

# Fatigue-Related Risks for Queensland Taxi Drivers

*Final report on the operational and scientific factors related to fatigue in taxi drivers, to inform the possible development of reform, regulation and industry guidelines.*



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**Disclaimer:** The results provided in this report reflect data provided to the consultants. The conclusions have been drawn from a combination of assessment methods. It is not suggested that the data and conclusions are 100% comprehensive or unimpeachable. It is considered highly desirable that results and other details are verified using additional data and other inputs wherever possible.

## Executive Summary

Existing legislation prohibits taxi drivers from driving while fatigued, however their working hours are not regulated. In addition, it is difficult to detect, measure and monitor fatigued taxi drivers. The Director General of the Queensland Department of Transport and Main Roads (TMR) requested that the Passenger Transport Division seek independent advice on fatigue issues relating to taxi driving to further inform a strategy to enhance fatigue management requirements for taxi drivers in Queensland. In September of 2010, Integrated Safety Support was contacted to contribute to the provision of this advice.

Relevant information was gathered from several sources, including published scientific journal articles, Taxi Industry documents, and from consultation with jurisdictional regulators in other states and territories. The issues of general driver fatigue and taxi driver fatigue were discussed from these perspectives.

Research indicates that taxi drivers are more than twice as likely to be killed or seriously injured while driving at work or while commuting. Taxi drivers are prone to fatigue-related risks, made worse by the very nature of the work which often requires long hours and driving at all times of the 24-hour day. Factors associated with an increased crash risk in taxi drivers include longer shifts and shorter total break times during shifts. However, there may be differences in these effects between owner-drivers, full-time permanent drivers and part-time or irregular drivers. Taxi drivers exhibit an optimistic bias concerning their ability to drive fatigued and generally seem to display a low level of awareness of fatigue risks. There are likely to be drivers at even greater increased risk of fatigue due to undiagnosed or untreated sleep disorders.

Although taxi drivers are prohibited from driving while fatigued under general Road Safety and OHS legislations, there are currently no enforceable regulations regarding fatigue in taxi drivers in any of the jurisdictions examined. Even if there were, there is no easy direct measure of fatigue, as there is for alcohol and other drugs. Additional factors also need to be considered for part-time taxi drivers, as many have others commitments such as second jobs or study. Several jurisdictions have recently developed Guidelines and/or other documents to inform taxi drivers and operators of the risks of fatigue and ways of managing this risk. These documents include a significant volume of practical and otherwise useful information that can be emulated and/or used as part of education programs within Queensland.

Driver fatigue is a complex, multi-factorial challenge in the taxi industry and there is no “quick fix” to address the problem. On the contrary, for example, introducing new restrictions on driving hours as an intended limiter of fatigue may actually increase fatigue risk if drivers take on additional employment to make up for the reduction in taxi driving income. A related issue to be addressed is the fairly widespread belief, even by some regulators, that short driving trips made by taxi drivers are not fatiguing. The suggestion that fatigue is a long distance driving issue may historically explain some of the reasons why so little has been done up until this point in time. The successful management of fatigue-related risks in Queensland taxi drivers will require an on-going, multi-tiered approach, in consultation with all key stakeholders. It is considered imperative to engage the taxi industry in the development of strategies to address the issue, in order to increase acknowledgement of the shared responsibility in managing fatigue and a greater acceptance of any resultant initiatives.

It is suggested that a two-phase approach be adopted. In the short term, it is recommended that:

1. Communications material be developed and distributed to existing and new taxi drivers, as well as operators and managers, to raise awareness of driver fatigue,
2. Clear hours of work limits are developed using a risk-based approach, and
3. Safety metrics are identified to provide valuable data to contextualise the problem of fatigue in taxi drivers and to monitor and review any strategies that are implemented.

In the longer term, it is recommended that:

4. Training programs and material are developed and delivered to all stakeholders regarding fatigue risk management,
5. That the issues of sleep disorders and other medical conditions which may affect sleep and/or fatigue are addressed, possibly under the auspices of existing requirements for medical assessments and certificates, and
6. Guidelines are developed and distributed for drivers, operators and managers around fatigue risk management and, in the event that these are not widely adopted as industry “best practice”, that more stringent policies and procedures are developed and enforced.

