groups on weekends between 0600 and 1159, and on weekends between 1200 and 1559.

The data presented in Figure 29 indicate that the higher-risk groups drove more at most times of the day, and that this difference was especially noticeable in the higher-risk times early in the morning and late at night. The members of the higher-risk clusters spent four times (weekdays) and twelve times (weekends) as much time driving in the early morning period (midnight to 5:59 am).
Respondents in the high-risk clusters were significantly more likely than those in the low-risk clusters to report having driven when mentally tired (81 percent compared to 51 percent, $\chi^2(1) = 25.1, p < .05$) and when physically tired (81 percent compared to 55 percent, $\chi^2(1) = 18.3, p < .05$) in the preceding two weeks. They were also more likely to report having driven after having five nights with insufficient sleep (41 percent compared to 7 percent, $\chi^2(1) = 48.6, p < .05$) and to report having nodded off when driving in the preceding two weeks (10 percent compared to 1 percent, $\chi^2(1) = 15.1, p < .05$).

The two groups of respondents did not differ in their self-reported crash involvement or their recollection of having experienced a fatigue-related near miss. The high-risk group were more likely to admit that fatigue may have had a role in their crash than were the low-risk group (18 percent of those who crashed compared to 8 percent, $\chi^2(1) = 3.3, p = .06$). There were no statistically significant relationships between group membership and occupational status, student status, living situation, sex, age, or driving experience. Respondents in the high-risk clusters were more likely to live in the metropolitan area than were those in the low risk clusters (85 percent compared to 68 percent, $\chi^2(1) = 9.2, p < .05$).

The responses of members of Clusters 1, 2, and 3 and Clusters 4 and 5 to the items relating to how they minimised fatigue problems when planning and undertaking a trip were compared. There were few differences, most likely in part due to the small number of respondents nominating many of the options. Respondents in the high-risk clusters were less likely than those in the low-risk clusters to nominate the following:

- Planning the route to include stops (1 percent compared to 6 percent, $\chi^2(1) = 4.1, p < .05$).
- Ensuring that the driver is well rested before starting the trip (24 percent compared to 41 percent, $\chi^2(1) = 8.0, p < .05$).
- Stopping for a break once underway (1 percent compared to 7 percent, $\chi^2(1) = 5.3, p < .05$).
High-risk respondents were more likely than those in the low-risk categories to nominate the following:

- Using caffeine before a trip (33 percent compared to 19 percent, $\chi^2_{(1)} = 6.9$, $p < .05$).
- Showering or freshening up before a trip (11 percent compared to 5 percent, $\chi^2_{(1)} = 4.6$, $p < .05$).
- Winding a window down (49 percent compared to 38 percent, $\chi^2_{(1)} = 3.9$, $p < .05$).
- Turning up the heater (4 percent compared to 0.3 percent, $\chi^2_{(1)} = 48.6$, $p < .05$).

Respondents in the high risk clusters were more likely than those in the low risk clusters to drive at night and early in the morning (see Figure 29). Figure 30 shows this pattern (further restricted to driving between 9 pm and 6 am) for different trip purposes. It shows the proportion of trips for each purpose undertaken between 9pm and 6am, disaggregated by cluster membership.

The data presented in Figure 30 confirm the tendency for respondents in the high risk clusters to undertake more of their driving at high-risk times. They also suggest that this is particularly so for driving trips associated with visiting friends. The proportion of trips undertaken for this purpose that occurred late at night or early in the morning was significantly greater than the proportion of trips for any other purpose that occurred at these times ($\chi^2_{(1)} = 27.9$, $p < .05$).

3.4 Discussion

The survey was undertaken to fill in some knowledge gaps relating to young drivers and fatigue. In this sense it was exploratory rather than directed by a particular theoretical issue or road safety program, but was constructed to take into account issues arising from the literature review presented earlier.

Although it is not possible to estimate the effects of any self-selection bias on the survey results, it appears that the sample was consistent with population data concerning place of residence and occupational/student status. The results presented above should be interpreted, however, in light of general concerns about the reliability and validity of survey methods raised in Harrison & Christie (2004). There are reasons to be concerned about the use of survey methods as a way to collect data from a sample of participants that can then be generalised to the broader population of interest. In particular, there are strong concerns about increasing levels of self-selection bias and potential exclusion from sample membership through the use of call-screening technologies. It is therefore recommended that the results of the survey be taken as a general guide to the fatigue-related driving behaviour of young adults rather than as being able to be generalised to all young drivers.

The survey included some items concerning beliefs about the potential effects of fatigue and other factors on safe driving. Responses to these items suggested that some fatigue-related factors were believed to be as risky as drink driving. Respondents thought that the safety-related effects of driving after more than 24 hours of wakefulness or after 5 nights of insufficient sleep were as bad as the effects of driving with a blood alcohol concentration over .05 g/100ml. The effects of driving when tired were perceived to be less serious but similar to driving after having one or two alcoholic drinks, but the riskiness of driving between 2am and 5am was perceived to be relatively low.

The relatively low ratings of the effects of mental or physical tiredness and of early morning driving on safety were interesting, suggesting that participants believed that it was only at reasonably extreme levels of fatigue that their driving would be significantly impaired. This was so across participants – the differences noted between males and females were only for ratings of the less-extreme fatigue items. One of the challenges facing program development and implementation in this area may be to increase perceptions of the risk of driving when tired to match those already held about the risk of driving when significantly sleep deprived.

This challenge is further complicated by the consistent failure to detect a relationship between these belief items and behavioural survey items. Responses to these items were not related to self-reported sleeping and driving patterns, and they were not related to cluster membership (considered in terms of...
the high-risk clusters and low-risk clusters). There are potentially two reasons for this. It is possible that beliefs about the potential riskiness of a behaviour are not related to the likelihood of the behaviour occurring because other factors (such as habit or necessity) motivate the behaviour more strongly. It is also possible that there is some threshold level of perceived riskiness that needs to be reached before beliefs about the potential effect of fatigue have an influence on fatigued driving.

Understanding which of these two is likely to apply is important because if the failure to detect a relationship between beliefs about riskiness and actual behaviour is a result of needing some threshold level of perceived riskiness, then it may be possible to increase beliefs about the riskiness of fatigued driving and to have an effect on behaviour. If the failure to detect this relationship is the result of other motivational factors having an influence on the fatigue-related driving behaviours of participants, then road safety programs would need to address these competing influences in addition to increasing the perceived risk of driving when tired.

The role of driving in the day-to-day lives of young people and the likelihood that motivational factors over-ride perceptions about the riskiness of driving when tired were addressed in the focus groups described later. The survey results do shed some light on this issue, however. The results of the cluster analysis indicated that the high-risk groups of participants had social motivations for much of their late-night driving. It is possible that they value being able to drive for social purposes and that this motivation is sufficient to make young drivers discount some of the risk they may perceive to be associated with their driving.

The suggestion that the driving decisions of young adults are influenced by motivational factors beyond and competing with concerns about their own safety is supported by the finding in the survey that about forty percent of the sample admitted to driving when tired in the two weeks preceding the survey. This is so despite broad agreement that there is some level of risk attached to driving when tired. The role of motivational factors in young driver decision making is consistent with the broader role of motivational factors in health-related decision making discussed in the literature review.

Participants appeared to believe that tiredness when driving was manageable. When asked to describe the methods they used to stay alert when driving, about half of the participants indicated that they used music or the radio to stave off tiredness, and fourteen percent increased the volume of their music. Only nine percent indicated that they had stopped to have a nap3, although it might be reasonable to be sceptical about this as it could be a response to the demand characteristics of the situation and the social desirability of this particular response.

Experiences of the negative consequences of fatigue were not unusual. Twenty-seven percent of participants admitted to a fatigue-related near miss, and five percent of participants indicated that they were involved in a crash (as a driver) that might have involved fatigue as a causal factor. The likelihood that fatigue had played a role in crash involvement was similar for males and females, and for participants in rural and metropolitan areas. Crash involvement was not correlated with perceptions of the riskiness of behaviours in the belief items discussed earlier, again underlining the independence of behaviour and beliefs about riskiness.

The sleep and driving diary data provided a substantial amount of information about the participants, with information collected about almost 2,400 driving trips spread evenly across the week and linked information about sleeping and waking times across participants. The general

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3 This small group of participants are of some interest. If they do make use of “power naps” to prevent tiredness when driving, it might be interesting to know something about their characteristics. The small number of survey participants in this group makes it difficult to conduct a detailed analysis of their characteristics compared to other participants. Participants resident outside the Melbourne area were significantly more likely than Melbourne residents to admit to having a nap (17 percent compared to 6 percent), and participants who admitted to having power naps reported significantly more instances of driving between 2am and 5am than those who did not admit to having a nap (1.7 instances in the preceding two weeks compared to 0.9 instances). There were no other statistically significant differences between participants who admitted to napping and those who did not.
results concerning driving and sleep times were not surprising. Participants generally reported sleeping and waking times that suggested they managed to achieve reasonable levels of sleep on most occasions. Waking times appeared to correct for the time at which participants went to sleep, such that later sleeping times on weekends were accompanied by later waking times on the following day. Work-related driving was relatively unusual, with most driving relating to commuting and shopping or chores (a total of fifty-six percent of trips).

Ninety-two percent of commuting trips were undertaken without any passengers in the car. Passengers were more common on social trips (only thirty-eight percent of trips were undertaken without any passengers), but the number of trips undertaken with two or more peers in the car was remarkably small – only three percent across all trips. This result has some important implications for policy development in the graduated licensing area. One key issue in the implementation of passenger restrictions for newly-licensed drivers is the potential effect of these on mobility amongst younger road users. In particular, passenger restrictions may make it difficult for young people to meet their mobility needs. Across all driving trips for this sample the results suggest that passenger restrictions of the type that apply in North American jurisdictions are unlikely to have a substantial effect on mobility.

A closer examination of the passenger data in this survey does suggest, however, that the effect of passenger restrictions might be larger for subsets of road users and trip purposes. Almost a quarter of driving trips undertaken for social purposes by drivers with less than three years of driving experience involved two or more friends as passengers. Trips of this type would be influenced by passenger restrictions. This issue merits further consideration, and some additional analysis of the current survey data set might provide some relevant information.

It was possible to identify two groups of drivers in the cluster analysis with driving and sleep patterns that would be expected to put them at a higher risk of driving when fatigued. It was noted earlier that these groups did not differ from other participants in their beliefs about the potential risk of driving when tired or while sleep deprived. They did differ from other participants, however, in that they were more likely to admit to driving when fatigued or after five nights of sleep deprivation, and were more likely to admit to having nodded off while driving. They were also more likely to admit to fatigue having played a role in any crashes they may have had.

This pattern of results raises an issue relating to self-awareness of fatigue as a potential problem. The participants in the high risk groups appeared to be aware that they were driving when tired and that fatigue may be affecting their safety – but they did not have stronger beliefs about fatigue as a safety issue than other participants and they continued to drive when fatigued despite their own level of awareness. This raises again the potential challenge for program development in this area – if a subset of young drivers are aware that they are driving when fatigued, and that this fatigue may influence their safety, and continue to drive to meet other motivational pressures, the problem for road safety program development may be one of dealing with competing motivations as well as raising awareness. The high prevalence of social-outing-related driving trips amongst high-risk group members suggests that any attempt to influence the role of motivational factors here may need to address the mobility needs of drivers in relation to their social lives rather than their employment or study lives.
4. Focus Groups

4.1 Introduction

One of the key outcomes of the survey discussed earlier was that fatigued driving amongst young adults includes a lifestyle element – young adult drivers appear to drive when fatigued as part of meeting their day-to-day lifestyle-related transport needs. One consequence of this is that developing and implementing countermeasures for fatigued driving will be complicated by the likely reliance of young drivers on driving to meet these lifestyle needs.

It was decided that some focus group discussions with young drivers involved in the telephone survey should be undertaken to collect some additional information concerning lifestyle-related factors and their interaction with fatigue and driving. The focus groups were also used as an opportunity to discuss fatigue and driving more generally.

It needs to be noted at the outset that there are some significant problems with relying too strongly on a focus group discussion. Focus group membership is likely to be heavily biased towards participants who are comfortable in a small group environment, and even with skilled facilitation it is likely that the discussion will be influenced by the verbally skilled members of the group. While one of the strengths of a discussion group can be its use of the social processes between group members to generate more detailed discussion, it is also possible that these social processes could encourage group members to exaggerate in some areas and to suppress some opinions or attitudes if they believe they are different to those of significant group members. In general it is not possible to generalise to the broader population from focus group discussions. They serve to provide some additional information that extends knowledge already derived from other sources (such as surveys), or to guide further development of ideas that will then be tested using a reliable research method.

In the present context, the discussion groups were conducted to extend some of the information collected in the survey and to assist in the development of some general countermeasure ideas. It is strongly recommended that the opinions expressed by group participants and reported here not be taken as necessarily indicative of the opinions of young people in general.

4.2 Method

Focus group participants were recruited from participants in the survey reported earlier. During the survey some participants were asked if they would be interested in taking part in an additional group discussion – this item was not included early in the survey period, with the result that thirty-eight percent of the sample were not asked if they could be contacted later about the discussion groups. The effect of this on any biases in recruiting participants for the focus group is uncertain.

Fifty-four percent (125) of participants who were asked about potential involvement in the discussion groups agreed to be contacted. Although the responses to this item were unrelated to participant’s sex, they were related to cluster membership ($\chi^2(4) = 13.7, p < .05$). Members of clusters 3 and 5 from the analysis of the survey data were less likely than the other participants to agree to be contacted (21 percent and 27 percent agreed respectively) than were members of the other three clusters (an average of 52 percent). This suggests a bias away from one of the high-risk clusters (Cluster 5).

