

## Tired of Raising Awareness of Driver Fatigue? Push On.

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### ABSTRACT

Countermeasures for non-commercial driver fatigue in NSW often involve the development and implementation of public education campaigns. The current study involved a telephone survey of the knowledge, attitudes and self-reported behaviours to driver fatigue of 1000 licence holders in NSW. The research was conducted to provide future strategic directions for driver fatigue policy and public education in NSW. Basic analyses of results, as well as more complex statistical analyses are presented. These revealed the importance of attitudes to driver fatigue (including perceptions of its seriousness) as well as situational factors to self-reported driver fatigue behaviour. The more complex analyses lead to the creation of a driver behaviour index, the creation of four clusters or types of fatigued driver and path analyses to quantify the relationship of perceptions of the seriousness of driver fatigue with attitudes and behaviour. Implications of the study include the likely benefits of further increasing the perceived seriousness of driver fatigue and decreasing its social acceptability. It also notes the importance of considering reasons that some groups of drivers give for pushing-on when tired and their general resistance to breaks. The study gives useful data on the most salient warning signs for driver fatigue and indicates community support for the creation of an offence of driving while fatigued.

### INTRODUCTION

Fatigue is a general term commonly used to describe the experience of being 'sleepy', 'tired' or 'exhausted'. Driver fatigue is a significant cause of road trauma and results in around 94 deaths and over 2000 injuries in NSW every year. However, unlike the other major causes of road trauma, including speeding, drink driving and the failure to wear a seatbelt, driving while fatigued is not the result of clearly defined causes or associated with clearly articulated legal consequences.

The causes of driver fatigue are numerous and interact in complex and little understood ways. Factors that affect a person's fatigue level include; time of day, sleep loss, time spent awake, time spent performing a task, nutrition and environmental factors. Countermeasures to driver fatigue are correspondingly difficult to formulate. In addition, fatigue per se is unavoidable; our bodies have limited capacity and require us to sleep every night.

Other obstacles to designing effective fatigue countermeasures include the lack of explicit legislation or enforcement of driving while fatigued. For non-commercial drivers the legal sanctions that may be applied to fatigued drivers (other than a general offence such as negligent driving) are limited to possible licence suspension on medical grounds as a result of a driver falling asleep at the wheel. It is doubtful that this acts as a deterrent to a person continuing to drive while fatigued. The lack of a specific offence for driving while fatigued is mainly due to the difficulty of designing, detecting and enforcing a relevant offence.

As such, and in contrast to policies that aim to deter driving over the speed limit or consuming alcohol through the threat of sanctions, policy directed at driver fatigue may be most effective when focused on the management of driver fatigue.

For these and other reasons, a review of policy instruments available to address non-commercial driver fatigue usually recommends public education to educate and persuade drivers to self-regulate and manage their fatigue.

In NSW, the current 'Dr Karl' driver fatigue public education campaign, focuses on raising the seriousness of driver fatigue and giving drivers the capacity to manage their fatigue. This is achieved by educating drivers on the warning signs for driver fatigue and providing them with rational/emotional demonstrations of the danger of ignoring these signs. Other campaign elements include providing scientific information to demystify driver fatigue.

## AIMS

The current paper is concerned with the current status of the NSW public's relationship with driver fatigue and draws on the results of a larger survey on the knowledge, attitudes and self-reported behaviours to driver fatigue of 1000 NSW drivers conducted in 2006. This survey was designed by the Roads and Traffic Authority (RTA) and *Ipsos Australia* who conducted the survey under contract to the RTA. This paper will:

- Present useful top line findings from the survey including:
  - the prevalence of driver fatigue.
  - countermeasures currently employed by drivers to manage fatigue, both prior to and during a long trip.
  - the most salient warning signs for driver fatigue and the likelihood of taking rest breaks on experiencing these.
  - drivers' understanding of the causes of driver fatigue.
  - attitudes to legislation to combat driver fatigue.
- Present and discuss the results of more complex analysis of survey responses for those seeking to understand the root causes of driver fatigue attitudes and behaviour.

