

# **Fatigued Driving in Urban Areas: The Role of Daily Activities**

Warren A Harrison  
Eastern Professional Services Pty Ltd.

## **ABSTRACT**

Fatigued driving was investigated using a telephone survey followed by small discussion groups using participants recruited from among survey participants based on their responses to fatigue-related items. The surveys and discussion groups were conducted in suburban areas of Sydney (in the outer west, the Hills district, and southern suburbs), Tamworth, and Newcastle. The results of both the surveys and the discussion groups suggested that day-to-day activities are an important factor in fatigued driving, and that fatigued drivers in urban areas continue to drive despite their awareness of both their fatigue and its potential consequences. The relevance of the results for countermeasure development are discussed.

## **INTRODUCTION**

This paper is based on the results of a study commissioned by the National Roads and Motorists' Association Ltd (NRMA) to extend our understanding of fatigue and tiredness amongst drivers, with a focus on the experiences of fatigue and drivers' understanding of the precursors to fatigue. The study was conducted in the broader context of general recognition that fatigued driving is a serious road safety problem (eg. Connor et al., 2001; Desmond and Matthews, 1997; Sagberg, 1999). The study is described fully in Harrison (2001).

This study used a telephone survey method to collect some initial data on fatigue and driving, and then used a series of discussion or focus groups to collect more-detailed information from drivers. This two-stage method was used as it was expected to provide a good balance between quantitative information about driver fatigue and qualitative information about experiences with fatigue and driving.

## **TELEPHONE SURVEY**

The telephone survey was conducted to collect quantitative data about tiredness and driving, and to recruit potential participants for the discussion group phase of the study.

### **Method**

The telephone survey was conducted using telephone numbers randomly selected from all listed telephone numbers in postcode areas selected for inclusion in the discussion groups (Sutherland, Penrith, the Hills area, Liverpool, and Tamworth (in rural NSW)). Details of the survey method are provided in Harrison (2001).

The total sample was composed of 426 participants, with an average refusal rate across locations of 37%. The survey included items relating to demographic information, tiredness in general, driving-related tiredness, and sleep patterns. It also included a request for participants to agree to taking part in a small discussion group. The limited space available here has necessitated restricting the focus of the paper to a subset of the results, and results of statistical tests are not reported here. All reported differences and relationships were statistically significant at  $p < .05$  using appropriate statistical techniques.

### **Results**

Details of responses to fatigue, lifestyle, and demographic items are provided in Harrison (2001). Seven items in the survey related to driving and fatigue. Respondents were asked to rate their tendency to suffer from tiredness while driving, relative to other drivers in general, on a four point scale (much less often, less often, more often, much more often). The majority of respondents (87% of those who responded to the item) indicated that they were less likely or much less likely to suffer from tiredness while driving compared to others. Drivers who drove as part of their occupation were more likely to report that they suffered from tiredness relatively often while driving than were other drivers. Respondents in the 21-30 and 41-50 year age groups were the most likely to rate themselves as relatively more likely to be tired when driving, and drivers in the 51-years-and-over age group were the least likely. Drivers who believed they were more likely than others to suffer from tiredness while driving reported that they spent longer driving on an average weekday (3.1 hours) than those who believed they were much less likely (1.2 hours) or less likely (1.3 hours).

Respondents reported that they felt tired while driving a mean of 2.3 times in the preceding month. 189 respondents admitted to feeling tired while driving at any time in the preceding month. Self reported instances of tiredness while driving were not significantly related to sex or place of residence. Respondents aged 51 years or over reported less instances of driving while tired (a mean of 0.3 instances) than did drivers in the 16-20, 21-30, and 31-40 year age groups (means of 4.7, 2.9, and 3.1 instances respectively). Respondents who drove as