The focus groups were arranged and conducted by Dean McDonald (Market Access Consulting and Research Pty Ltd), who also prepared a draft report based on them. This section of the current report was prepared by Warren Harrison based closely on the draft focus-group report and the transcripts of the focus-group discussions.
Participants contacted to participate in the focus groups were selected from the survey sample based on their self-reported driving either while fatigued or in the high-risk period from 2 am to 5 am. Fifty-nine survey participants were selected who met these criteria, and forty-nine were able to be contacted by telephone. Of these, twenty-four agreed to participate in the focus groups and arranged a suitable session time. Five participants failed to attend, with the result that four groups and a single interview were conducted, with a total of nineteen participants.

The group discussion protocol developed and used by Market Access Consulting and Research Pty Ltd, the company that organised and conducted the focus group is shown as Figure 31. The discussions were conducted in a semi-structured way with the protocol being used as a guide to ensure that key issues were discussed in each session.

4.3 Results and Discussion

4.3.1 Lifestyle as a Context

The discussion that occurred in the focus groups needs to be considered in the context of the lifestyle of group members. This is particularly so because the participants were selected based on their responses to fatigue-related items in the survey that appeared to reflect lifestyle issues.

It is not surprising, therefore, that group members generally indicated that they had busy lifestyles:

- Many indicated that they were studying and working.
- Some had more than one job or had a job that was demanding of their time.
- Some were undertaking courses of study conducted over multiple campuses.
- Some had interests beyond their work and study that took up additional time.
- Most indicated that they also had busy social lives.

Comments during the introductions in the focus groups included the following:

I’m 18, I go to uni studying business and I work part time for Myer and I just got another job as well at Dan Murphy’s, and I enjoy going out, I go out a lot, I’m never home.

Um my dad works for a voluntary organization in the city so I drive, I go there and help out a few days a week so I’m driving there a lot.

Hi I’m XXX, um I am 18, I’ve had my licence for nine months now, um I’m studying at the moment International Business, um I work part time at McDonalds, I drive pretty much everywhere, I go out a fair bit, um like out anywhere like city, clubs, um.

Hi my name is XXX. I’m 19 years old, I’ve been driving for a year and a half now, um I work part time at a child care centre, I don’t go to uni, I’m looking for a job as well, I do go to clubs but I never drive to clubs cause I drink a lot so I never drive.

My name’s XXX, I’m 21 and I might be the only one here that works full time, I work for the XXX company in XXX, I’m in electrical maintenance, the maintenance sparky there, I’m only a third year apprentice so another year to go so I drive to work every day.

And what do you get up to in your spare time?

Oh look if I’m not at work I’m just kicking back doing nothing……just relaxing really, I go out a bit but not much I try to do as much overtime as I can so once you work 5-6-7 days a week you just want to go home.

5 Quotes from group members are used extensively throughout this section of the report to provide examples of general themes that were identified by Dean McDonald (Market Access Consulting and Research Pty Ltd). The quotes are not exhaustive or fully representative – they are provided only to illustrate issues raised by participants. The quotes are presented in italics, and comments or questions by the group facilitator are in boldface italics.
Figure 31 Focus group protocol

**Introduction**
- **Moderators**
- **Explain refreshments, previous market research, duration, confidentiality and people viewing.**
- **Consent to tape – recording.**
- **Purpose of research viz:**

We are conducting a series of discussion groups with some of the people who took part in a survey about fatigue and driving. We’ve selected people for the discussion groups based on the information they provided in the survey, and we have focused on people who seemed to get less sleep and drive more often than other people in the survey. This doesn’t mean that you are a road safety problem or anything like that – just that when we compared people in the survey with each other you were more likely to get a bit less sleep and to drive more often.

With this in mind, what we want to do today is learn a bit more about you – what’s going on in your life, how do you get around, how important your car and driving and what part does it play in different parts of your life, how do you make decisions about when to drive and when to use other forms of transport, and so on.

The discussion will be pretty relaxed – I have a set of issues that I want to make sure we talk about, but we are really keen to listen to your opinions and to learn more about you than was possible in the survey.

**Group Warm-Up**

Now to get the ball rolling – perhaps we could go around the group and you could briefly tell us a bit about yourself – your first name, how old you are, how long you’ve been driving, (when you do most of your driving and perhaps something about how you spend your time in relation to work, study, interests, and so on), and what you do with your spare time.

**Background Discussion – Role & importance of driving viz. lifestyles**

Let’s now talk more generally about driving – tell us…

- How do you feel about having a car eg. is it primarily a social or transport tool?
- What do you like / dislike about driving? Can you give me some examples of these?
- What are the things you do that lead you to drive?
- Where / how does driving fit into your lives - such as work, study, hobbies, and sports, social life… how important is the car / driving in each of these areas?
- How does this compare with your friends, family / other people?
- Are you driving more / less these days? (Probe: what are the causal factors for this eg. work, social life etc.)
- Do you ever consider / use other forms of transport – which, for what purposes / occasions and how frequently?
- Why are some options not / never considered ie. what are some of the problems associated with these?
- Do you feel you are any different from other people in terms of why some options are chosen or considered over others? (If so…in what way do you feel you are different)?

Turning now to the issue of driving at night and early in the morning

- Firstly, when we say “night driving” / “early morning driving” – what do you consider each of these as being?
- What’s going on that leads you to be driving at these times? (Probe: what are the causal factors for this eg. work, social life etc.)
- Again, do you ever consider other options instead of driving - what are they and how do you decide what form of transport to use (for what occasion)?

- If (not explored thoroughly….) What about driving after midnight – what is going on that leads you to be driving then?
- Do your friends / family drive at these times, as often as you?
- And what about the hours between 2am – 5am, do you do much driving between these hours – what’s going on here that leads you to be driving then?
- Again, do your friends / family drive between these hours, as often as you?

**Lifestyle & Sleep**

We’d like to talk a bit about the sleep that you get, or don’t get and the causes for such.

- Explore in detail, if not already covered: what are they doing which results in them getting less sleep – work, study, social etc.)
- How frequently do you get less sleep than you need?
- On average how many hours less sleep are you getting than you need each night?
- Is this regular – is this how your life is always or is this last few weeks different for some reason? What why and how? (Probe fully)
- How do you feel when you are not getting enough sleep?
- Why is it that you are not getting enough sleep?
- Do you try and get more sleep? What do you do and how does it work?
- Do you think of when I say the words (in turn)… fatigue, sleepy and tired? Are these words different? How and why? (Probe: what each term means in terms of state / feeling & relate this to driving)

**Fatigue & Driving**

Thinking now about sleep or the lack of it, and when you drive.

Can you tell us a little more about when you have been driving and feeling that you are tired?

- What’s going on that leads you to be driving when you are tired? (Probe: what are the causal factors for this - how long have you been awake eg. being up for extended periods of time – what was reason – work, social life, etc.)
- Why didn’t you consider / use other forms of transport?
- How do you actually feel when you are tired / how do you know you are tired, (when they are driving)?
- (Probe: Perceived consequences, if necessary)
- How do you feel people generally view being tired, while driving?
- (Probe: Perceived consequences, if necessary)
- What type/s of communications do you remember / works for you?
- Why and in what way have they had impact?

**Youth Communications**

- (If not explored already)… What about powermaps, putting off trip, resting beforehand, regular breaks etc. – which techniques have been used – why, some, not others?

**Wind down**

If you were developing an advertising program aimed at younger people who may do a lot of driving at night, or when they are tired, what are the kinds of things that should be said, which might have some impact on people?

- Probe: kinds of messages, style / nature of communications

**Thank & Conclude**
So on the occasions you drive other than going to and from work when else do you drive?

Oh at the moment I’m on afternoon shift so I work for a contractor during the day as well so I’ll drive, he does a lot of work around Thomastown, ah Doncaster and all up Bell street so I spend a bit driving around there.

Hi everyone I’m XXX, I go to uni full time, I have a part time job which I do on weekends…welding, um I just got off my P’s about a month ago which is really good cause I can go to the pub and drive home, and um yes, in my spare time, all my friends they surf so we, I have a holiday house in Sorrento so we go down there a lot which is a decent drive, um…I’m 21.

And what else do you like to get up to on weekends and you know in your spare time?

I like to go to my mates house and relax….Playing Playstation…. we go to the footy a lot.

I’m XXX, I’m 20. Um, been driving um, well since I got my ‘L’s’ I suppose, that was 16, but I’ve been on my licence since I was 18, and um, I am a full time student, night student and I work during the day…….And I am cracking under the pressure of exams.

I work at a company called YYY, so we basically outsource call centres to clients.

Night classes at uni – 4 nights.

Oh, night classes at uni, and you’re working a full job?

It’s not full time, but um, yeah I work between 20 and 30 hours.

XXX. I’m 22, and um, I mainly study, but I work 1 day a week at a high school, and I do a few gigs a week.

So when you say gigs, what sort of things?

Um, just playing in a few different bands.

Hi, my name’s XXX, um, I’ve been driving for approximately 2 1/2 years. Um, I was working up till about a week ago, I’m currently bludging. Um, I used to work as a store person so I used to have ridiculous shifts, so, I probably start driving about 6.30. Far too early for me.

4.3.2 Driving

As might be expected, most driving related to the busy lifestyles of participants noted earlier. Participants reported that a significant proportion of their driving related to commuting – either to and from work or to and from their place of study. Social activities were also an important focus of driving, where much of the driving involved driving to and from friends’ houses or a mutual meeting place. Some of this driving related to visiting a boyfriend or girlfriend where there was a suggestion that having a partner increased the number of time demands and consequently increased the general level of sleep deficit.

I drive to uni a lot and my course is between two campuses in Sunbury and Footscray so I’m driving to Sunbury and Footscray all the time so its hard work, also going out and driving.

Um I drive to work, a lot of my friends play indoor cricket, indoor soccer so every Tuesday and Thursday night I’m driving there and back.

Um, I drive to school every day, home from school, out every weekend. My boyfriend’s house every night after school. He’s about 20 minutes away. Mum used to drive me before I got my licence….I haven’t walked anywhere since I got my licence really.
Well it’s not that far to uni. It’s only about 10 minutes to uni. But it’s probably about half an hour to work, and then Geelong, yeah probably up to about 3 or more hours.

Um, between 10 and 15 hours… Um, between, um, on a good run it’s about 35 minutes, but at night time it would take me up to an hour to get home…. And in the morning, sometimes it takes longer, depends on if the Westgate’s had an accident or not, because that comes the way that I go… and then my sister doesn’t drive, she works at Kmart, so if she needs picking up, I’ll go out and pick her up… that’s just Monday to Friday.

Um, Monday to Friday I would probably say about 10 hours a week. Yeah, mostly to and from uni and to and from work, and to and from friends places. I would tend to go to uni in the morning, and then I’ll end up doing something at night as well, and eventually go home, so yeah.

My partner lives in Geelong … back and forth all the time, yeah.. Like I’m going there tonight after I finish here, and probably every second weekend, and two or three nights a week. And then he comes up other nights.

Some participants had less utilitarian reasons for some of their driving. Some driving revolved around travel to nightclubs or other specific events. Less commonly, some driving related to chores such as shopping and driving other people.

Just the usual that most people would do to different clubs.

Like when I go away, I’ve been up to Phillip Island and I drove back from Phillip Island today, just a holiday.

I’ll just be driving to see my mates, … they all live locally, Werribee which is not far for me to drive. The longest I drive would be to and from work everyday or driving to the city. I hate driving when going clubbing because I tend to be the same as her I tend to get a bit drunk.

Every now and again we drive to the football, that’s about it, like just going to the shops you drive to the shops and something like that.

I like driving just to get out of the house. Any time of day, anywhere, just to get out of the house.

Public transport was not generally regarded as a useful alternative to driving in most circumstances. The most common exception to this was in relation to driving after drinking alcohol – some participants noted that they would make use of taxis or would nominate a non-drinking driver on outings when alcohol consumption was likely. Attitudes to public transport are discussed later.

Participants indicated that they were generally uncomfortable driving after drinking, and some indicated that they were not comfortable driving in heavy traffic or found it frustrating having to find parking when driving into the city.

I don’t drive at all on the weekends usually……Because I’m drinking, I’ve never drunk-drove because I’ve had a few minor accidents that’s convinced me that I can’t drive sober.

But I never drive to clubs or anything like that.

It’s hard, its not that its hard finding a park but its just the times of the parking, you only get 1-2 hours and I don’t want to go pay $8.

Some participants indicated that they enjoyed driving for reasons such as having a relatively new car or being in their own space, and the ability to get about without relying on others was widely viewed as an important positive aspect of driving.

I love driving, I get to be in my own space. When we have training in the city, everyone would catch a train in cos they didn’t have to worry about the peak hour and I’m like no, when I get in my car, I don’t have to be with all these other people, I can put my own music on, I don’t care if I have to sit in the traffic.
Yeah, it's my own freedom I suppose, I can just get in the car and go.

When you go for a um, a cruise, with your friends, so you’re going down to the beach tonight and the music is pumping and it’s a nice night and everyone’s talking and socializing, and you just go for a drive, so you just enjoy yourself.

Some participants identified some negative aspects of driving and car ownership, such as the cost of maintaining a car, dealing with the complexity of driving (especially in heavy traffic or at night), problems with their current car, and the behaviour of other road users.