## METHODOLOGY

A 20 minute questionnaire was designed and tested in cognitive testing workshops to ensure respondents understood question meaning and response categories. Computer assisted telephone interviewing (CATI) was conducted in March 2006. This involves the interviewer reading questionnaire items from a computer screen to respondents via the telephone and entering responses into a computer. Respondents formed a randomly selected sample of 1000 NSW licence holders aged 17-79. Data were weighted to be representative of the NSW licensing holder population.

### *Data Analysis*

Basic analysis was conducted on the responses of key groups throughout the report. These groups were defined by demographic, behavioural or attitudinal factors and significant differences were detected at an alpha set to 0.05. Wherever possible multiple regression has been used to exclude the effects of confounding variables on the results presented. The key target group (identified from crash data) was males aged 17-49.

Factor analysis was conducted on 20 attitudinal items using SPSS and applying varimax rotation to factors with an eigenvalue greater than one. Cluster analysis (using the k-means routine) was also performed based on factors developed from the factor analysis.

A driver behaviour index score out of 100 was created from all behavioural items in the survey to provide a single summary measure of each individual's self-reported behaviours in relation to driver fatigue. The higher the score the more likely a driver is to engage in risky behaviours and the less likely they are to take steps to prevent fatigue.

Finally, path analysis was conducted to assess the strength of relationships between the perceived seriousness of driver fatigue and attitudes to driver fatigue on actual behaviours related to driver fatigue.

## RESULTS

### *Extent of fatigue driving*

NSW drivers reported that they spend an average of 12.3 hours driving each week. Males aged 17-49 drive more often than average (15.1 hours per week) and more often during 10pm to 6am.

Driving when tired is fairly common for NSW drivers. Sixty percent said they have driven when quite tired on either a long trip or a short trip in the last 12 months. Those who drove when tired on long trips were more likely to be younger (17-49) and male (57 per cent had driven while tired on a long trip in the last 12 months). They were also more likely to live in rural areas.

Those who drove when tired on short trips were more likely to be younger, but males and females were equally likely to drive when tired on short trips. Blue collar workers were more likely to drive while fatigued on both long and short trips.

Fifty seven percent of the sample thinks they have had a microsleep while driving and 7 per cent say they have had a crash because of fatigue.

### *Understanding of the causes of fatigue*

Most drivers (71%) spontaneously mentioned sleep debt as a significant contributor to driver fatigue. Factors such as length of time spent driving (32%), not taking rest breaks (26%) and drinking alcohol before driving (22%) were other commonly mentioned causes.

The other major sleep factors that contribute to fatigue- sleep inertia, circadian rhythms and hours of wakefulness, were mentioned by fewer (15 per cent or less for each factor) respondents. However, those aware of RTA advertising (which incorporates circadian rhythms) were twice as likely to mention circadian rhythms as a cause of fatigue.

### *Actions Taken to Avoid Fatigue*

The most common action taken to avoid driver fatigue before a long trip was to get a good night's sleep. This was spontaneously mentioned by three quarters (75%) of the sample. Other elements of the sleep and wake cycle are less likely to be mentioned. Other common pre-trip responses included; a good meal before the trip (30%), setting a realistic schedule (18%) and taking water and snacks (16%). There were no significant differences based on age or gender for these relationships.

During the trip, the main fatigue avoidance strategy employed was to take regular breaks (45%). However, less effective measures for fatigue management persist and included; turning on music (29%) or opening the window / turning on air conditioning (18%). It was primarily younger drivers (the core target aged 17-49) who used these strategies.

### *Rest Breaks*

The primary factors that determine when and where drivers take breaks on long journeys mainly fall into three categories: 'time based' - e.g. when have been driving for a set period of time (45%), 'needs based' - toilet/food etc (44%) or 'fatigue based' - when tired/noticing the early warning signs of fatigue (30%). Thirty five percent of drivers said they would take a break every 2 hours or less.