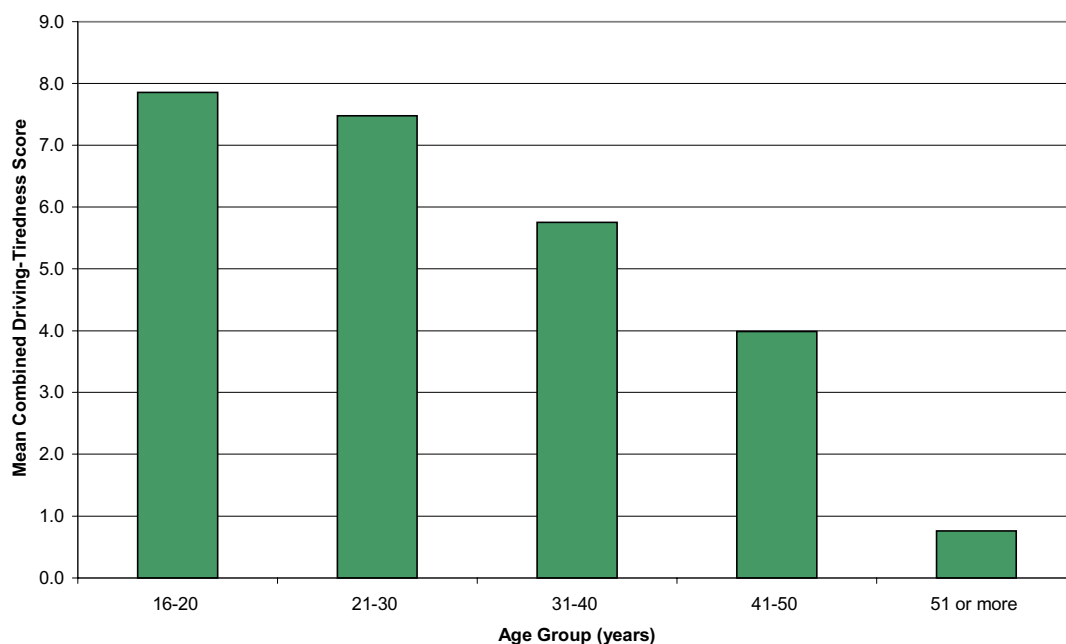
part of their occupations reported significantly more instances of driving while tired (mean of 4.9) than did other respondents (1.6 instances).

Respondents reported a mean of 1.0 instances of finding it difficult to concentrate when driving as a result of tiredness in the preceding month. Tiredness-related concentration problems were reported more often by males (a mean of 1.3 instances) than females (0.7 instances), and were more likely to be reported by those who drove for a living than others (2.2 and 0.7 instances respectively). Respondents aged 21-30 years of age reported more instances of this than those aged 16-21 years and 51 years or more.

Only 60 respondents admitted to making mistake while driving because they felt tired in the preceding month. The mean number of mistakes reported by drivers aged 51 years or more (0.1 instances) was significantly lower than those reported by 21-30 and 31-40 year olds (0.9 and 0.8 instances respectively). Respondents reported that they felt drowsy while driving a mean of 0.7 times in the preceding month. Eighty-eight respondents admitted to feeling drowsy while driving over this time period. Males reported more instances of drowsiness while driving than females (means of 1.0 and 0.4 respectively), and respondents who drove as part of their occupation reported more instances of drowsiness than other respondents (means of 1.2 and 0.6 respectively).

Fifty-eight drivers admitted to needing to stop driving in the preceding month as a result of tiredness. The mean across the sample was 0.3 instances of this. Men, and those respondents who drove as part of their occupation, were more likely to have to stop than females or other respondents respectively. Only seven respondents indicated that they had fallen asleep while driving in the preceding month.

Responses to the driving-tiredness items were combined to create a single measure of tiredness and driving for further analysis. Responses to the driving-tiredness items discussed above were summed for each respondent, and the sum then used as a measure of the amount of driving-related tiredness experienced by respondents for further analysis. Males recorded higher combined driving-tiredness scores than females (6.3 and 3.6 respectively), and respondents who drove as part of their occupation recorded higher scores than other respondents (10.4 and 3.3 respectively). The combined driving-tiredness score was significantly associated with age group, as is shown in Figure 1.