I catch the train to the city sometimes when its peak hour because I cant be bothered with the traffic, I'm not good in traffic situations.

Oh I can't stand driving in peak hour.

I suppose I just don't find it relaxing at all, like I have to concentrate.

Um, just really heavy traffic, I don't like. Like peak hour in the city.

I think the cost was always an issue, you know I’m filling up again, or another things gone wrong with the car, if there was a downside that would be it.

Although generally negative, attitudes to the use of alternative methods of transport were discussed in the focus groups. While participants indicated that there were some benefits associated with public transport (such as cost, stress levels, and parking), there was a strong reluctance to make use of it.

Nah, I hate public transport I reckon its evil.

It's just ridiculous; you wouldn't go on a tram or a bus.

It appeared that ease of use or the availability of nearby public transport was a consideration for some participants, and some participants were unable to make effective use of public transport as their residential areas were not well-serviced.

During exams I caught the train cause Caulfield is right near the train tracks and I live right near the train track so I just walk up there.

If it’s too hard to drive or park, I’ll get public transport, basically.

Trains are really convenient cos I live 2 blocks from the train station so, it's just a short walk to the train station.

And the night rider bus is not really an option, I caught it home once, and had to walk 2 ? hours to get to my house, you know.

There was a sense that participants compared the benefits of driving and the benefits of using public transport and favoured driving for a number of practical reasons despite the potential availability of public transport. Considerations here included the flexibility of driving and the cost of different public transport options.

Sometimes when I went to uni I would catch public transport but since I've had my car I don't use it anymore.

When you have had a car you can't go back to public transport.

Um, I think it's that I just prefer being in my car, it's comfortable, I've got my music, um, convenient.

Because it's uncomfortable, you don't have the luxury of listening to the radio.

Comments by some participants suggested that they had been intensive users of public transport when younger and attending school, but they were now unwilling to continue using it.
I think it’s, I obviously caught a lot of public transport when I was at school and that sort of thing and I hate it, it’s you know, the people you meet on there and the whole experience is not enjoyable in my experience so I just prefer to drive.

I used public transport too much, I’m over it. I’d do anything to avoid it.

Despite the generally negative response to the public transport issue, there were some participants who favoured the use of public transport to meet specific mobility needs. These most often related to trips for a specific purpose, and most often into Melbourne from their residential area.

If I didn’t have my car, I would catch the train into work, I actually worked it out to be cheaper to drive, from where I live, but you know, if we’re going into the city or the boys are going into the footy or, we’ll take the train, and if we do something like that, we’ll take the train in.

Yeah I try and catch the train if I’m coming into the city or something, cos it’s really convenient, go straight in and straight out, you know. And um, trying to ride to uni a little bit, or get the shuttle bus over to there, over to Clayton from Caulfield, and that’s working out alright.

Use of taxis was unusual, with the cost being identified as a significant barrier for group participants. Taxis were more likely to be used if a group of people could share the cost. Female participants expressed some concerns about the safety of using a taxi alone at night.

Cos everything’s so far away, it costs you $45 to get anywhere.

Exactly, and unless you’re with a massive group of people, it’s just not worth it.

But yeah, it’s just not economically viable, I mean, I know that I come from a good group of friends, who always have a designated driver, or we plan, but you know, when to leave, or whether that means that we spend an extra hour at Hungry Jacks, or something like that, just so we can catch the first train out, or something like that.

I’ve just had creepy, creepy taxi drivers before, that I don’t know, I don’t mind catching them that much by myself but I make my friends say like when they’re getting out or whatever, oh call me as soon as you get home.

I only catch them home again, if I’m going out drinking like before, we’ll catch a tram into somewhere, and we’ll catch a taxi home if nobody is available to pick us up.

Yeah, the last resort would be a taxi yeah.

Two key issues need to be considered in relation to the potential value of public transport for group participants. The first is that it is probably not surprising that public transport played a relatively minor role in meeting their transport needs given their flexible and busy lifestyles. The public transport system is ordered in time and space – providing timetabled services over limited routes – and is unlikely to meet the needs of young people who lead relatively spontaneous lives. Using a car is likely to be more attractive simply because of the flexibility it offers.

The second key issue is that public transport appeared to have negative connotations for some group members. Some suggested that they had used public transport a lot as children or teenagers and that they were happy that that stage was behind them, and some had negative feelings towards using public transport regardless of its potential value to them. This negativity and problems with the cost of taxis almost certainly mean that group participants will continue to use cars as their main form of transport even if there are improvements to the public transport system.

Group members sometimes dealt with potential fatigue or drink-driving issues by staying at a friends house. This option appeared to be most common where alcohol may have been an issue and was less common as a way to deal with fatigue. There may be some potential for using this as the basis for an education program dealing with driving when tired, but the attitude of high-risk drivers to sleeping over would need to be assessed more formally.
Yeah, usually it would be if nobody is willing to drive or, it would sort of be a last resort the whole stay over option.

Like if I was at a mates house and we were having a big night drinking, we’d probably just stay there, otherwise go home if you don’t want to stay.

Yeah, it is, very much my second home, so and, it’s just, and not only me, quite a lot of my friends will stay at her house, cos it’s the most convenient one from the city.

Do you find that, like with my mates, we have a couple of designated houses, which is where we kind of always seem to crash.

Groups of young people on outings made use of designated drivers. Group participants were generally positive about this approach (and appeared to be strongly negative about drink driving), but were less positive about being selected as the designated driver. They felt not being able to drink when others were doing so was a negative, and that taking on this role put them in a less flexible situation than they would normally prefer. The benefits of promoting the designated driver idea are relevant to fatigue as there is likely to be an interaction between the impairment resulting from fatigue and the impairment resulting from alcohol consumption.

No, just one person says I’m not drinking tonight….. You just take a turn…..Normally it’s the person who’s the poorest at the moment….Yep, or who’s working the next day.

I hate being designated driver, you have to drive all the drunk people home.

I’ve been the designated driver for a while, and kind of, it is, a bit bad sometimes, but geez you save some money, quite remarkable, yeah.

And I used to, not so much any more, but I used to go to heaps and heaps of raves, so I didn’t drink there anyway, so I used to always drive.

Some group participants commented that they would sometimes phone a friend for a lift home if they were unable to drive or make use of public transport. Some participants indicated that they sometimes acted as “driver” for friends in this situation. This appeared to relate to situations where the person had not intended to drive home anyway, so probably does not reflect a way of dealing with potential fatigue problems.

Actually, when my boyfriend was still here, in the country, he used to actually drive me and my friends into wherever we were going, drop us off, cos he couldn’t be bothered coming out with us, go home and then come back and pick us up whenever we called, and that was very good.

4.3.3 Importance of Cars

Group participants relied very strongly on their cars to meet their mobility needs. In addition to providing more comfortable transport to places of work or study, the availability of a car provided group participants with the means to have busy, spontaneous social lives. Availability of a car reduced the amount of time required to get to places of employment and study, increasing the availability of time for other things.

…I lived with my grandma for a while, didn’t really like relying on her to drive me around, so it was just the freedom, I didn’t have to worry about trains and all that sort of stuff, so definitely freedom for me.

Yeah, I just drive everywhere, never home any more.

Yeah there’s good things and bad things you know, getting out of the house and not being so reliant on people.

I think its more just A to B, but I couldn’t live without it now that I’ve had it so long.

I used to walk to places that were so close, now I drive there, if it takes more than two seconds in the car I’d prefer to take the car than walk there.

I would feel trapped if I didn’t have it.
For younger group participants, the importance of car ownership was magnified by their increased status within their group of friends if car ownership was uncommon, and by the freedom from dependence on others for meeting transport needs. It was noteworthy that car ownership quickly became an important issue for younger participants, becoming an integral part of their day-to-day lives.

Um, oh, just a whole heap of friends, to a party, which is in the middle of nowhere… and then I took them all home again, and went shopping the next day. So wouldn’t have done any of that.

But yeah, it’s just nice, because you’ve got that option, and especially if it’s like 9.00 and your friends say, oh quick come out, if I didn’t have a car, I’d be like, oh no I can’t be bothered, I’m going to bed, but with my car, it’s like no worries, I’ll be there in 10 minutes, or whatever.

4.3.4 Sleep

Participants in the focus groups generally indicated that they were getting less sleep (one to two hours) than they felt they needed, and in turn somewhat less sleep than they would like. This is consistent with the selection of participants based on their patterns of sleeping and driving, and confirms that focus group participants were most likely at higher risk of fatigue problems than other survey participants may have been.

Participants with relatively unstructured lives (eg. those who were not in full time employment) appeared to find it relatively difficult to estimate how much sleep they were getting and the size of their sleep deficit. In discussing this issue it was apparent that there were some factors that may influence the level of sleep deficit that were only sometimes taken into account, including:

- Short term time demands relating to study.
- Irregular time demands relating to commitments such as casual employment.
- Infrequent time demands such as those related to late-night socialising.
- Difference in sleep patterns across the week.

The discussions suggested that participants with a consistent pattern of sleep deprivation had adapted to this situation, leading them to believe that their level of deprivation was not substantial. All participants indicated that they had experienced on-going sleep deprivation over a five-night period, and many indicated that deficits of 2-3 hours for extended periods were common.

I would say seven-eight hours would be a good nights sleep.

Oh I would have had less, the last couple of weeks I’ve had less…. Yes the last couple of weeks, Thursday, Friday, Saturday and Sunday I’d get home at about four-five, get up about nine.

I can get 1 hour sleep or no sleep it doesn’t bother me anymore.

How much more sleep would you like than you’re currently getting?

A few more hours.

Well I’m getting about 6, on a good night I’d get about 6 hours sleep, so, 7 or 8 hours would be nice.

That would be good, the other night I had 3.

Yeah, I probably get about 7 hours a night, which is not too bad, I probably would actually like 8 hours, like it doesn’t sound like much, but it’s probably just, given me that little bit extra.

Yeah, so even like, and extra 6 hours sleep a week, is probably what I need. Yeah.
Work and study were the central foci of participants’ lives, and other time commitments were made to suit them. This was true for sleep too – with sleep generally given a lower priority than work and study, and in some cases having a lower priority than social activities.

Those participants in the full-time workforce structured their non-work activities (including sleeping) around their work and commuting commitments. All the participants in tertiary education had part-time jobs, and their primary commitment was to the demands of their study and work. Other activities (including sleep) were structured around these two commitments, and sleep also tended to be structured around the additional demands of participants’ social lives and commitments to sport and other activities.

Where there were temporary increases in the time commitment required for work or study (during periods of exams, for example), participants appeared willing to allow the time available for sleeping to decline in preference to alternative ways of balancing their commitments. The combination of ongoing commitments to study, work, and social activities, and the need to incorporate short-term increases in the time demands of study and work, appeared to be the main reason for the sleep deficits reported by focus group participants.

The sleep deficit reported by participants during the focus group discussions was rarely more than 1-3 hours, however, suggesting some degree of self-regulation that ensured that sleep did not decline below some threshold level. The discussions suggested that participants prioritised these factors beginning with their work and study commitments, followed by the threshold sleep requirement and then their social activities. This should not be assumed to be the result of a conscious decision-making process, however, as there was no discussion in the focus groups suggesting that participants were aware of this apparent prioritising of commitments, or that they were even aware in their day-to-day behavioural decision making that there could be a play-off between sleep and other activities. One possibility is that the apparent prioritising reflects the habitual behavioural patterns of participants and positive and negative consequences of their past allocation of time to different activities.

Involvement in social activities was a higher priority when participants’ friends had busy, irregular lifestyles that made it difficult to find opportunities to socialise. One important consequence of this for road safety was that the participants would often respond to this situation by arranging social activities late at night, when it was more likely that they and their friends would have free time.

**What are the things that actually stop you getting the amount of sleep you need?**

*Study.*

*Phone calls in the middle of the night.*

*I know when I’m going to Geelong after uni, I won’t get there until sort of about half past 10, 10 past 10, and I won’t go to bed as soon as I get there, I like to spend some time, with Matt, so we often stay up pretty late, just chatting and watching TV, like not doing anything particular, but just because we want to spend some time together, but other than that, probably study, mostly.*

*Yeah, it’s a balancing act, like sometimes, you can forgo the social and go to sleep, and sometimes the other way around.*

**Think about your friends, do you think your friends are well slept? Is that lack of sleep unique to you, or is it just something to do with the group of people that you’re involved with?**

*I think we’re about the same, except for the weekends. The boys that I live with, during the week, they’ll go to bed at like midnight and get up at 7 or 6. And they say that’s fine, that’s enough sleep for them, whatever. Friday and Saturday nights, they won’t go to bed until 7am the next morning. Then they’ll sleep all day, and they get up and do it again, and then go back to work on Monday at 6. I don’t know how they do it.*
Some participants, especially those studying at University, found that it was difficult to have a regular or consistent sleep pattern, primarily because their time commitments to study and work tended to be irregular. It appeared that older participants were better able to manage this irregularity—perhaps as a result of their experience and self-awareness, but this would need to be further investigated. Dealing with irregular commitments without increasing the risk of fatigued driving may be an important focus for communication with young drivers at university.

I start at 3.30pm and I can work anything from, normally I'm supposed to finish at 12am, which means I get home at 1am but if I stay back to maybe 3-4am the latest I've come home is 5 or 6am.

Oh normally on Friday night I'll do a double shift so that's from 3.30pm to 8.30 am, that's with no sleep.