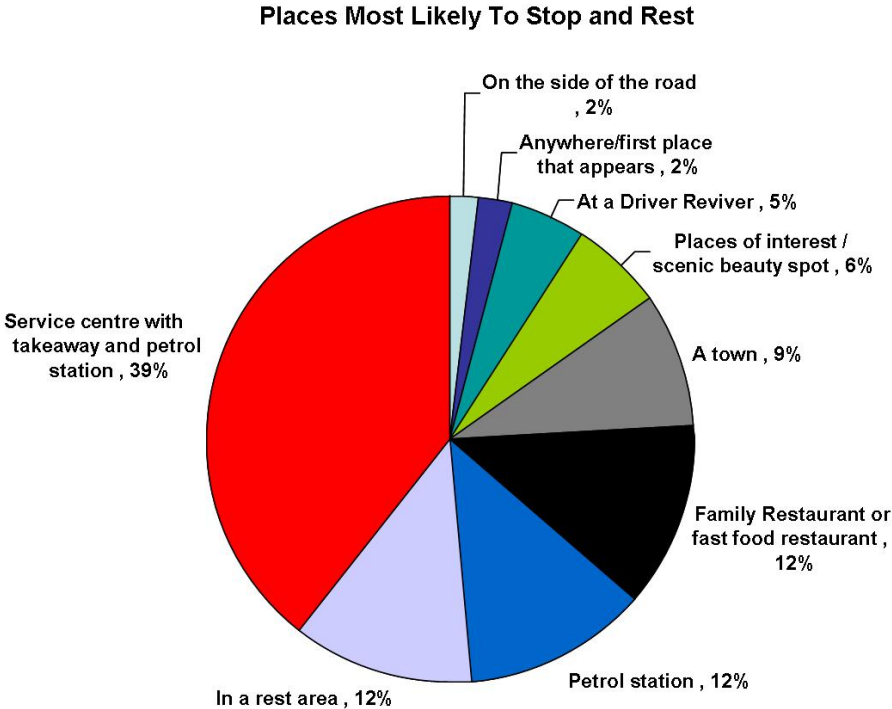
Other factors influencing when breaks were taken were finding a suitable location (23%), and the influence of other passengers in the car (12%).

Older drivers were more likely than average to nominate a set period of time (56% vs 45%) and younger drivers were more likely than average to nominate symptoms of driver fatigue (34% vs 30%) as the reason for taking a break.

The average length of a break was 27 minutes, those with worse fatigue related behaviours (as measured by the driver behaviour index) tended to take shorter breaks.

Figure 1 below shows that drivers were most likely to stop and rest at a service centre where there is both a take away and petrol station (39% on average and 47% for males 17-49), rest areas, petrol stations and family/fast food restaurants were the next most common mentions (12% each).

Figure 1. Places drivers are most likely to stop.



### *Reasons for not taking rest breaks*

Drivers were asked if there are situations they would not stop and rest when feeling fatigued, other than for an emergency, 45 per cent of drivers gave some reason to drive while fatigued, these included:

- Deadlines to meet (17%), wanted to reach destination at a reasonable hour (4%) (more likely to be male)
- “Pushing on” - not far from next town (13%), to get journey over with (4%) (more likely to be male)
- Safety - didn’t feel safe stopping (8%) (more likely to be female)
- Nowhere to stop (7%)

Drivers were also asked to indicate the extent to which they agreed with statements about driver fatigue, 42 per cent agreed to “pushing on” when tired by trying to make it to the next town before stopping, 43 per cent agreed to keeping driving when within an hour of home. Minimising the number of stops on a long trip was not as common (27%) nor were the numbers who weren’t prepared to pull over on a short trip when tired (23%).