**Figure 1: Combined Driving-Tiredness Score by Age Group**

A multiple-regression analysis was performed to assess the combined relationship between potential predictors and the combined tiredness score. The results of this analysis are presented in Table 1. The multiple regression analysis was conducted by including all potential predictors into the analysis in one step. There was a significant relationship between the predictors and the criterion ( $R = .66$ ,  $F_{(18,407)} = 17.2$ ,  $p < .05$ ), predicting 41% of the variance in the combined score ( $adjusted R^2 = .41$ ). Tiredness while driving (as measured using the combined score) was associated with higher levels of driving, fewer long trips, sleepiness in the afternoon, falling asleep early, getting insufficient sleep, fewer instances of waking early, being aged between 21 and 50 years of age, and living in a rural area.

**Table 1: Results of the Multiple Regression Analysis**

<b>Term</b>	<b>Coefficient<sup>1</sup></b>	<b>SE</b>	<b>p</b>
<b>Intercept</b>	<b>-10.87</b>	2.84	0.0001
<b>Driving time on an average weekday</b>	<b>2.40</b>	0.24	<0.0001
<b>Number of long trips in 2 months</b>	<b>-0.15</b>	0.06	0.0106
<b>Instances of sleepiness in the afternoon in 2 weeks</b>	<b>0.30</b>	0.07	0.0001
<b>Instances of falling asleep before going to bed in 2 weeks</b>	<b>0.42</b>	0.11	0.0003
Number of late nights out in the preceding month	0.10	0.08	0.2156
<b>Instances when sleep was insufficient</b>	<b>0.19</b>	0.04	<0.0001
<b>Instances of waking before 6 a.m. in preceding month</b>	<b>-0.08</b>	0.03	0.0245
Age between 16 and 20	2.63	1.53	0.0866
<b>Age between 21 and 30</b>	<b>5.77</b>	1.27	<0.0001
<b>Age between 31 and 40</b>	<b>4.54</b>	1.12	<0.0001
<b>Age between 41 and 50</b>	<b>3.37</b>	1.30	0.0099
Drive as part of occupation	0.97	1.17	0.4092
Male	1.75	0.90	0.0537
Resident in Hills area	3.01	2.72	0.2686
<b>Resident in Tamworth area</b>	<b>6.11</b>	2.70	0.0244
Resident in Sutherland area	2.27	2.83	0.4234
Resident in Liverpool area	4.03	2.93	0.1700
Resident in Penrith area	5.14	2.75	0.0621

### **Discussion**

The key advantage of a multiple-regression analysis is that it assesses the predictive validity of a number of variables in the context of the predictive validity of other variables. A number of general results are worth noting:

- Driving fatigue may not be closely associated with a history of long driving trips. While these may induce fatigue at the time (perhaps especially for inexperienced long-distance drivers), experience with relatively high levels of longer-distance driving appears to be associated with lower levels of driving-related tiredness or fatigue.
- General tiredness is associated with tiredness when driving. Insufficient sleep, sleepiness, and falling asleep early are associated with tiredness while driving. While this is not surprising, it does offer an opportunity to target messages about fatigued driving to people who are tired for other reasons, and may offer a way for people to predict their own problems with tiredness while driving.
- Fatigued driving appears to be more of a problem for people aged between 21 and 50 rather than younger drivers. It is also not significantly associated with either sex, suggesting that the key decisions about targets may be able to ignore sex and focus on age – although there are reasons to believe (see later) that the reasons for fatigued driving depend strongly on lifestyle and so may differ for males and females.

### **DISCUSSION GROUPS**

The discussion groups were included in the study to collect more-detailed information about personal experiences of fatigue than would have been possible in a less-flexible telephone survey.

### **Method**

Participants for the discussion groups were recruited through the telephone survey. Initial agreement to be contacted was obtained from 79 survey respondents. A total of 43 people were recruited to take part in the six discussion groups. All groups included younger and older participants. The youngest group participant in the study was 20 years of age. The oldest was 72 years of age. Participants had a variety of backgrounds. Each group included at least two group members who were mothers of children or young teenagers, and each group

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<sup>1</sup> Coefficients that reflect statistically significant predictors are presented in bold-face.

included both full-time and part-time employees. The discussions were recorded and reviewed after each session.