Oh you sort of catch up on your sleep bit by bit but as I said I'm used to it now, so hopefully I'll get a bit more sleeping with a change again as I'm going to night shift which is 11.30 to 7 in the morning, so yeah you just get used to it after a while.

Yeah because you've got afternoon classes, morning classes, morning shifts at work, afternoons shifts and evening shifts and everything changes so it's really hard to make a pattern. You just flop whenever you're tired pretty much and wake up when the alarm goes off.

4.3.5 Fatigue and Tiredness

The majority of road safety communications relating to fatigued driving in Victoria focus on “fatigue” as a description of the psychological or physiological state of the driver that is associated with a relatively high risk of crash involvement. It was considered important to collect some information about the meaning of this term to participants, so they were asked to discuss the terms fatigue, tired, and sleepy.

The meaning of these terms for participants needs to be assessed in the broader context of their experiences of sleep deprivation. It should be recalled that participants in the focus groups were specifically selected to have a relatively high risk of fatigued driving, and therefore that they were relatively likely to be sleep deprived. As some level of sleep deprivation might be regarded as the “natural” state of participants, it is not surprising that when discussing the effect of insufficient sleep they tended to comment on specific experiences of significant sleep deprivation rather than their day-to-day experiences of insufficient sleep.

Participants generally equated insufficient sleep with relatively extreme experiences where they found it difficult to stay awake. This was also the generally held definition of fatigue—participants viewed fatigue as the most extreme of fatigue, tiredness, and sleepiness and many participants indicated that in a fatigued state they would be unable to function or to stay awake. Fatigue was seen as the precursor to falling into a deep sleep, and was seen as having both mental and physical features. Together with sleepy and tired, fatigue was seen as encompassing the broad dimension of wanting or needing sleep, but fatigue was clearly viewed as qualitatively different to the other two. Participants indicated that they could function when tired or sleepy, but not when fatigued.

I think it depends, like whether you’re really thoroughly tired, worn out like for me if I’ve been down the coast or whatever and had a big night and then been up all day surfing or whatever. If I’m really tired then yes it can be a problem. If it’s 5 am and I’ve had a good night and I’m ready to go home and I’m feeling good, I’m a bit tired but you know that’s okay I think. So I think there’s levels to it.

Fatigue is a lot worse than being tired.

And “tired” is what?

You’ve had a hard day, your just wrecked but you are not that bad that you are just going to sleep.

Where does the word “sleepy” come in?
Sleepy is your eyes just want to close.
Sleepy is when you are sitting in front of the TV and you fall asleep, like you are not fatigued, you just fall asleep.

Fatigue is tired in my mind yeah. I guess it's just a matter of what side of sleep you are on in my opinion, sleepy almost equates to the feeling after waking up from sleep, in essence the whole rubbing your eyes and am, whereas tired in my mind I would think of it as being ready to go to bed. Fatigue isn't really a word I've really thought about but its almost an exaggeration of both in my mind, its almost the extreme of it where you, not to the point where you start to see things, haven't slept for 3 days, but its getting towards that sort of direction, that extreme thing in my mind, that's how I see it.

And fatigue as you were saying is a much more extreme version?
Yes, mmm. Feeling both [sleepy and tired] at the same time maybe.

I'd probably consider that like a more long term thing, like you're tired, but you're not necessarily sleepy where you can just drop when you're standing, but it's like over a long period of time, you're just constantly tired, and your bodies run down and you know, you just generally feel sick.

Um, if it stops you from functioning from your full potential.

I think tiredness, like if you're feeling really tired, you're yawning heaps and you can't kind of concentrate very much, but at the same time, um, you can keep your eyes open, but maybe fatigue, that's when your eyes are you know, really starting to, shut and you're really on that verge.

In addition to the strength of the fatigue experience, fatigue was differentiated from the other two terms by its relative rarity. Because it was viewed as an extreme state, fatigue was associated only with long periods of extreme sleep deprivation and was not associated with shorter periods of poor sleep patterns or the day-to-day sleep deficit that formed the background sleep experience of participants.

Let me ask another few question then. Have any of you ever felt fatigued?
Yeah.
Yeah.

Yeah, it's when your whole body is trying to say, go to bed, go to bed, go to bed.

Yeah.

I think it's from where you go from sleepy which is like a comfortable sort of state…where you're still in control of it, to tired where you can moderately control it where you can say I've got to keep going, I'm tired, I'm exhausted, but I've got to keep going, but fatigue is where, no, this is my desk, and it's now my pillow.

If you sit down, you're going to fall asleep.

You're brain just can't focus, like, I suppose it's the same kind of thing as like, you guys would have all done this, you're writing an assignment that you should have started weeks ago, and you do it the night before it's due, and you write it, you kind of get through the night, but then, you actually can't read it the next morning, you can't re-read it, just doesn't go into your brain, it's like, I don't know what I've written, wouldn't have a clue, hand it in and hope for the best.

You read it later and go "did I write that?"
Yeah, it's kind of like your brain just can't process anymore.
If I say tired, sleepy and fatigue, what do they all mean? Are they different, the same?

A lot more emphasis is put on the word fatigue especially when driving, and that, like compared to being tired, like tired you could just be drained, you are not physically tired like you would fall asleep as in fatigued, but just with fatigue you are physically drained to the point you could just get into a car accident.

Tired is more when you feel sleepy, you’ve done a hard days work um physically doing something, fatigue is something more mental, when you drive you have to concentrate right and when you are fatigued you just can’t concentrate, you really don’t care what’s going on around you, you just want to get home and chill out, so I think fatigue is more a mental thing and tiredness is probably more a physical thing.

Fatigued is so much worse, like you see it on the ads and stuff and it’s the thing that kills you, sleepy is like I could really go to bed now, fatigue you’re like I really should be going to sleep now, so sleepy if you want it but fatigue if you need it.

The general direction of this discussion has some important implications for road safety programs and measures concerning fatigued driving. Young drivers in a high-risk group for driving while fatigued may be relatively unlikely to respond to public education messages in this area because they do not share the vocabulary of the message. When focus group participants hear a message about driving when fatigued, they are likely to agree that this is unsafe (because their experiences of fatigue tell them that they are unable to function in this state), but are unlikely to associate the message with their day-to-day driving in a state of sleep deficit because they do not define this as driving when fatigued.

The focus group discussion suggests that this is a critical issue for the development of road safety programs focusing on fatigue. If the general message about fatigued driving is not delivered in a way that is perceived as relating to young drivers’ day-to-day driving when in a general state of sleep deficit, they are unlikely to result in any safety related changes in behaviour.

4.3.6 Driving at Night

As expected given the selection criteria for involvement in the group discussions, driving at night or in the early morning was common amongst participants. There were some differences in how group members understood terms like night driving and early morning driving that may be important when considering the use of these terms in road safety programs that include a communications component.

Some participants considered night driving to be any driving when it was dark, suggesting that early morning driving referred to driving after sunrise but before they would normally be driving. The alternative interpretation was to link early morning driving with driving after midnight but before sunrise – most commonly associated with returning home after a night out. The presence of different understandings of early morning driving in particular means that it would be important to specify the target driving times of any communications based road safety measure rather than relying on a shared understanding of terms like early morning.

Ok if I say the words “night driving”, what do you consider to be the word “night driving”?

Driving home at three in the morning, there’s nobody on the roads, normally its clear about three or four.

After ten o’clock till the morning, about seven.

Till five probably, starts getting day around sixish.

When it starts to get dark.

Yes I associate it with darkness so as soon as it becomes dark, its night driving, that’s what I reckon.

Right excellent, if I was to say what is “early morning driving” what is that?
After 5am.

No even in the morning, two three, even though it is morning, I still consider it night.

Yes I still consider it night, as soon as the sun comes up, that’s morning driving.

Night time driving was generally associated with socialising or meeting work and study commitments. Driving well after midnight was most often associated with socialising. In some cases, driving in the period before sunrise was associated with early work commitments.

Yep, all my classes are till 8 or 9 at night, and then some nights a week, I’ll drive to Geelong from there. So that’s a big factor. And then in the morning, going to work, when it’s dark.

Um, I go to my boyfriends probably twice a week, leave there about 9.30. Um, I used to work until about last week, until about 10 at night.…..study, and yeah, just weekends, parties occasionally.

I work sometimes night shift, so I do, go to work those hours, or socialising, or going to visit some family members.

I think for work too, I work in a pub, so driving to and from there at night and, yeah, just going to gym after work or class or whatever, get home, go to the gym, come home, 8.30 or something.

Um on weekends on Friday and Saturday nights I don’t drive but during the week I go out sometimes to maybe three in the morning, and I usually take it in turns with my friend because I don’t like driving very much.

So let’s talk about the hours of midnight onwards, what of leads you to be out at night, what’s going on for you to be out at that time of night?

Work. Not on a Saturday or a Sunday but majority of the time its work.

Yes socializing.

I have to pick up my younger brother from work.

I had to pick up my friend once, because she was too drunk to drive, I went and picked her up at like two three in the morning, usually I’d be out with her so it was just one time I didn’t go out and she was stuck so I went and got her.

So what about those one to three to six, what sort of stuff is going on at that time, same stuff or different stuff?

If I’m out to five or six it’s a bloody good night.

Around at your friends home.

Doing a double shift.

Driving at night evoked positive responses from some participants relating to the lack of traffic or being able to drive more quickly than was possible during the day-time.

I don’t know, like I think there’s a certain thing with driving at night time. It can be quite exciting you know if your leaving, I don’t know I think there’s a certain feeling that goes with driving at that time of the morning. There are no cars, you’ve got the road all to yourself and it’s cold outside and it’s interesting and it’s a bit — it can be a bit scary you know. It’s sort of, I don’t know I quite enjoy it.

Three in the morning is the best time to drive, hit the freeway, set the cruise control to 100km and not have to break until I have to leave the road, it’s beautiful.

Can speed so much more, there’s no one around.
4.3.7 Driving When Tired

Group participants agreed that tiredness was a potential problem when driving, but in general believed that the risk was manageable – that they could recognise their tiredness and drive more carefully if necessary. The heightened risk associated with tiredness was only seen to be serious at extreme levels of fatigue. Tiredness was only perceived to be a problem if there was a risk of falling asleep while driving. While some participants could comment that they had experienced situations where they had driven home at night and not remembered doing so, they did not equate this experience with an increase in crash risk.

I am aware, that’s when I know that I’m tired because I can drive along and see a set of lights or a stop sign but when I’m tired I get in dazes, and I’ll drive around in a blank stare and then I’ll look up and think ‘oh I’m driving’ you know there’s the lights stop, usually I’ll have a cigarette as well or put the music up or sing or do something or talk to the people in the car with me. So even when I’m by myself I get tired and stuff and whenever I have people in the car even if I am tired I keep awake because they talk to me and stuff.

Um just like when you feel out of it, you are slow to react to things and say you’ve been driving and you suddenly realise you are almost there and like you don’t realise till the last minute and then, yeah you seem to be slow to react to things.

This poor understanding of the potential risks associated with tiredness-related impairment could be an unintended result of the focus of road safety communications based programs on “fatigue” as a road safety problem, combined with the broad understanding of “fatigue” in this group as a term that relates to extreme tiredness. Young drivers may believe that the road safety problem raised by these communications relates to an extreme feeling of tiredness that is largely irrelevant to their own day-to-day experiences of tiredness and relates more strongly to the less common experiences of “fatigue”.

I don’t notice things till the last second, it could be like the lights have changed, I wouldn’t notice till the last second, I could be in a daze and then I’ll go ‘oh the lights have changed’ and I’ll stop.

Yeah, um, I haven’t actually had, I suppose when I drive at 3am in the morning, I’m a bit sleepy but never to the point where I’ve had to stop, and if I was really sleepy I would.

Cos you just um, cos when you’re fatigued, like extremely tired, you’re so slow to react to things… last week I had a, it was just a really mad week, lots of assignments due, and every night it was about churning out the assignments, and I remember driving to uni to hand one in the next day and I was just, hadn’t like, in 3 days, had 10 hours sleep, I think and you know, there were just times when suddenly I’d realise oh my god, the car in front of me just braked, you know, normally I would have enough, I’d be quick enough to brake, but it was like, too many close calls.

Driving really late at night, when I’ve been completely exhausted, and I’ll be driving, and my eyes won’t be shut, but in my head I’ll be going through the motions of going to bed.

From a driving perspective, the discussion appeared to suggest that participants recognised different levels of tiredness and increasingly employed different strategies to continue driving as they felt their driving was becoming less safe with increasing tiredness. However, there were no clear boundaries between different levels of tiredness that might allow for a simple message as part of a road safety communications program.

Once, if I’m tired I wont drive, but this one time I wasn’t that tired so I was driving, and I could feel I got really tired and I put the music up really loud, I had something to eat, I slapped myself a few times, I had the window down and I slapped myself a few times to keep myself awake because I knew I was going to fall asleep.

Like, you know that you’re driving and that you’ve been looking at the road and stuff, and if a car came out you’d know what to do, but you sort of at the same time, you’re in a completely different world… Mmm, you’re like, when did I drive past that truck?
I’ve done it and like a huge difference, because that place you go into, sort of like a mechanical mode, you know what you’re doing, it is slow and maybe, when you get home you’ve had a freak out and go I don’t really remember parts of that bit, but you know that you had the responses but it’s still actually different to sitting there, falling asleep, and then seeing that you’re off the road.

You try hard to keep yourself awake sometimes. Participants suggested that it was possible to habituate to the effects of tiredness with increasing experience, and that the riskiness of driving when tired was less for those drivers who had done so for some time.