### *Awareness and sensitivity to fatigue warning signs*

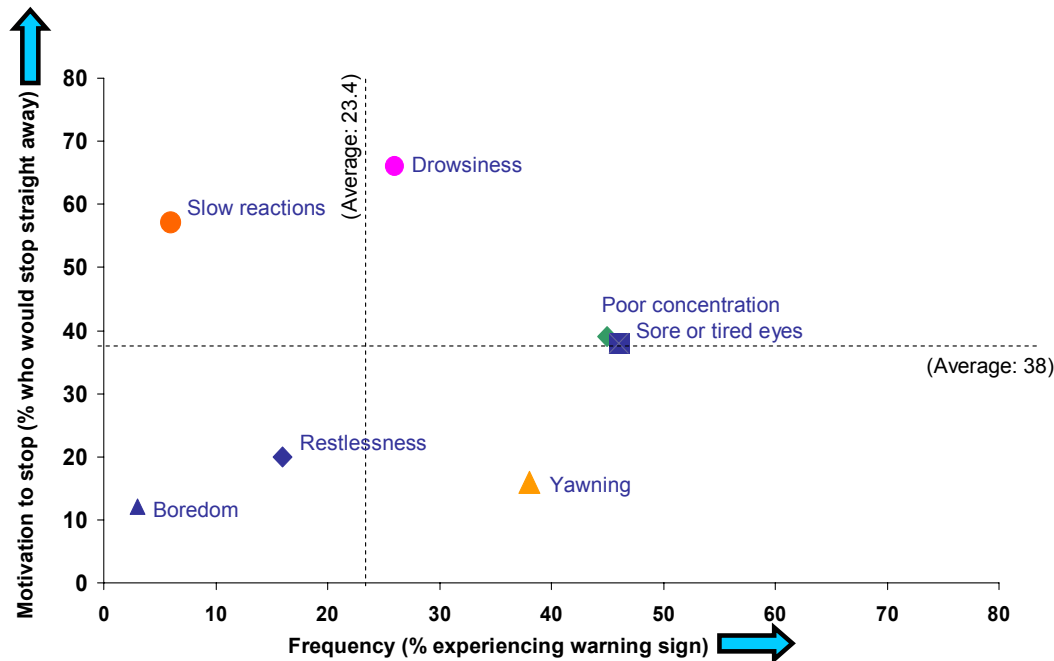
RTA has incorporated eight major warning signs for driver fatigue as part of educational campaigns since 2001. These are: yawning, poor concentration, tired or sore eyes, restlessness, drowsiness, slow reactions, boredom and oversteering.

The fatigue warning signs that drivers most commonly experienced were sore or tired eyes (46%), poor concentration (45%), yawning (38%), and drowsiness (26%). Restlessness (17%) was less frequently mentioned and difficulty staying in lanes, slow reactions and boredom rarely mentioned (7% or less).

Over 80 per cent of drivers would stop when experiencing any one of the following; drowsiness, slow reactions, oversteering, poor concentration or sore/tired eyes indicating that these warning signs are recognised by most as indicators of fatigue. Restlessness and yawning were less likely to prompt drivers to stop (two thirds say they would stop) and much less likely to motivate drivers to stop immediately. Only 47 per cent say they would stop when bored.

Figure 2 below shows the relationship between the percentage of drivers who had experienced each warning sign and the percentage of drivers who would stop immediately when experiencing that sign. This figure suggests that those symptoms in the top-right quadrant are the most salient warning signs for driver fatigue.

Figure2: Frequency of experiencing and motivation to stop associated with each warning sign for driver fatigue.



The likelihood of stopping straight away when experiencing a specific warning sign varied considerably. However, the reasons drivers gave varied little by each sign. The major reasons were that drivers did not see the signs as serious enough to warrant stopping (39%) or didn't see them as indicating they were tired (21%).

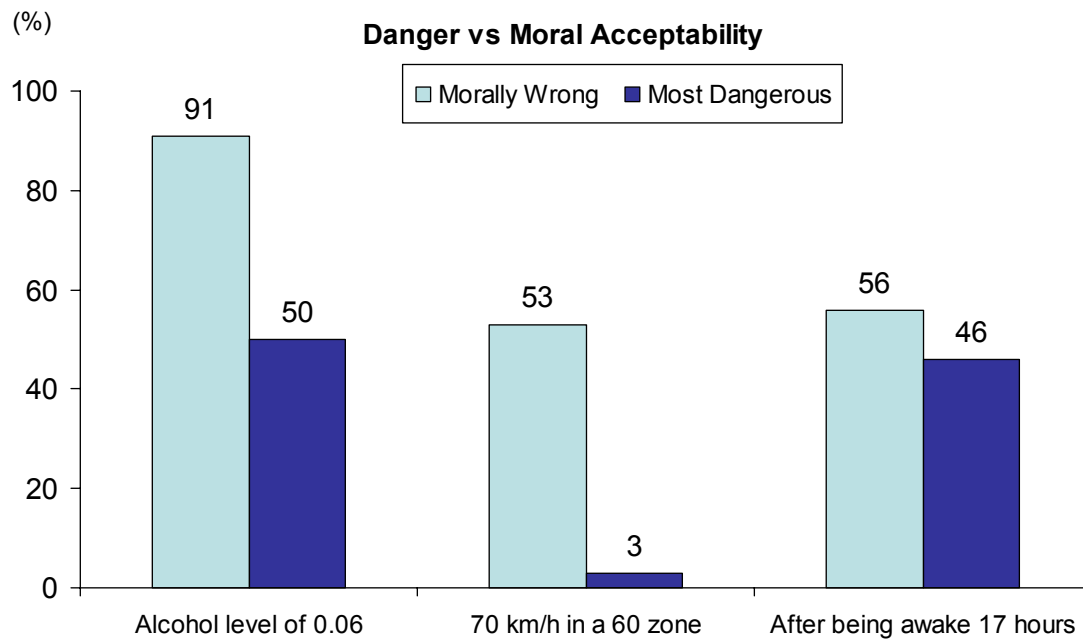
#### *Seriousness, dangerousness and acceptability of driver fatigue*