### **Results and Discussion**

Each group commenced discussion of the driving fatigue issue by discussing who gets fatigued. The broad pattern of responses to this issue commenced with some discussion of long distance drivers and truck drivers, and then moved on to focus on tiredness and fatigue as every day issues. This pattern was common across groups.

*"I must be a subspecies or something. I get the kids ready for school, drive them there, have to fit 10 hours of work into 5 hours. You go flat out. I'm sure I'm not the only person who does this. No lunch, no afternoon tea. By the time you have to go out and get the kids you're exhausted, just exhausted. All you want to do is go to bed."*

After some discussion of tiredness in the context of daily activities, one group member commented:

*"I have never thought about fatigue in a daily sense. My friends talk about doing distance driving but never short distance problems."*

The theme of motherhood-related tiredness was raised in all groups (without prompting). Participants who were also mothers commented often about the stresses and fatigue associated with this role. These concerns appeared to relate to the time pressures associated with running a household and the need to manage a busy sequence of activities to meet the day-to-day commitments of both their children and themselves.

*"I haven't slept one night all the way through in the last 9 years because of my kids. I would have averaged about 4 hours every night. How do you help mothers who are chronically fatigued?"*

*"I think young mothers. When I was getting up through the night there were times when I had to get my mum to come down and drive me places because I felt really really tired."*

There was general recognition across the groups that parenting required driving, and that choosing to put off a trip or to cancel an event is not an acceptable option:

*"We have to drive every day, and it's hard."*

*"It's alright on a holiday trip to stop and have a rest, but it's impossible to do that on a daily basis or late at night on the way home from somewhere."*

Tiredness relating to social activities was raised as a concern in all groups, especially by parents of children who appeared to place some value on being able to make the best of limited access to opportunities to socialise:

*"We go out and we want to make the best of it, but it's always the wife who has to drive home even when you're really exhausted. You make noises like you really want to leave because you know your going to have trouble staying awake on the way home, and you just have to go home. It's not like you can stay over when you've got a babysitter to look after."*

*"I play cards with some girlfriends once a month make a point of driving on roads where there are traffic lights and things to keep me awake. Straight roads are dangerous."*

*"You just have to drive. If we go out and have to go home at 2 a.m., you still have to drive. You're not going to stop."*

Work was discussed in all groups as a contributor to general levels of fatigue that had an effect on driving on a day to day basis:

*"I do contract work and do a lot of racing around and I did have an accident that was caused by stress and exhaustion. Since then I've woken up a bit and try to slow down a bit more with my work"*

*"My brother once worked for 24 hours straight without any stops and on the way home he had to stop three times because he almost fell asleep."*

*“I’m always running around and I feel tired as soon as I sit down and relax. Often this happens in the car because sitting in the car can be the first time I relax after work.”*

Groups were asked to discuss how they can recognise fatigue in themselves – what some of the precursors or signs might be that could be used to advise others about recognising the problem. Some people looked to external cues or situational cues for guidance about how tired they might be, and attempted to modify their behaviour accordingly:

*“When I’ve been really busy then I know I’ll have problems.”*

*Driving into the sun after work. It’s warm, you’ve switched off from work. You can’t help but feel exhausted.”*

*“I know if I’ve had a long day at work that I’ll be tired on the way home.”*

Most commonly, participants noticed reductions in their ability to concentrate or to make decisions and took these (and other internal cues) as warning signs:

*“When your eyes keep wanting to close. I had that happen on a long trip – even after a good night’s sleep.”*

*“Starting to yawn – it’s not enough to make me stop, though.”*

*“I start to fidget with things on the dashboard.”*

Groups were asked to discuss what they did to minimise the negative effect of tiredness on their driving, and to share any ideas they had heard about from friends or relatives. There was a consistent tendency amongst groups to accept that tiredness is unavoidable in some situations and that there are no viable, alternative options but to continue on regardless of fatigue levels:

*“People do get in the car tired – like after the football – you have to go home and there is no way people will decide not to drive.”*

*“It’s OK for me to stop and rest, but if you’ve got kids or something you just need to keep going.”*

*“The problem is that you still have to drive.”*

*“Everyone’s exhausted, but you still have to drive your kids to school and sport and all the other things you have to do.”*