Well it depends on the person. Like everyone’s different like, I can cope fairly well without sleep and other people I know can’t function without like 8 hours, so it depends what you are used to.

4.3.8 Strategies to Combat Tiredness

The strategies used by participants to minimise the effects of tiredness on their driving were consistent with those reported in the telephone survey reported earlier. It should be noted, however, that the focus of these strategies was not to avoid driving when tired, but rather to prevent the more serious symptoms of tiredness – such as falling asleep. Strategies included turning on a radio or music and increasing the volume, stopping to buy food, winding down the window, smoking, and so on.

Yeah, radio’s good.

Um, getting a Coke at the service station, or something like that, or just even, not even just for the Coke, something to break it up.

You wind down the window.

Turn the music up really loud.

Sing very badly, yeah.

I talk to people, like with my hands free. And I just ring people up, like some of my girlfriends work late, one of them finishes at half past 12 every night, so I ring her, if I’m tired, to keep me awake.

If you’ve got someone else in the car, you make them like, talk to you, I had a drive to Moama, and like 2 of my friends fell asleep in the back seat, and I made my friend sit there and read me stuff from a magazine, sort of thing, and then my friend woke up and said, oh that trip went so fast.

Coffee.

A bottle of “V” and a cigarette, that wasn’t unusual, yeah a quarter of a pack I’d smoke while driving and it wasn’t unusual for me to have 7 or 8 “Vs” a day, and two of those were on the way up and on the way back.

It was very rare for participants to stop for a short nap, and this was perceived by group members to be an extreme strategy. Participants raised concerns such as the possibility that they might oversleep in this situation, that their car was uncomfortable, that there were few places in the city or suburbs where this was possible, and an unwillingness to arrive at their destination any later than planned.

Isn’t the whole point that you pull over, for a sleep, and if you really need to sleep, then you’ll stay asleep.

Yeah apart from it just not being practical, I would be terrified that I wouldn’t wake up, you know, you look at the clock and it’s 10 the next morning.

You just don’t want to be couped up in your little car.

I have had one, a power nap actually, I remember, after going out and rocking up to uni really hung over, I had to have a power nap and then I just drove home. But, I felt like the biggest loser, like a complete wanker.
Heaps of times you see people that have pulled over in the car, pulled over in the car asleep, I just couldn’t do it.

Well I think when that first came out it was an idea I hadn’t even thought of, pulling over and having a power nap would be a good idea, but I’m not stopping I’ve got to be somewhere, um so yeah the idea is valid in my mind but I just don’t.

Of some concern, a small number of participants suggested that driving quickly was one way of maintaining wakefulness when tired and getting to a destination before tiredness could influence their safety.

I’m definitely more alert when speeding. I’m looking at everything, even the bird that just flew over, everything. So I’d be a safer driver.

4.3.9 Messages

Communication issues were discussed towards the end of each focus group. It was clear in general terms that messages that were personally relevant and simple were believed to be the most effective – although it needs to be noted as an aside that this may not reflect their actual effectiveness. Participants were inclined to favour advertising that was relatively explicit.

Have ads like TV stuff, some of them are very boring, I hate to say it, like with the fatigue on the power nap when you just pull over and stuff, like I wouldn’t pull over.

I know the gory ads, the shock campaigns - they really get to me.

The one with the kid, with the basket ball, and the ball runs onto the road, and he runs in front of it, like in front of the car, so the school zone is only 40, beside the fact that it’s going to make me go 40 in school zones, and be more aware of children, it’s going to make me educate my kids not to run out on the road.

Like the slip slop slap was a big you know catch phrase and everything, I think it’s a bit more scare tactics. Like wear sunscreen or you’re going to get a big cancerous lump.

I think that the drink drive, bloody idiot, whole push, like the whole advertising campaign, was pretty successful, in the grand scheme of things, but I don’t know what it is about that that made it successful. Like whether it was the catch phrase, or the shock tactic advertising, or whether it’s society has become more desensitised to stuff like that because of it. That means that it won’t be as influential.

Stuff like that with the ads and the campaigns, you just don’t think it will happen to you, like if one of your friends had a major accident or something and they really got hurt and they went to hospital or something and they were like drinking or fatigued, that would make me think oh my God, it has happened to them it could happen to me. But with the ads you think yeah I’ve been driving when I’m really tired and I haven’t drunk drove but my friends have and if they can get away with it, you know its not that bad, you know you’d think I’ve done it before, just one more time wont hurt, it would have to be a friend or a close family member for them to get really hurt for you to realise that this stuff happens.

Communicating the potential risks associated with participants’ day-to-day driving when tired will prove difficult. In addition to the lifestyle issues raised earlier, perceptions about fatigue as an extreme level of tiredness not often experienced by participants, and the perceived necessity of car use amongst this group, the current focus of road safety advertising on fatigue as a country driving issue may have made the issue less relevant to the day-to-day driving of young people. Comments made by participants about the rural focus of fatigue advertising underscored this concern.

Do you think your friends would accept that driving fatigued is dangerous?

If you put the word fatigued in there.
That just makes it dangerous, is that almost by definition?

Yes it's like saying I've had a few drinks and I'm a bit tipsy, or I've had a few drinks and I'm roaring drunk; you know the wording it may mean the same but the wording it sounds ‘whoa’.

**So fatigued is like the equivalent of blind drunk?**

*In people’s minds yes.*

It's that thing about relevance, all of us live in the suburbs, all we see is them driving through the country, like on model roads really, that's what I reckon, if you had a person who is designated driver from the pub, and he's feeling a bit tired and he gets in the car and has a crash. Also the fatigue signs, on the road right, if I'm not fatigued but a bit tired, they should target something else like tiredness instead of fatigue, too specific, like what you’re feeling like. Like ‘are you feeling a bit heavy, pull over’, you know you don't think am I feeling fatigued, you think I'm feeling a bit tired, a bit sleepy.

I think fatigue is sort of I don't know a bit weighty, a bit scientific you know, it's a bit we want to be smart and we’re telling you this big word. I ignore most signs by the side of the road anyway. I wouldn't really read them, but if I did I wouldn’t care. It's a bit like nah I’m going pretty hard at the time, I haven’t got time to read signs. You know…

Well don’t use big words like fatigue.

Yeah I agree. I don’t like the word fatigue. It’s a very sciencey sort of term and it’s like I know what the word means but I don’t know, I have this thing about people using big words when they don’t have to. It really pisses me off. Like communicate first and then show me how smart you are by doing that rather than saying the trajectory of X over fatigue blah, blah, blah.

*Use something simple like the — oh what was it? The drinking one? Drink and drive you’re a bloody idiot. Use something simple like that.*

The fatigue issue is further complicated by the nature of driving when fatigued or tired. Fatigued driving does not evoke the same negative reaction at a community level as does drink driving (except perhaps at an extreme level of fatigue), and unlike drink driving and speeding there are no clear legal consequences for fatigued driving unless a serious crash occurs. The differences between fatigued driving and other road safety problems was discussed by participants, some of whom considered the differences between fatigued driving and drink driving, for example, to be substantial. They suggested that driving when tired was not as serious because they felt it was possible to counteract the effects of tiredness and is a less “absolute” state, although it was interesting to note that some participants have not fully taken up the road safety messages about drink driving.

*It’s like alcohol I suppose, but um, having never driven when drunk, I can only estimate about that drive of mine to Geelong, would be the same as having got drunk and driving home.*

Yeah, I think that it’s pretty comparable as well, like I know that with the drinking obviously you’re physically affected and I think that’s similar to when you’re really tired, cos when you’re really tired, cos if you’re tired your reflexes aren’t going to be as alert, you’re not concentrating, you know, your vision blurs.

**So what goes on that you would consider driving that tired but you would never consider drinking and driving?**

*The law.*

Yeah.
I guess the obvious affects, people get, like in our definition, you can still do it, you know, sleepy you can’t, but if you say to yourself I’m just tired, then I can work my way through it, and I think oh, I don’t know.

It’s not as sort of socially unacceptable you know, drinking, well driving while tired as opposed to drink driving.

Being tired is a lot more work than driving with .05. You’re probably less in control of your reactions. Yeah. I mean a few beers they might sharpen you up a little bit whereas if you’re tired...

Yeah .05 probably wouldn’t do much for me, being tired would probably affect me more when I’m driving.

I don’t think people see it as breaking the law, I think they do because they’re afraid of losing their license or getting fined.

Fatigue you can get away with it, you know you are not going to get pulled over for it, like with drink driving most people drink drive within 5-10 minute from the home, with fatigue you could drive for an hour because you know you are not going to get done for it.

4.4 Discussion

The focus groups were used to explore more fully some of the issues arising from the survey results. It is important to emphasise that it is not reasonable to generalise the outcomes of the focus groups to young drivers in general:

- The focus groups were conducted with a sample of survey participants that was purposefully biased towards drivers who appeared more likely to drive at times when fatigue might be an issue. The self selection bias in the survey sample means that this source of participants for the focus groups is itself unrepresentative of young drivers in general.

- Focus groups are unreliable as a source of information about members of the broader population of interest. They are unlikely to attract all members of the population equally, and regardless of the facilitators’ skills will tend to be influenced by stronger group members.

In the present situation, only nineteen participants took part in a small number of focus group discussions, further limiting the value of the groups as a guide to broader community attitudes and behaviours.

Nevertheless, the focus group discussions did provide some general information about the thoughts and behaviours of group participants that should provide some additional information for RACV and other road safety agencies’ work in the fatigue area.

Much of the discussion reflected the results of the survey. This is not surprising as the focus group participants were selected from the survey participants with a bias towards participants with a higher risk of fatigued driving. Participants had busy, somewhat unstructured lifestyles with busy social lives. Their driving focused on their work and study commitments, and on visiting friends and other social outings. They felt slightly sleep deprived, but this appeared to be the norm rather than the result of specific lifestyle issues at the time of the discussion groups.

Driving was an important aspect of participants’ lives, despite some of the negative comments about some aspects of driving or car ownership. Access to a car became important from an early age for participants and provided some social advantages. The central factor encouraging a positive attitude towards driving appeared to be that driving met a perceived need for flexibility. In addition to freeing them from the structure of public transport, driving gave participants the opportunity to make flexible social arrangements and to meet their mobility needs in relative comfort.
The importance of flexibility and comfort in driving was especially noteworthy when participants discussed public transport as an alternative transport method. Attitudes here were generally negative, with the negativity most often related to issues such as access, flexibility, comfort, and cost (particularly in relation to taxis). Taxi use was generally an option of last resort because of its cost, and appeared to occur only when a group of friends could share the trip and expense.

The participants generally made an effort to avoid drink driving, but were much less concerned about driving when tired. The use of a designated driver appeared to be common (although being the designated driver was not generally a positive experience) and participants would sometimes stay at a friend's house instead of driving home, or would even call a friend for a lift to avoid drink driving. Similar methods were not used to minimise the harm associated with driving when tired, and the discussions suggested that the most common response to being tired at the end of a social event was to drive home regardless, using some of the common approaches to reducing the effects of fatigue such as winding windows down and listening to loud music.

The use of a “power nap” as a means to manage tiredness was not accepted by participants. Concerns were raised about safety and comfort issues, and the motivational pressure to get home after an outing appeared to have more influence than the potential effect of tiredness when driving. Participants generally believed that it was possible to habituate to tiredness with experience such that any increase in crash risk could be minimised. This notion that tiredness was manageable was common, but a similar belief was not generally held concerning the potential effects of alcohol. The risks associated with tiredness were only believed to be serious when participants were extremely tired and close to falling asleep. The reluctance to use power naps may also reflect the fact that participants all resided in the metropolitan area.

The difference in opinions concerning tiredness and alcohol was interesting given that the potential effects of both sources of impairment are similar. Participants appeared to view drink driving as significantly more dangerous than driving when tired. This appeared to relate to the social norms associated with the two, as well as the legislative and enforcement structures in place to deter drink driving. The current lack of social pressure to avoid driving when tired (as opposed to fatigued – see below) will make the development and implementation of successful programs in this area difficult. There has been a long period of effective deterrence against drink driving that has, with the help of mass media communications programs, created a broad community attitude against drink driving. Reaching the same level of community attitude with fatigue will prove very difficult without a means to motivate a change in behaviour – such as enforcement.

One of the challenges for any program in this area will be the combined effect of young drivers’ experiences with fatigued driving and their understanding of the road safety vocabulary that has been used in mass media communications. Young driver participants in the discussion groups clearly had already accrued many experiences of driving when tired or at times of the day when tiredness would be expected. They recognised this, and it is likely that their experiences of fatigued driving relate to their relatively spontaneous social lives and the priorities they give to work, study, social activities, and sleep. Experiencing a negative consequence of driving when tired (apart from some discomfort) appears from the survey data to be relatively rare. In almost all instances young drivers would experience a positive consequence when they drive tired – they arrive at their destination safely and so meet the motivational pressure that put them in the car initially.