Such a phased approach is likely to lead to a more targeted use of resources, to achieve more cost-effective outcomes for any initiatives. Also, by not only seeing fatigue as an issue managed by limiting driving hours, it will be possible to better understand the complexities of the risks associated with fatigue in the taxi industry, and how to effectively treat those risks. Such a cultural understanding can only be addressed over time, with the sharing of relevant crash data, reports from drivers, and other valid sources.

The Queensland Department of Transport and Main Roads is to be commended for taking the initiative to address the challenges of managing fatigue in the taxi industry. With ongoing, risk-based efforts, the largest current exposures can be addressed first, and programs of work can be developed for continuing to reduce fatigue-related fatalities, injuries and damages in the future.

## Background

Taxi drivers regularly work long hours, often at night and in the early hours of the morning, so can be vulnerable to fatigue-related risks while driving. Existing legislation prohibits taxi drivers from driving while fatigued, however their working hours are not regulated. In addition, it is difficult to detect, measure and monitor fatigued taxi drivers.

The Director General of the Queensland Department of Transport and Main Roads (TMR) has requested that the Passenger Transport Division seek independent advice on fatigue issues relating to taxi driving to further inform a strategy to enhance fatigue management requirements for taxi drivers in Queensland. In September of 2010, Integrated Safety Support was contacted to contribute to the provision of this advice. Their involvement relates to expertise in management of fatigue-related risks, from both operational and scientific perspectives.

John McReynolds, Manager, Industry Standards and Passenger Safety, was the primary contact point within TMR, and Melissa Radke, Principal Advisor (Policy), Rail Safety Governance, was the overall project manager.

## Project Scope and Objectives

The general project scope included research and analysis to support the Queensland Government to identify and evaluate fatigue-related risks and management associated with taxi driving. The specific scope of the project was the provision of independent advice to the Passenger Transport Division on potential fatigue-related risk factors, and the possible interaction or combination of those factors, involved in taxi driving, which could inform future Government strategies.

Key objectives included the following:

- Overview of general fatigue-related issues in taxi driving;
- Identification of relevant research outcomes;
- Provision of advice on existing tools in other Australian jurisdictions or internationally that could be used to assess fatigue-related risks for taxi drivers;
- Identification of regulatory options for management of taxi driver fatigue in Queensland; and
- Any other key considerations.

## Methodology

Pertinent information was gathered from several sources, including published scientific journal articles, Taxi Industry documents, and consultation with jurisdictional regulators in other states and territories. Issues will be discussed below from these perspectives.

The main search terms that provided valuable results included “taxi” and “fatigue”. The primary source of material was the *Entrez PubMed* database, which is a service of the U.S. National Library of Medicine that includes over 18 million citations from MEDLINE and other life science journals for biomedical articles. Additional uses of the search terms were with the Google Scholar search engine. Specific unpublished articles, industry reports and research dissertations were also provided by the authors.

## Reference Documents

### Government and Industry Documents

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## **General fatigue related issues in taxi driving**

### ***Scientific Literature***

Driver fatigue is a leading cause of road crashes resulting in death or serious injury. Fatigue and/or sleepiness is thought to contribute to around 18% of all motor vehicle crashes (New South Wales, Roads and Traffic Authority, 1995), and up to 25% in the case of long, monotonous roads (Horne and Reyner, 1995). A recent Australian report puts "major accidents" in the road transport industry caused by fatigue at 20.3% (Driscoll, 2009). Also, it is often suggested that these figures are under-estimates, since accidents may not be wholly attributable to fatigue or always identified. Accident data relies heavily on the investigation method (e.g. fatigue sometimes cannot be recorded as a potential cause as it is not listed on the investigation form). Similarly, survey data can suffer from low response rates and can be biased.

Taxi drivers in Australia are likely to be at higher risk of fatigue-related incidents due to factors such as:

1. Long shifts, generally up to 12 hours in duration;
2. Significant amounts of work occurring at times usually preferred for sleep, such at night time and early mornings;

3. High demand for additional drivers in many jurisdictions, often resulting in reported additional pressure on existing drivers to work more hours, up to seven days per week;
4. Sub-populations of new and/or non-professional drivers (e.g. students, migrants new to Australia) who may not have high awareness of fatigue or other safety risks, or self-management strategies and tactics; and
5. An anecdotal culture of driving while fatigued as 'normal' and/or 'acceptable', coupled with high levels of stimulant use (e.g. energy drinks).