The perception of the seriousness of driver fatigue by NSW drivers has increased by over 33 per cent from 2001 – 2006. In 2001, 47 per cent and in 2006, 63 per cent of respondents gave driver fatigue a seriousness score of 9 or 10 out of 10.

Respondents were asked to rank-order the dangerousness of three specific behaviours (driving after being awake for 17 hours, driving with a BAC of 0.06 and driving at 70 km/h in a 60 zone). Figure 3 below shows that driving after being awake for 17 hours and driving with a BAC of 0.06 were rated as the most dangerous behaviour by a similar number of respondents.

However, whereas most drivers (91%) regarded driving with an alcohol level of 0.06 as morally wrong only 56 per cent regarded driving after being awake for 17 hours as morally wrong.

Figure 3 Danger vs. Moral acceptability of three driving behaviours.



Those who regarded ‘driving after being awake for 17’ hours as morally wrong were significantly less likely to have negative driving behaviours, even when controlling for potentially confounding factors such as age, sex and driving characteristics.

#### *Attitudes to legislation targeting non-commercial driver fatigue*

The majority of drivers were generally positive towards possible legislation against driving while fatigued – there was a greater level of support for making it illegal to drive if drivers haven’t slept in the previous 24 hours (77%) and less support for making it illegal to just generally drive while fatigued (a more subjective measure) (63%). Support is greater among females than males but there is no difference with age.

Support for the “24 hour” offence was strong across all attitudinal segments and across all driver behaviour groups with at least two thirds of all groups giving their support. Demerit points or fines were the most commonly suggested penalties.

#### *Factor analysis, cluster analysis, the driver behaviour index and path analysis*

##### *Factor and cluster analysis*

A range of driver attitudes in relation to fatigue were measured and factor analysis performed on the results. The following five factors were identified: **Pushing on** (reflects the extent to which drivers are willing to push on to arrive at their destination when experiencing fatigue); **Resistance to breaks** (reflects the extent to which drivers are resistant to taking breaks when on a trip), **Well Rested** (reflects drivers’ attitudes to being well rested before starting a trip), **Denial** (reflects the extent to which drivers feel their driving is unaffected by tiredness) and **Danger** (reflects the extent to which drivers view driving while fatigued as dangerous).

Based on these factors, cluster analysis allowed respondents to be grouped into one of four clusters, these were:

**Irresponsible** (20% of sample) characterised by low acknowledgement of the dangers of driving fatigued, low compliance with recommendations about preventing fatigue, seeing

themselves as less responsible drivers, an unwillingness to compromise other aspects of their life to prevent fatigue and being more likely to see driver fatigue as socially acceptable. The Irresponsible are younger, male and better educated. They are as knowledgeable about the causes of driver fatigue as other segments. They have the highest level of negative driving behaviour.

- Deniers** (16% of sample) characterised by their confidence that being tired does not change their ability to drive. They are older, more likely to be male and work in blue collar occupations. They tend to have lower knowledge about the causes of driver fatigue. Despite the potential for their attitudes to negatively affect their behaviour they have average fatigue related behaviours as measured by the driver behaviour index (see next section).
- Compromisers** (28% of sample) characterised by their generally responsible behaviours and acknowledgement of driver fatigue as a serious cause of death and injury. However, they are willing to compromise their behaviour by “pushing through” to a destination and are more understanding about others who drive when tired. Members of this segment are not significantly different from the average on demographic factors, but they do tend to have more long trips than average. They are just as knowledgeable about the causes of driver fatigue as other segments. Compromisers have the second highest level of negative behaviours in relation to fatigue.
- Compliant** (37% of sample) characterised by their acknowledgment of the dangers of driving fatigued, a willingness to comply with recommendations and responsible driving practices. They are mostly female and tend to be older. They have the lowest level of negative fatigue related behaviours of any group.