This accrued experience of safe outcomes when driving fatigued needs to be considered in the context of the vocabulary of mass media communications in this area. It was clear from the discussions that young drivers do not share the vocabulary used in these publicity programs. When mass media material and signage refer to “fatigue” as a crash risk and suggest methods to cope with “fatigue”, group participants generally understood the term as referring to an extreme level of tiredness characterised by a need to sleep. They did not understand “fatigue” as a reference to their common experience of tiredness brought about by their own background level of sleep deprivation or their socially motivated driving late at night or early in the morning.
The consequence of this combination of accrued experiences of safe outcomes when driving when tired and a different understanding of the messages communicated in road safety publicity means that it might be unreasonable to expect any shift in attitudes or behaviour based on current publicity amongst young drivers with characteristics similar to those in the focus groups. More importantly, it raises an important challenge for future programs that is similar in some respects to the challenge currently faced in the speed area. In both cases, the accrued experience of drivers is that the behaviour in question does not lead to significant negative consequences except at extreme levels. In the case of fatigued driving, young drivers’ understanding of the vocabulary of road safety publicity will have reinforced this belief – not only is their experience indicating that tiredness is not a risk, their perception is that the focus of road safety concern has been at the extreme. Countering the combined effects of these will be difficult.
RACV had two main reasons for undertaking this study. The first was to collect information about fatigued driving amongst young drivers within the broader context of attempting to understand this problem more fully. The literature review, survey, and focus groups met this aim, presenting a general picture of fatigued driving as part of the day-to-day experience of a subset of young drivers who have relatively unstructured social lives in addition to busy work or study commitments and who value access to a car as the key means to meet their mobility needs.

The second aim of the study follows from the first – it was thought important to consider how community based organisations and other road safety agencies could contribute to reducing the potential road safety consequences of fatigued driving amongst younger drivers.

The key issues that need to be taken into account in considering potential actions in the fatigued driving area appear to be as follows:

- The broader scientific literature suggests that:
  - Partial sleep deprivation is a widespread phenomenon that has cumulative effects on cognitive processes, but self-awareness of partial sleep deprivation may not reflect the actual level of impairment.
  - Lifestyle-related fatigue may be an important contributor to crashes, and drivers are generally poor at recognising fatigue-related symptoms.
  - Young people in their late teens and early twenties are particularly prone to partial sleep deprivation, and some subgroups may be more affected than others.
  - Decision making when fatigued is likely to be based on motivational and habit-related factors and on the accrued experiences of the driver and their normative beliefs.

- The telephone survey of younger drivers suggested the following:
  - Participants believed that the effects of longer term sleep deprivation and serious short term sleep deprivation were similar to drink driving, and that these were more serious than physical or mental tiredness when driving.
  - These beliefs were unrelated to fatigue-related crash involvement or patterns of sleeping and driving.
  - Almost half of participants admitted to driving when tired in the preceding week, and almost one third admitted to having had a near miss that was possible related to fatigue.
  - Participants appeared to self-regulate their sleep such that they countered the effects of going to sleep late by waking later the following morning.
  - Driving trips were mostly undertaken for commuting purposes and to complete chores, or for social purposes.
  - Almost all trips were undertaken with one or no passengers, although almost one quarter of trips undertaken for social reasons by less experienced drivers involved carrying two or more friends as passengers.
  - It was possible to identify a subset of participants based on their driving and sleeping patterns that were at a higher risk of driving when fatigued and who were more likely to admit a role for fatigue in any of their crashes.
  - These high-risk drivers undertook a substantial amount of night time driving for social purposes compared to other survey participants.
The focus groups conducted with a small sample of survey participants selected as having a relatively high risk of driving when fatigued suggested the following:

- Driving when fatigued appears to be a consequence of lifestyle-related motivational factors that over-ride any concerns about the potential negative consequences of doing so. Participants had busy lifestyles and largely unstructured social lives and valued the flexibility provided by driving, and they reacted to short term increases in workload or social demands by sacrificing sleep.

- The motivational pressures of work, study, and social life appear to take priority over participants' sleep, leading to participants having a low level of ongoing sleep deprivation.

- Participants believed that the effects of tiredness on driving were manageable at all but the most extreme levels and that they could habituate to tiredness with experience. Participants experiences of driving when tired had probably reinforced this belief.

- The vocabulary of fatigue amongst participants was not the same as that used in road safety communications – participants reserved the word “fatigue” for the most extreme state of tiredness and as a result did not believe that the current approach to fatigued driving publicity related to their day-to-day experiences of sleep debt and driving while tired.

The results of the literature review, survey, and focus groups together emphasise the importance of lifestyle and motivational factors in fatigued driving. Driving meets the mobility needs of young drivers that are in turn determined by the broader context in which they live. The high-risk groups identified in the survey had a higher risk of fatigued driving not because they had a less risky perception of driving when tired, but because they spent more time driving at night to meet their social needs. They recognised that they were tired at times, but did not feel motivated to change their behaviour to reduce the risk. This most likely relates to a combination of a perception that the risk is manageable (based on their experience and habitual behaviours), motivational pressures to go on doing the things they have to do and that they enjoy, and a belief that the “fatigue” of concern in road safety publicity is much more extreme than they would normally experience.

The challenge for the road safety community is to develop and implement programs that might address this problem. If the argument made here is correct, then any successful intervention will need to address one or more of the following:

- It will need to change the perception that fatigue is manageable,

- It will need to counter or reduce the motivational pressures to drive when tired to meet the work, study, and social demands of day to day life, and/or

- It will need to communicate the fatigue message (and the benefits of alternative behaviours) in a way that matches the vocabulary of the audience.

Given that young drivers appear to recognise that there is some risk associated with driving when tired, and that they continue to do so regardless of this risk, the key issues are likely to be the first two. While there is no doubt that an effective communication strategy would be an important part of any program, this strategy will need to address the specific perceptual and motivational factors that appear to underlie fatigued driving. A communications strategy that raises the fatigue issue from a safety perspective and does little else is unlikely to influence the behaviour of young drivers as they will continue to believe that the risk is manageable (based on their own experiences) and they will continue to drive in response to motivational pressures.

It will not be possible to influence fatigue amongst young drivers using legislative or enforcement methods as there is still no objective measure of fatigue that could be used to assess drivers who are impaired by low levels of sleep debt. This means that programs will need to focus on communications strategies. Key issues for communication strategies would include the following:
Low levels of sleep debt are common amongst young drivers and present a road safety risk for these drivers and other road users.

Driving when tired amongst high-risk young drivers appears to relate to motivational factors, such that any mass media program needs either to reduce these lifestyle-related motivations or to provide a significant counter-motivation to encourage behaviour change. Alternatively, it might be possible to suggest behaviour changes that are consistent with existing motivations that also reduce the amount of driving when tired.

Publicity that deals with the perception that fatigue is manageable when driving is likely to be more effective than publicity that leaves this perception in place.

Any publicity in this area needs to use the vocabulary of the audience. Current publicity programs do not do this.

More specifically, program development and implementation with a communications focus might include the following:

- Media communications, focusing on the potential problems associated with low levels of sleep debt.
- Development of communications materials (brochures, booklets, and perhaps videos) and distribution through channels that provide good access to young drivers – such as schools, youth-oriented community groups, TAFE colleges, and perhaps Universities.
- Development of suitable communications materials and distribution through social venues frequented by younger drivers – such as nightclubs, selected hotels, etc. These materials could include wall posters, coasters, etc designed to suit the audience and the likely venues.
- Development of communications materials and distribution through sporting clubs and venues. This might be a particularly useful approach in rural areas where sporting clubs are an important social venue for young adults.
- Development of communications materials and distribution through businesses that employ young adults in a part-time capacity – such as some of the fast-food chains and supermarkets.
- Development and placement of publicity on youth-oriented radio content. Radio is still a relatively inexpensive channel for communications programs and would provide an opportunity to place relevant messages at times when young drivers might be returning (fatigued) from social outings.

Communications developed for a young driver fatigued driving campaign would need to take the following issues into account:

- It is important to note that young drivers will continue to drive when fatigued. Under the recognition primed decision making model described in the literature review, it is clear that young drivers will respond to the motivational pressures arising from their lifestyles by choosing to drive and are unlikely (given their broadly positive experiences with driving) to consider using alternatives when they are tired. This means that one effective strategy may be to focus on minimising the potential negative consequences of driving when tired.
- It will not be possible to counter the motivational pressures that lead young drivers to have busy lifestyles. It would not be sensible, for example, to suggest curtailing social activities after a busy day at work. This would damage the credibility of any message about fatigue.
- Suggestions about power naps are not likely to be well accepted by young drivers.
- Suggesting the use of public transport or taxis may be appropriate, but the results of the discussion groups raise some concerns about the acceptability of this to the target high-risk audience.
It may be more constructive to take a harm minimisation approach, where the ongoing fatigued driving of the target audience is accepted, but the communications strategy aims to raise awareness about the increased risk associated with this and advises a driving strategy that reduces this risk and that minimises the potential effects of fatigue-related cognitive impairment on decision-making while driving. Young drivers could be advised to manage their speed more carefully when tired, or to take more time making decisions at intersections, may provide an effective alternative to a more negative approach. There would need to be some caution used in developing this approach, however, as the literature review indicated that people are generally poor at recognising their own fatigue. It might be worth considering a harm minimisation approach where it is known that young drivers are already tired as a result of their social or work situation or the time of driving – so they do not have to recognise the development of fatigue – and to use other methods for fatigue that develops over the course of a driving trip as might be the case in long distance driving.

Any communications strategy will need to emphasise that the impairment resulting from fatigue is present even when the driver thinks they can handle it – that its effects are subtle. It will also be important to communicate the message that it can be difficult to detect tiredness and its effects – self-awareness of impairment is an executive cognitive function that is itself affected by fatigue.

It might be sensible to draw on the reasonably widespread near-miss experiences of high-risk young drivers – many admitted that fatigue had played a role in a near miss, so it might be possible to use this as part of a message that aims to increase the perceived risk of driving when fatigued as a way to then motivate behaviours that minimise the potential harm.

Any communications strategy should avoid the use of the term “fatigue” and focus instead on words that reflect the day-to-day experiences of young drivers, such as “tired”.

An important focus of a communications strategy will need to be drivers’ perceptions of normative behaviour amongst their peers. A strategy that encourages a belief that other young drivers are more sensitive to the effects of fatigue and are taking precautions to avoid some of the negative consequences of fatigued driving (again using a harm minimisation approach rather than attempting to stop young people driving when they may be tired) may have a long term effect on behaviour.

It is not possible to estimate the potential effects of a communications strategy in the fatigue area. By taking up some of the key issues arising from this study, however, any such strategy is more likely to have a positive effect on the day-to-day driving-related behaviours of young adults than one that continues to focus on “fatigue” as an issue in long-distance driving.
6. References


Ferguson, S. A. (2003). Other high-risk factors for young drivers—how graduated licensing does, doesn’t, or could address them. *Journal of Safety Research, 34*(1), 71-77.


Questionnaire

Good morning/afternoon/evening. My name is (....) from the Social Research Centre calling on behalf of the RACV.

The RACV is conducting research amongst its younger members to find out about driver fatigue and how driving fits into their busy lifestyles. May I speak to (NAME FROM SAMPLE) please?

WHEN TALKING DIRECTLY TO RESPONDENT REPEAT INTRO AS NECESSARY AND SAY:

We would only need about 15 minutes of your time.

PRIVACY ACT PREAMBLE

Any information you provide will be protected by strict privacy and confidentiality rules. Your personal details will not be linked to the information you provide for the survey.

IF NECESSARY: This means the information you provide will not impact on your premium or your relationship with RACV in any way.

While we hope that you answer all the questions, if there are any questions you don’t want to answer just tell me so I can skip over them.

IF ABSOLUTELY NECESSARY SAY:

If you have any concerns about this research project you may contact Anne Harris at the RACV on (03) 9790 2917.

Is now a convenient time?

1. Person available 2. Person not available now (ARRANGE CALLBACK) 3. Person not known (TERMINATE) 4. Denies involvement with RACV / out of scope (TERMINATE) 5. Refused (TERMINATE)

Screening Questions

Before we start I would like to ask a couple of questions to see if you can help us with this survey.

S1a Firstly, can I just check, do you have a driver’s licence?

INTERVIEWER NOTE: Actual licence including P plates ok. Motorcycle licence (P / full) ok

1. Yes
2. No (no licence, Learner’s only) (TERMINATE)
3. Don’t know (TERMINATE)
4. Refused (TERMINATE)

S1b And would you mind telling me your age please?

1. 17 or younger (TERMINATE)
2. 18
3. 19
4. 20
5. 21
6. 22
7. 23
8. 24
9. 25
10. 26 or older (TERMINATE)
11. Refused

S2 Are you working?

1. Yes
2. No (GO TO DD1d)
3. (Can’t say)

S3 Is your work?

1. full-time (permanent)
2. part-time (permanent), or
3. casual (temporary, whether full time or part time hours)
4. (Can’t say)

S4 What type of work do you do?

1. Director, Manager or Administrator
2. Professional work
3. Technician or associate professional work
4. Tradesperson or related work
5. Advanced clerical or service work
6. Intermediate clerical, sales or service work
7. Intermediate plant operator / transport work
8. Elementary clerical, sales or service work
9. Labourer or related work
10. Other (Specify___________)
11. Refused

S5 (Just to confirm) Is this a job such as taxi driving or deliveries, where you drive for a living?

1. Yes
2. No
3. Refused
License Questions

QL1m In which month and year did you FIRST obtain your drivers licence?
   (INTERVIEWER NOTE – Actual licence including P plates, but not Learners)
   (GENTLY PROBE FOR NEAREST MONTH)
   1. January
   2. February
   3. March
   4. April
   5. May
   6. June
   7. July
   8. August
   9. September
   10. October
   11. November
   12. December
   13. Don’t Know / Unsure
   14. Refused

QL1y In which year did you FIRST obtain your drivers licence?
   1. 2004
   2. 2003
   3. 2002
   4. 2001
   5. 2000
   6. 1999
   7. 1998
   8. 1997
   9. 1996
   10. 1995
   11. Don’t Know / Unsure
   12. Refused

Explanation of Terms

Qexpl In this survey when we refer to driving we are only interested in your driving on PUBLIC ROADS, not any driving you may have done on private property.