There is a large volume of scientific research investigating driver fatigue in heavy vehicle professional drivers, which is not covered in significant detail in this report, but there are relatively few studies which have examined fatigue in taxi drivers. This report will first review information obtained pertaining to driver fatigue in general, and will then review relevant research and documentation related to fatigue in taxi drivers.

### **General Driver Fatigue**

A common misperception regarding driver fatigue is that it is primarily a problem in rural areas or in long distance driving. It is true that rural crashes tend to be more severe due to increased speeds, but the reality is that, in N.S.W. for example, 42% of driver fatigue accidents occur in a city, predominantly Sydney (Fell & Black, 1997). Likewise, the majority of fatigue-related incidents in cities occur on intended trips of less than two hours and within 15 minutes of home (Fell & Black, 1997).

Fell and Black (1997) interviewed 301 Sydney drivers, randomly selected from telephone listings, who had been involved in accidents, near accidents or unintentional drifting-out-of-lane events to investigate the features of driver fatigue incidents in cities. For their most recent "fatigue incident trip", drivers were asked about issues like prior sleep and activities, trip purpose, intended trip length, time of day, driving hours and sleep characteristics. Over half (57%) of those who had a driver fatigue incident in the city reported not having a full night's sleep the night before, mostly due to work-related factors like extended hours, working night shift or early starts. The second most common reason given for insufficient sleep was engaging in social activities or 'partying'. Almost one-third (30%) of these drivers had been awake for at least 17 hours at the time of the incident, 16% had been awake more than 20 hours, and 3% had been awake longer than 24 hours, indicating a high likelihood that they were acutely fatigued. Many of these drivers also reported routinely short sleep lengths, making it more probable that they were driving against "a high background level of fatigue" in the form of cumulative sleep loss. Cumulative sleep loss occurs where an individual gets some, but not sufficient, recovery sleep over a period of consecutive 24-hour days. In contrast, acute sleep loss refers to one long period, such as a whole 24-hour day, without any sleep at all.

It is worth noting that 27% of fatigue incident drivers stated that they did not feel at all tired at the start of the trip and 35% said they only felt "a bit tired", even though they self-reported that the incident occurred due to tiredness or fatigue. This highlights the difficulty many people have in identifying their levels of fatigue, their reduced ability to perceive their impairment (e.g. Dorrian et. al., 2003; Dorrian, Roach, Fletcher & Dawson, 2007), and/or the importance of education about the early identification of the warning signs of fatigue and how to respond. Forty-three percent of drivers' fatigue incidents in Fell and Black's study occurred during a work-related trip and 42% of these drivers were shiftworkers. This finding is consistent with previous research which has found that shiftworkers are more likely to have a car crash than day workers. Clearly, work factors are often prominently associated with fatigue incidents.

In a recent study, Valent and colleagues (2010) examined the relationship between sleep and work hours and the risk of road traffic crashes. They interviewed 574 injured drivers presenting to the Emergency Room of an Italian hospital for care after a crash over a 12-month period. They found that both being awake longer than 16 hours and working longer than 12 hours represented strong risk factors for a road crash. It is suggested that there is a need for raising awareness about the risks of fatigue in workers, particularly in those working prolonged shifts, and that particular attention should be paid to driving home after a shift. The authors proposed that both acute and cumulative sleep loss needs to be considered with regard to driver fatigue and highlight the importance of education, given the previously mentioned reduced ability of drivers to judge their own ability to drive safely when fatigued.

Road crashes are the leading cause of work-related deaths in Australia (Symmons & Haworth, 2004), highlighting the need for improved education and intervention in professional drivers and the general driving public. In his review article of sleepiness in occupational drivers, Philip (2005) suggests that “Health care, educational programs and work schedules integrating notions of sleep hygiene and sleep medicine could significantly improve road safety”.