#### *Driver Behaviour Index (DBI)*

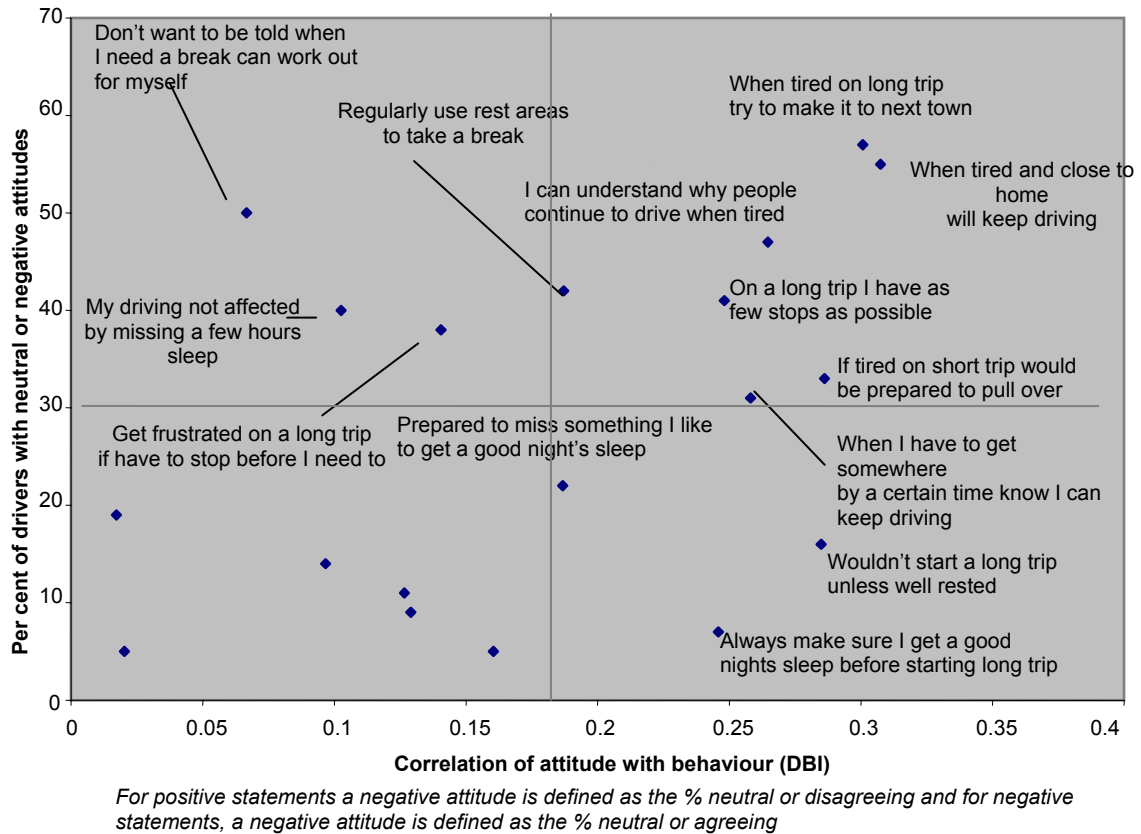
For all respondents a summary score of all driver fatigue related behaviour items was created. This was called the driver behaviour index (DBI) and measured the degree to which drivers engaged in negative behaviours. The higher the score the more risky behaviours were performed and the less likely they were to take steps to prevent fatigue. The DBI was used to place drivers into one of three equal sized groups - positive behaviours, average and negative behaviours.

Behaviours were generally poorer for males 17-49 (particularly those aged 17-20), blue collar workers, students, the Irresponsible and Compromisers, high knowledge drivers those who have experienced any negative effects of fatigue on their driving and those who traveled on more long distance trips each year.