1. Continue

Safe Driving

SD I’m going to ask you some questions about driving in certain conditions and I’d like you to tell me what affect they have on your ability to drive safely.

Please use a scale from 0 to 10, where 0 is ‘No affect on driving safely’ and 10 is ‘A very significant affect on driving safely’.

To what extent is your ability to drive safely affected by… RANDOMISE STATEMENTS

IF NECESSARY: If it does not matter if you would not drive in these conditions,… What we are really after is to what extent you think your ability to drive safely WOULD be affected by…

PROGRAMMER NOTE: Record order of statements for each case and include in data file

STATEMENTS

1. Driving when you feel physically tired or worn out
2. Driving when you feel mentally tired or sleepy
3. Driving when you have been awake for 24 hours
4. Driving when you haven’t had enough sleep for five nights in a row
5. Driving after you have had one or two drinks
6. Driving when you think your blood alcohol might be over .05
7. Driving between 2am and 5am in the morning
8. Driving after midnight

RESPONSE FRAME
PROGRAMMER NOTE: CODE NUMBER TO CORRESPOND TO RESPONSE FRAME NUMBER
0. 0 (No affect on safe driving)
1. 1
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. (A very significant affect on safe driving)
11. Don’t Know / Unsure
12. Refused

Sleep General
QSG Now I’d like ask you some general questions about the amount of sleep that you need and how much
sleep you get. When we ask about sleep, we mean ACTUAL SLEEP rather when you might go to bed.
1. Continue
QSG1 How many hours of sleep do you need each night to wake up feeling fresh and rested?
1. Hours given (SPECIFY:_______) TWO DECIMAL PLACES ALLOWABLE (EG 7.5, 8.25) (ALLOWABLE
RANGE 1 TO 16)
2. Don’t know
3. Refused

QSG2 Over the past 2 weeks, how many hours of sleep have you been getting each night, on average?
IF NECESSARY: That’s actual sleep, not how long you’ve spent in bed
1. Hours given (SPECIFY:_______) TWO DECIMAL PLACES ALLOWABLE (EG 7.5, 8.25) (ALLOWABLE
RANGE 1 TO 16)
2. Don’t know
3. Refused
4. (Don’t Know / Unsure)
5. (Refused)

QSG3 Over the past 2 weeks what would be the longest period that you went without sleep?
1. Hours given (SPECIFY:_______) TWO DECIMAL PLACES ALLOWABLE (EG 7.5, 8.25) (ALLOWABLE
RANGE 1 TO 72)
2. Don’t know
3. Refused

QSG3a Towards the end of that period of being awake, did you drive before going to sleep?
1. Yes
2. No
3. Don’t Know / Unsure
4. Refused

QSG4 Over the past 2 weeks, on how many nights did you get LESS sleep than you needed?
1. Number given (SPECIFY:_______) (ALLOWABLE RANGE 0 TO 14)
2. Don’t know
3. Refused
4. (Don’t Know / Unsure)
5. (Refused)

QSG4a So over the past 2 weeks would you say you have had…. READ OUT …
1. A lot less sleep than you needed
2. A little less sleep than you needed, or
3. About the right amount
4. (Don’t Know / Unsure)
5. (Refused)

Driving Experience
QD1 I would like to ask you some questions about your driving under certain conditions in the last 2
weeks… So, on how many of the last 14 days have you driven at night?
(IF NECESSARY: By at night, we mean driving after dark)
1. Claims not to have driven at all in the last 2 weeks GO TO QD1)
2. None (driven in last 2 weeks, but not at night) (GO TO QD4)
3. Number given (SPECIFY:_______) (ALLOWABLE RANGE 1 TO 14)
4. Don’t know
5. Refused

QD2 In the last 2 weeks, how many times have you driven after midnight?
1. None (GO TO QD4)
2. Number given (SPECIFY:_______) (ALLOWABLE RANGE 1 TO 14)
3. Don’t know
4. Refused
QD3 In the last 2 weeks, how many times have you driven between 2am and 5 am in the morning?
1. None
2. Number given (SPECIFY______) (ALLOWABLE RANGE 1 TO 14)
3. Don’t Know
4. Refused

QD4 In the last 2 weeks, how many times have you driven for more than two hours in one go?
1. None
2. Number given (SPECIFY______) (ALLOWABLE RANGE 1 TO 14)
3. Don’t Know
4. Refused

PREQD5 – IF QSG3 CODE 1 GREATER THAN OR EQUAL TO 24 (LONGEST PERIOD WENT WITHOUT SLEEP IN LAST TWO WEEKS >24 HOURS) CONTINUE. OTHERS GO TO QD6
QD5 In the last 2 weeks, how many times have you driven after being awake for 24 hours or more?
1. None
2. Number given (SPECIFY______) (ALLOWABLE RANGE 1 TO 14)
3. Don’t Know
4. Refused

QD6 In the past 2 weeks have you driven when you felt MENTALLY tired or sleepy?
1. Yes
2. No
3. Don’t Know / Unsure
4. Refused

QD7 In the past 2 weeks have you driven when you felt PHYSICALLY tired or worn out?
1. Yes
2. No
3. Don’t Know / Unsure
4. Refused

PREQD8 – IF QSG4 CODE 1 IS FIVE OR MORE (HAD FIVE OR MORE NIGHTS IN LAST 2 WEEKS WHEN GOT LESS SLEEP THAN NEEDED) CONTINUE. OTHERS GO TO QD9
QD9 In the past 2 weeks have you found yourself nodding off whilst driving?
1. Yes
2. No
3. Don’t Know / Unsure
4. Refused

Strategies
QS1 I am going to ask you some questions about the things you have done to deal with driving when you are tired.
So firstly, when PLANNING to drive, or BEFORE SETTING OFF on a trip, what things have you done to avoid or reduce the likelihood of becoming tired or drowsy when driving? (MULTIPLES ACCEPTED)
1. Delayed the trip (waited until sufficiently rested before leaving)
2. Planned to SHARE the driving
3. Got someone else to drive (ie did not drive yourself)
4. Planned to stop overnight to break up the trip
5. Taken a cab / public transport
6. Stayed where you were (not taken trip at all)
7. Had a nap before leaving
8. Planned route / planned where to have rest stops
9. Planned to avoid driving when normally tired
10. Planned to avoid driving after long day’s work
11. Ensure well rested / had a good night’s sleep the night before
12. Drunk coffee / other caffeine based drink
13. Had shower / freshened up before leaving
14. Other (Specify ____________)
15. None
16. Don’t Know / Unsure
17. Refused

QS2 WHILE YOU HAVE BEEN DRIVING, what things have you done to help you try to stay awake when driving? (MULTIPLES ACCEPTED)
1. Pulled over and had a nap
2. Pulled over and had something to eat / drink
3. Drunk coffee or another caffeine based drink
4. Stopped the car for a break
5. Wound down the window
6. Turned on the air conditioning
7. Turned off the heating
8. Turned on radio / listened to music
Daily Diary

DO I'm going to ask you some questions about your sleep and driving over the past 2 days. For each day I will be asking you about when you woke when you went to sleep and what driving you did. It is a bit like creating a daily diary but only about your sleep and driving.

1. Continue

Yesterday

DD1a Just thinking about yesterday, that is (TODAY -1)…. What time did you wake up yesterday morning?

1. Did not sleep yesterday
2. Time given (SPECIFY______) (RECORD AS 24 HOUR CLOCK – RECORD HOURS AND MINUTES)
   IF HOURS GREATER THAN 12 DISPLAY “UNLIKELY RESPONSE, PLEASE CONFIRM”
3. Don’t Know
4. Refused

DD1b What time did you go to sleep last night?

1. Did not sleep last night
2. Time given (SPECIFY______) (RECORD AS 24 HOUR CLOCK – RECORD HOURS AND MINUTES)
   IF HOURS= MORE THAN OR EQUAL TO 4 AND LESS THAN OR EQUAL TO 20 (IE WENT TO SLEEP AFTER 4.00 AM OR BEFORE 8.59 PM) DISPLAY “UNLIKELY RESPONSE, PLEASE CONFIRM”
3. Don’t Know
4. Refused

DD1c Did you nap yesterday?

1. No (GO TO PREDD1di)
2. Yes
3. Don’t Know / Unsure
4. Refused

DD1ci What time did you (first) nap?

1. Time given (SPECIFY______) (RECORD AS 24 HOUR CLOCK – RECORD HOURS AND MINUTES)
2. Don’t Know
3. Refused

DD1cii How long was that for?

1. Hours given (SPECIFY______) TWO DECIMAL PLACES ALLOWABLE (EG 0.25, 1.5) (ALLOWABLE RANGE 0.25 TO 16) IF 2.5 OR MORE, DISPLAY “UNLIKELY RESPONSE, PLEASE CONFIRM”
2. Don’t know
3. Refused

Consequences

QC1 Have you EVER been involved in an accident where you were driving?
IF NECESSARY: That’s involved in an accident AS A DRIVER

1. Yes
2. No (GO TO QC3)
3. Don’t Know / Unsure
4. Refused

QC2 Has being tired ever contributed to your being involved in an accident?

1. Definitely
2. Probably
3. Possibly
4. No
5. Don’t Know / Unsure
6. Refused

QC3 Have you ever had a near miss that you think might have been because you were tired?

1. Yes
2. No
3. Don’t Know / Unsure
4. Refused
At what time did you next nap?
1. Did not have any other naps yesterday GO TO PREDD1di
2. Time given (SPECIFY______) (RECORD AS 24 HOUR CLOCK – RECORD HOURS AND MINUTES)
3. Don’t Know
4. Refused

How long was that for?
1. Hours given (SPECIFY:_______) TWO DECIMAL PLACES ALLOWABLE (EG 0.25, 1.5) (ALLOWABLE RANGE 0.25 TO 16) IF 2.5 OR MORE, DISPLAY “UNLIKELY RESPONSE, PLEASE CONFIRM”
2. Don’t know
3. Refused

Repeat DD1ciii and DD1civ for up to six naps.

Drives for Work

PREDD1d – IF DD1d=2 (DID NOT DRIVE YESTERDAY) GO TO PREDD3x. OTHERS CONTINUE.

IF S5=1 (DRIVES FOR WORK) CONTINUE, OTHERS GO TO DD1e

1. Excluding commuting to and from work was any of the driving you did yesterday as part of your job?
   1. Yes
   2. No (Skip to DD1e)
   3. Don’t Know / Unsure
   4. Refused

1. Excluding driving to get to work, at what time did you first drive as part of your job?
   1. Time given (SPECIFY______) (RECORD AS 24 HOUR CLOCK – RECORD HOURS AND MINUTES)
      IF HOURS=LESS THAN 6, DISPLAY “UNLIKELY RESPONSE – PLEASE CONFIRM”
   2. Don’t Know
   3. Refused

1. Excluding driving to leave work, at what time did you finish driving as part of your job?
   1. Time given (SPECIFY______) (RECORD AS 24 HOUR CLOCK – RECORD HOURS AND MINUTES)
      IF HOURS = LESS THAN 14, OR MORE THAN 22, DISPLAY “UNLIKELY RESPONSE – PLEASE CONFIRM”
   2. Don’t Know
   3. Refused

1. What type of vehicle were you driving for work? (MULTIPLES ACCEPTED)
   1. Car
   2. Motorbike
   3. Truck / Van
   4. Other (Specify______)
   5. Don’t Know / Unsure
   6. Refused

For the remainder of these questions we would like you to think about the driving you did EXCLUDING the driving you were doing as part of your job. So we want you to talk about your driving for personal and other reasons, including your driving to and from work. Excluding the work driving that you have already mentioned did you drive yesterday?
1. Yes
2. No (Skip to DD3a)
3. Don’t Know / Unsure
4. Refused

1. When you drove yesterday were you mainly driving a car or something else?
   1. Car
   2. Motorbike
   3. Truck / Van
   4. Other
   5. Don’t Know / Unsure
   6. Refused

1. What other types of vehicle did you drive yesterday?
   1. None
   2. Car
   3. Motorbike
   4. Truck / Van
   5. Other
   6. Don’t Know / Unsure
   7. Refused

Now I am going to ask you questions about the trips you made on (TODAY –1)

1. For the purposes of this diary we would like you to treat a trip as any time you drove somewhere and turned off your vehicle.
2. (IF NECESSARY, PROBE: Can you remember what you did in the morning / afternoon / evening / night, etc)
3. At what time did you first drive on (TODAY –1)?
   1. Time given (SPECIFY______) (RECORD AS 24 HOUR CLOCK – RECORD HOURS AND MINUTES)
      IF HOURS=LESS THAN 5, DISPLAY “UNLIKELY RESPONSE – PLEASE CONFIRM”
   2. Don’t Know
   3. Refused

1. What was the main reason for the trip? MULTIPLES ACCEPTED
   1. School / uni / college (to attend as student)
   2. Commuting to / from work
   3. Driving for work / as part of job
4. Visiting friends
5. Going out socially
6. To attend / play sport
7. Family outing / visiting relatives
8. Shopping or chores (incl dropping off others at school, prof. appointment)
9. Going home
10. Other (please specify)
11. Don’t Know / Unsure
12. Refused