The option of not undertaking trips when tired was discussed in all groups, with mixed responses. Some participants thought there were occasions when it was possible to change plans to reduce the danger associated with fatigue, but others were less positive (as noted earlier):

*“Sometimes I mention to my friends that I might have a sleep in the car before heading home and they tell me it’s not safe to do that and that I’d be safer going home.”*

Discussion drifted towards public education programs and advertising in each group, as these were widely seen as the most likely way to deal with fatigue. There was a widespread, negative response to recent fatigue-related advertising, and some of the criticisms probably apply to road safety advertising in general:

*“Ads are also unrealistic – they use the same people and no-one is going to take this type of ad realistically.”*

*“They’re just so make-believe.”*

*“None of the ads talk about how exhausted I am all the time – they always have a family or something going on a long trip.”*

## **GENERAL DISCUSSION**

The results of the study underscore the potential importance of day-to-day activity and lifestyle on fatigued driving. The multiple-regression analysis of the survey results suggested that the best predictors of a combined

measure of fatigued driving were driving exposure, age, and lifestyle-related measures such as measures of general tiredness. The discussion groups supported this, with general agreement in all groups that general day-to-day activities such as work, social activities, and parenting responsibilities were the main contributor to tiredness while driving. Although group discussions all included some focus on holiday-related driving and long-distance work-related driving as sources of fatigue, the focus on lifestyle-related tiredness was stronger. This is an important result and provides some definite direction for fatigue-related programs that is consistent with some earlier literature

The survey results and the information obtained in the group discussions suggests that the following points need to be considered in applying the results of this study to practical road safety programs:

- Some drivers (and perhaps many in the broader community) are unable to recognise the cognitive signs of tiredness (reduced concentration etc) and believe that “heavy eyes” and falling asleep are the first signs they can notice.
- Driving is an essential activity for most in the community, and the day-to-day lifestyle factors that appear to be associated with fatigued driving are also factors that necessitate continued driving. Thus, any message that suggests restricting driving activity when fatigue is an issue is likely to be disregarded and potentially viewed as irrelevant or unrealistic.
- The emphasis in the group discussions on the day-to-day activities of mothers and related tiredness suggests that it may be useful to target public education programs concerning fatigued driving through community organisations that serve the needs of parents – such as health centres and schools.

There are some implications of the results presented here and other considerations that are somewhat more speculative. There is no doubt that lifestyle and day-to-day demands contribute to a fatigued driving problem in urban areas that is not currently being addressed. The unprompted shift in discussion towards this issue in the group discussions indicates that drivers perceive there to be a fatigue problem here. That this shift in discussion occurred in every group within a broader context in which fatigued driving is widely advertised as a long-distance driving problem underscores the potential importance of urban fatigue as a safety issue.

Fatigue is not currently an issue that can be effectively targeted by enforcement measures, and engineering options (such as ITS technologies that detect and react to fatigue) are distant possibilities. The only option available to road safety practice in this context is education in some form. The challenge is to find some way to modify behaviour using educational tools without causing some form of resistance to the general message that there is a fatigue problem for urban drivers. It is important to note that attitude change should not be viewed as a target for an educational program for urban fatigued driving. Apart from the current (and past) debate about the weak relationship between attitudes and behaviour, in this case it is already clear that drivers are not happy with having to drive when fatigued. Group discussion participants were consistent in their negative attitude towards fatigued driving – they were unable, however, to see a practical way of changing their behaviour. An attitude-oriented campaign is unlikely to have an effect on behaviour.

The development of behavioural goals will need to recognise the resistance of drivers to a message that suggests they should not drive when fatigued. Drivers in the discussion groups perceived a strong need to drive (to meet their lifestyle demands) regardless of their state at the time. Any education program therefore will need to incorporate behavioural goals such as planning to reduce driving exposure at high-fatigue times, and will need to take a harm-minimisation approach to the likely reduction in driving skill at high-fatigue times. It is therefore suggested that any public education campaign directed towards urban fatigued driving should promote harm minimisation, aiming to make fatigued driving safer (but undesirable) rather than attempting to make it unacceptable.

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