Figure 4 below looks at the relationship between the per cent of drivers with neutral or negative attitudes to an attitude item on the questionnaire and the correlation of that attitude item with driver behaviour. Attitudes in the top right quadrant were prevalent and more strongly correlated with behaviour.



Figure 4. Attitudes to driving and fatigue - Contrast between Correlation with behaviour and prevalence of negative behaviours



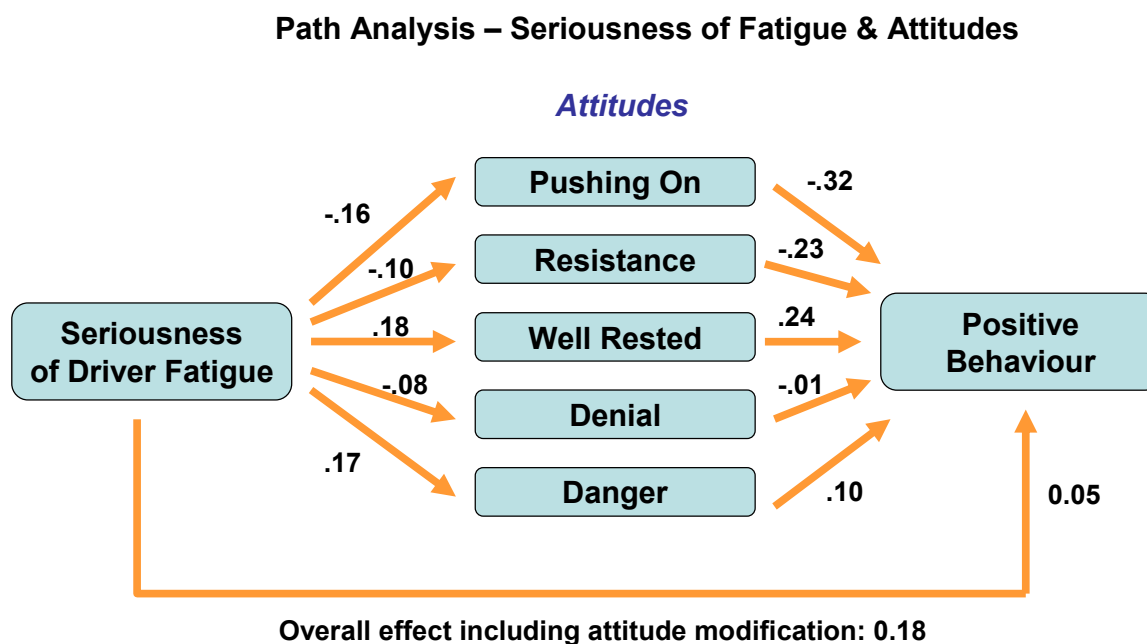
### What Influences Driver Behaviour in Relation to Fatigue?

The preceding results demonstrate key knowledge, attitude and behavioural variables relevant to driver fatigue. They also demonstrate the relationships of NSW drivers, grouped demographically (age/gender/geographic location/occupation), attitudinally (cluster analysis) or behaviourally (DBI) to these variables.

The following section employs path analysis to measure the contribution of the *perceived seriousness of driver fatigue* to each of the *five attitudinal factors* relating to driver fatigue and the relationships of these attitudes to *self-reported driver fatigue behaviour*. This analysis takes positive driving behaviour (as measured by the DBI) as a starting point. It then works backwards through a series of multiple regression analyses to ascertain the relationship (or correlation) of behaviour with each of the *five attitudinal factors* and the relationship between each of these attitudes and the *perceived seriousness of driver fatigue*. Figure 5 below gives an indication of the significant relationships evident from that analysis.

This analysis assumes that the perceptions of the seriousness of fatigue will influence attitudes to fatigue which may then influence behaviour. This may be a reasonable assumption but it is still an assumption and not a proof of cause.

Figure 5. Path analysis map of the relationship between perceived seriousness, attitudes and behaviour



Figures represent the strength of the relationship (beta coefficients for regression) between each element the higher the figure (whether negative or positive) the stronger the relationship.

Taken as a whole, the model in figure 5 shows a multiple correlation of 0.49 ( $R^2 = .24$ ) between the perceived seriousness of driver fatigue, driver attitudes and their affect on positive behaviour.