DD3a.ii How long were you driving for?
1. Time given (SPECIFY_______) (RECORD HOURS AND MINUTES)
   IF HOURS = MORE THAN 3, DISPLAY “UNLIKELY RESPONSE – PLEASE CONFIRM”
2. Don’t know
3. Refused

DD3a.v Who was with you? MULTIPLES ACCEPTED
1. No-one
2. Partner
3. 1 Friend
4. 2 or more friends
5. Older family / relatives
6. Other family / relatives
7. Workmates
8. Other (please specify)
9. Don’t Know / Unsure
10. Refused

DD3a.vi What were you driving?
1. Car
2. Motorbike
3. Truck / Van
4. Other
5. Don’t Know / Unsure
6. Refused

DD3b.i What was the main reason for that trip? MULTIPLES ACCEPTED
1. School uni/college
2. Commuting to / from work
3. For work
4. Visiting friends
5. Going out socially
6. Sport
7. Family outing / visiting relatives
8. Shopping or chores
9. Going home
10. Other (please specify)
11. Don’t Know / Unsure
12. Refused

DD3b.ii How long were you driving for?
1. Time given (SPECIFY_______) (RECORD HOURS AND MINUTES)
   IF HOURS = MORE THAN 3, DISPLAY “UNLIKELY RESPONSE – PLEASE CONFIRM”
2. Don’t know
3. Refused

DD3b.v Who was with you? MULTIPLES ACCEPTED
1. No-one
2. Partner
3. 1 Friend
4. 2 or more friends
5. Older family / relatives
6. Other family / relatives
7. Workmates
8. Other (please specify)
9. Don’t Know / Unsure
10. Refused

PREDD3b If DD1f = MULTIPLE RESPONSE (DROVE MORE THAN ONE VEHICLE) CONTINUE, OTHERS
GO TO DD3b

DD3b.v What were you driving?
1. Car
2. Motorbike
3. Truck / Van
4. Other
5. Don’t Know / Unsure
6. Refused

PREDD3b If DD1f = MULTIPLE RESPONSE (DROVE MORE THAN ONE VEHICLE) CONTINUE, OTHERS
GO TO DD3b
4. Other
5. Don’t Know / Unsure
6. Refused

REPEAT UNTIL NO MORE TRIPS (LOOP FOR 10 TRIPS?)
IF NECESSARY END AT 9AM FOLLOWING MORNING

PREDD3x IF DD1d=1 (Drove yesterday), continue. Others go to PREDD3y

DD3x Thinking about the driving you just described doing on (TODAY - 1) would you say that was more, less or about average for you on a (TODAY - 1):
1. More
2. Less
3. Average
4. Don’t Know / Unsure
5. Refused

PREDD3y IF NUMBER OF TRIPS MORE THAN SIX CONTINUE, OTHERS GO TO DD4

DD3y I know that took some time, but we just need some information about your driving trips on one more day and then we’re done... We really appreciate the time you’re spending on this?
1. Continue with diary section (GO TO DD4)
2. Does not want to go through extra day

DD3z In that case just to finish the diary section could you please tell me what time you went to sleep on (TODAY - 2) night?
1. Did not sleep that night
2. Time given (SPECIFY______) (RECORD AS 24 HOUR CLOCK – RECORD HOURS AND MINUTES)
   IF HOURS = MORE THAN OR EQUAL TO 4 AND LESS THAN OR EQUAL TO 20 (IF WENT TO SLEEP AFTER 4:00 AM OR BEFORE 8:59 PM) DISPLAY “UNLIKELY RESPONSE, PLEASE CONFIRM”
3. Don’t Know
4. Refused

NOW GO TO D1

Day Before Yesterday

DD4 IF NECESSARY I know that took some time, but we just need some information about sleep and driving trips on one more day and then we’re done... We really appreciate the time you’re spending on this... Just thinking about the day before yesterday, that is (TODAY - 2)... What time did you wake up that morning?
1. Did not sleep
2. Time given (SPECIFY______) (RECORD AS 24 HOUR CLOCK – RECORD HOURS AND MINUTES)
   IF HOURS = MORE THAN OR EQUAL TO 4 AND LESS THAN OR EQUAL TO 20 (IF WENT TO SLEEP AFTER 4:00 AM OR BEFORE 8:59 PM) DISPLAY “UNLIKELY RESPONSE, PLEASE CONFIRM”
3. Don’t Know
4. Refused

NOW GO TO D1

DD4b What time did you go to sleep on (TODAY -2)?
1. Did not sleep
2. Time given (SPECIFY______) (RECORD AS 24 HOUR CLOCK – RECORD HOURS AND MINUTES)
   IF HOURS = MORE THAN OR EQUAL TO 4 AND LESS THAN OR EQUAL TO 20 (IF WENT TO SLEEP AFTER 4:00 AM OR BEFORE 8:59 PM) DISPLAY “UNLIKELY RESPONSE, PLEASE CONFIRM”
3. Don’t Know
4. Refused

DD4c Did you nap on (TODAY -2)?
1. No (GO TO PREDD4d)
2. Yes
3. Don’t Know / Unsure
4. Refused

DD4d What time did you (first) nap?
1. Time given (SPECIFY______) (RECORD AS 24 HOUR CLOCK – RECORD HOURS AND MINUTES)
2. Don’t Know
3. Refused

DD4dii How long was that for?
1. Hours given (SPECIFY______) TWO DECIMAL PLACES ALLOWABLE (EG 0.25, 1.5) ALLOWABLE RANGE 0.25 TO 16
   IF 2.5 OR MORE, DISPLAY “UNLIKELY RESPONSE, PLEASE CONFIRM”
2. Don’t know
3. Refused

DD4di At what time did you next nap?
1. Did not have any other naps that day GO TO PREDD4dii
2. Time given (SPECIFY______) (RECORD AS 24 HOUR CLOCK – RECORD HOURS AND MINUTES)
3. Don’t Know
4. Refused

DD4dv How long was that for?
1. Hours given (SPECIFY______) TWO DECIMAL PLACES ALLOWABLE (EG 0.25, 1.5) ALLOWABLE RANGE 0.25 TO 16
   IF 2.5 OR MORE, DISPLAY “UNLIKELY RESPONSE, PLEASE CONFIRM”
2. Don’t know
3. Refused

REPEAT DD4dii AND DD4d for up to six naps
Drives for Work

PRED: If DD4d=2 (Did not drive day before yesterday) go to DD5x. Others continue.
If SS=1 (Drives for work) continue, others go to DD4e.

DD4d Excluding commuting to and from work was any of the driving you did on (TODAY-2) as part of your job?
1. Yes
2. No (Skip to DD4e)
3. Don’t Know / Unsure
4. Refused

DD4dii Excluding driving to get to work, at what time did you first drive as part of your job?
1. Time given (Specify______) (Record as 24 hour clock – record hours and minutes)
   If hours = less than 6, display “unlikely response – please confirm.”
2. Don’t Know
3. Refused

DD4diii Excluding driving to leave work, at what time did you finish driving as part of your job?
1. Time given (Specify______) (Record as 24 hour clock – record hours and minutes)
   If hours = less than 14, or more than 22, display “unlikely response – please confirm.”
2. Don’t Know
3. Refused

DD4div What type of vehicle were you driving for work? (Multiples accepted)
1. Car
2. Motorbike
3. Truck / Van
4. Other (Specify______)
5. Don’t Know / Unsure
6. Refused

DD4div For the remainder of these questions we would like you to think about the driving you did EXCLUDING the driving you were doing as part of your job. So we want you to talk about your driving for personal and other reasons, including your driving to and from work. Excluding the work driving that you have already mentioned, did you drive on (TODAY-2)?
1. Yes
2. No (Skip to DD5x)
3. Don’t Know / Unsure
4. Refused

DD4e When you drove on (TODAY-2) were you mainly driving a car or something else?
1. Car
2. Motorbike
3. Truck / Van
4. Other
5. Don’t Know / Unsure
6. Refused

DD4f What other types of vehicle did you drive on (TODAY-2)?
1. None
2. Car
3. Motorbike
4. Truck / Van
5. Other
6. Don’t Know / Unsure
7. Refused

DD5a When you drove on (TODAY-2) were you mainly driving a car or something else?
1. Car
2. Motorbike
3. Truck / Van
4. Other
5. Don’t Know / Unsure
6. Refused

DD5ai Now I am going to ask you questions about the trips you made on (TODAY-2).
For the purposes of this diary we would like you to treat a trip as any time you drove somewhere and turned off your vehicle.
(IF NECESSARY, PROBE: Can you remember what you did in the morning / afternoon / evening / night, etc)
IF NECESSARY: I realise this took some time when we spoke about your driving trips from yesterday, but we just need some information about your driving trips on one more day and then we’re done....
We really appreciate the time you’re spending on this?
At what time did you first drive on (TODAY-2)?
1. Time given (Specify______) (Record as 24 hour clock – record hours and minutes)
   If hours = less than 5, display “unlikely response – please confirm.”
2. Don’t Know
3. Refused

DD5a What was the main reason for the trip? (Multiples accepted)
1. School / uni / college
2. Commuting to / from work
3. Driving for work / as part of job
4. Visiting friends
5. Going out socially
6. To attend / play sport
7. Family outing / visiting relatives
8. Shopping or chores
9. Going home
10. Other (please specify)
11. Don’t Know / Unsure
12. Refused
DD5aiii How long were you driving for?
1. Time given (SPECIFY_______) (RECORD HOURS AND MINUTES)
   IF HOURS = MORE THAN 3, DISPLAY “UNLIKELY RESPONSE – PLEASE CONFIRM”
2. Don’t know
3. Refused

DD5aiv Who was with you? MULTIPLES ACCEPTED
1. No-one
2. Partner
3. 1 Friend
4. 2 or more friends
5. Older family / relatives
6. Other family / relatives
7. Workmates
8. Other (please specify)
9. Don’t Know / Unsure
10. Refused

PREDD5av IF DD4f = MULTIPLE RESPONSE (DROVE MORE THAN ONE VEHICLE) CONTINUE, OTHERS
GO TO DD5bi

DD5av What were you driving?
1. Car
2. Motorbike
3. Truck / Van
4. Other
5. Don’t Know / Unsure
6. Refused

PREDD5av IF DD4f = MULTIPLE RESPONSE (DROVE MORE THAN ONE VEHICLE) CONTINUE, OTHERS
GO TO DD5bi

DD5bi At what time did you next drive?
1. Did not drive again / any more that day GO TO PREDD5x
2. Time given (SPECIFY_______) (RECORD AS 24 HOUR CLOCK – RECORD HOURS AND MINUTES)
3. Don’t know
4. Refused

DD5bii What was the main reason for that trip? MULTIPLES ACCEPTED
1. School uni/college
2. Commuting to / from work
3. For work
4. Visiting friends
5. Going out socially
6. Sport
7. Family outing / visiting relatives
8. Shopping or chores
9. Going home
10. Other (please specify)
11. Don’t Know / Unsure
12. Refused

PREDD5biv IF DD4f = MULTIPLE RESPONSE (DROVE MORE THAN ONE VEHICLE) CONTINUE, OTHERS
GO TO DD5bi

DD5biv What were you driving?
1. Car
2. Motorbike
3. Truck / Van
4. Other
5. Don’t Know / Unsure
6. Refused

REPEAT UNTIL NO MORE TRIPS (LOOP FOR 10 TRIPS?) IF NECESSARY END AT 9AM FOLLOWING MORNING

PREDD5x IF DD4d=1 (DROVE DAY BEFORE YESTERDAY) CONTINUE. OTHERS GO TO DD6

DD5x Thinking about the driving you just described doing on (TODAY -2) would you say that was more, less or about average for you on a (TODAY -2).
**Demographics**

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<th>D1</th>
<th>And a final few questions just to help us make sure that we have spoken to a good range of RACV members and customers</th>
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<td>D2</td>
<td>RECORD SEX OF RESPONDENT</td>
</tr>
<tr>
<td>1</td>
<td>Male</td>
</tr>
<tr>
<td>2</td>
<td>Female</td>
</tr>
<tr>
<td>D3</td>
<td>Are you studying?</td>
</tr>
<tr>
<td>1</td>
<td>Yes (READ OUT)</td>
</tr>
<tr>
<td>2</td>
<td>No (READ OUT)</td>
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<tr>
<td>D4</td>
<td>What type of study are you doing?</td>
</tr>
<tr>
<td>1</td>
<td>University</td>
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<tr>
<td>2</td>
<td>Trade, TAFE or technical qualifications</td>
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<tr>
<td>3</td>
<td>Secondary</td>
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<tr>
<td>4</td>
<td>Other (Specify)</td>
</tr>
<tr>
<td>D5</td>
<td>Which of these best describes your living situation?</td>
</tr>
<tr>
<td>1</td>
<td>Living with parents</td>
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<tr>
<td>2</td>
<td>Living with friends</td>
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<td>3</td>
<td>Living in a shared house</td>
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<tr>
<td>4</td>
<td>Living alone</td>
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<td>5</td>
<td>Living with partner</td>
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<tr>
<td>6</td>
<td>Living with other family members</td>
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<tr>
<td>7</td>
<td>Other (Specify)</td>
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<tr>
<td>D6</td>
<td>What postcode do you live in?</td>
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<td>2</td>
<td>Edit (Record Number)</td>
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**End**

Thank you for participating in this survey. Just in case you missed it, my name is (...). From the Social Research Centre, Ten per cent of my work is checked by my supervisor; so just in case they need to call you back to verify your participation, I may record your first name please.

| 1  | Yes (Record First Name for Validation Purposes) |
| 2  | No |