The perception of the seriousness of driver fatigue has a small direct relation ( $\beta = .05$ ) to driver behaviour. However, it is primarily through its relation to the five attitudinal factors that perceptions of the seriousness of driver fatigue appear to affect positive behaviour (overall effect:  $\beta = .18$ ).

Perceptions of the seriousness of driver fatigue have the strongest relations with the *Pushing On* ( $\beta = -.16$ ), *Well Rested* ( $\beta = .18$ ) and *Danger* ( $\beta = .17$ ) factors. The attitudinal factors that then have the greatest relation to positive behaviour were *Pushing on* ( $\beta = -.32$ ), followed by *Well Rested* ( $\beta = .24$ ) and *Resistance to Breaks* ( $\beta = -.23$ ).

Interestingly, the current data suggest that knowledge of the causes of driver fatigue does not strongly affect behaviours, attitudes or the perceived seriousness of driver fatigue. However, it may be that knowledge of the causes of fatigue has some effect on psychological concepts not measured in this survey, such as self-efficacy and attribution. This is an area for future research.

## DISCUSSION

The results of this study suggest that driver fatigue is a relatively common experience in NSW and is experienced more by younger male drivers than other ages and gender groups. This is supported by available crash data. However, drivers of all ages and gender generally give similar answers for actions they perform to reduce fatigue, places they take rest breaks, knowledge of the causes of fatigue, the warning signs they experience and attend to, and reasons for continuing to drive while tired. A notable exception relates to fatigue management strategies, where older drivers are more likely to plan trips and take frequent rest breaks, whereas younger drivers are more likely to use the warning signs for driver fatigue as a guide for taking breaks.

With regard to attitudinal groups or clusters of drivers - the Compromisers - who have generally positive fatigue related attitudes and are knowledgeable about fatigue are more likely to compromise their behaviour in order to meet a deadline or to get to their destination. Another cluster, the Irresponsible, who have a less responsible attitude and the poorest behaviours of any group, are less likely to see driver fatigue as a serious cause of death and injury and are less likely to acknowledge the dangers of fatigue. They also see fatigue related behaviours as more socially acceptable.

The path analysis suggests that the attitudinal dimensions that have the greatest relation to positive behaviour are *Pushing on*, followed by *Well Rested* and *Resistance to Breaks*, *Denial and Danger* are much less influential. While these attitudes may be difficult to change directly, the public's perceived seriousness of driver fatigue may provide an easier 'policy handle' to target, thereby improving these attitudes and overall behaviour. Of course the preceding analysis is correlational in nature, more experimental data would be required to confirm this hypothesis. It should also be noted that the path analysis model ascribes 24 per cent of the variation in self-reported behaviour to attitudinal factors. Occupation, geographic location and amount of driving are also likely to predict negative driver fatigue experiences and behaviour.

Social cognitive-behavioural theories of behaviour change emphasise attitudes and environmental influences on behaviour. They also suggest that providing sufficiently motivated drivers with simple, effective alternative behaviours can facilitate behaviour change. In this context it is worth noting that commonly experienced symptoms (or warning signs) of driver fatigue that are most likely to motivate drivers to stop driving and take a break immediately include; drowsiness, poor concentration and sore/tired eyes.

Legislation to make certain fatigue related driving behaviours illegal received strong support from drivers. More research is required to examine whether legislation might be influential on driver behaviours from both a compliance viewpoint and by affecting the social unacceptability of driving while fatigued. The latter result could be expected based on the effects of random breath testing on the social unacceptability of drink driving.

Limitations of this study include that the questionnaire was not exhaustive in relation to knowledge, attitudes and behaviours relating to driver fatigue. Secondly, behavioural data was based on self-reported behaviours. Thirdly, while care was taken to assess situational causes of fatigue the questionnaire measures attitudes to driver fatigue in general.

Overall, the current study suggests that public education on driver fatigue can be effective by addressing:

- Perceptions of the seriousness of driver fatigue.
- Social acceptability (being seen as not morally wrong or as understandable behaviour) of driving while fatigued.
- The willingness to "push on" to a destination to meet a deadline or to get to a destination and the general resistance to taking rest breaks. These are more commonly held attitudes which are strongly related to negative behaviours.

Driver fatigue is now firmly on the road safety agenda, it is hoped that the current paper will provide useful direction in designing future driver fatigue countermeasures.