**Section Summary:**

**Driver fatigue is a major cause of road crash fatalities and serious injuries and, contrary to popular belief, many fatigue-related crashes occur in urban areas and/or on short trips. Drivers can be notoriously poor at self-assessing their levels of performance and related degree of impairment. This lack of self-assessment ability in specific contexts is a key message required in communications to drivers and education programs targeting drivers.**

### **Taxi Driver Fatigue**

Corfitsen (1993) described a Danish study in which 120 taxi drivers were stopped by police on a major highway just outside of Copenhagen between 0000 and 0600h and asked to rate their level of tiredness and to perform a visual reaction time test as would be used in laboratory studies of performance and impairment. One-third of drivers rated themselves as “tired” or “very tired” and these drivers demonstrated significantly slower reaction times than the “rested” drivers. The author states that the finding that the surveyed drivers reported an average sleep length of 8 hours (with a Standard Deviation [SD] of 1 hour) suggests that “nighttime cab drivers must be among the most well-adapted to nighttime driving”, possible due to their ability to stop driving and rest if they feel tired. However, these results should be treated with caution, as it is possible that drivers in this study over-reported their previous sleep lengths since data was collected by police and the drivers may have feared there would be repercussions if they had not had sufficient sleep before working. Participants are more likely to provide honest, more accurate, data when the information is confidential and individual responses cannot be identified.

Dalziel and Job (1997) examined fatigue-related factors, and their relationship with accident involvement, in 42 Sydney metropolitan taxi drivers across a 2-year period using questionnaires and insurance company records. Two-thirds of the drivers surveyed spent 50 hours or more per week driving a taxi. Half of the drivers also reported doing additional work, so the average total work hours per week in this sample was 59 hours, with 50% working 60 or more hours. These drivers nominally worked 12-hour shifts, 0300-1500h day shift and 1500-0300h night shift, although actual shift lengths tended to vary according to demand, with drivers more likely to work the full 12 hours or more during busy times like weekend nights.

Another important finding in this study was that the number of accidents was related to total break time during shift, with shorter break times associated with more accidents. This relationship may vary according to the employment status of taxi drivers, as “owner-drivers” had longer break times than “permanent drivers”, who in turn had longer total break times than “irregular drivers” and the authors point out that this requires further investigation. It was suggested that there may be individual personality and/or motivational differences reflected in both reduced break times and an increased accident risk, described as a predisposition towards “hard driving”. An additional interesting finding was that drivers typically displayed an optimistic bias concerning their driving abilities in general, and less so, their ability to drive safely when tired. That is, drivers usually perceive their own ability to drive safely when tired as greater than that of the average taxi driver. It is important to note that none of the drivers in this study actually believed (or reported) that they had been involved in a fatigue-related accident.

The authors suggest that the constantly changing (and predominantly urban) nature of the work involved in taxi driving may be tiring “in the sense of being taxing on attentional and cognitive resources, ...not fatiguing in the way that the minimal stimulation (and subsequent boredom) of a long straight country road at night can be”. That is, it is possible that the diverse nature of the job requirements of driving a taxi (for example, negotiating traffic, talking to passengers, monitoring the dispatching service, looking for the next fare, maintaining personal safety, and determining the trip route) may be mentally demanding and therefore tiring.

The authors propose that this challenging nature of taxi driving may protect drivers somewhat from the effects of fatigue that may be observed in a boring, minimally stimulating long distance drive. However, this premise is controversial as it has been demonstrated that there is actually a U-shaped relationship between workload and fatigue (Nakatumba & van der Aalst, 2010), with higher levels of fatigue seen with both very low and very high mental and/or physical demands. Baulk et al. (2007) showed that workload, fatigue and performance are interrelated and stressed that it is imperative to consider the specific operational context when examining these relationships. It should also be highlighted that this study only examined reported accidents on-the-job and did not include near-misses or accidents outside of work hours.

In his unpublished PhD thesis, Dalziel (1999) expanded on this work and further examined the relationship between driving experiences, accident records and optimism bias in 151 Sydney taxi drivers. In this study, he included questions about accidents while driving home after a work shift and also asked about sleeping problems. Drivers in this sample drove taxis for an average of 51 hours (almost two-thirds driving 50 or more hours per week), with an average total work time of 58 hours per week (with 38% working at least 60 hours each week). Almost a quarter of drivers reported having fallen asleep at the wheel at some stage, with 77% of these drivers falling asleep while driving more than once. In addition, 18% of respondents stated that they experienced “sleep apnoea, chronic snoring, or other major sleeping difficulties”, and more of these drivers (50%) reported falling asleep at the wheel than those without sleeping problems (14%).

Five drivers also stated that they had fallen asleep while driving home from work. However, self-reported falling asleep at the wheel was not a significant predictor of accident risk in this sample, once general risk-taking attitude and average shift length were taken into account. Dalziel suggested that longer shift length “in addition to being an exposure variable, may be considered a fatigue-related variable”, with increased accident rates observed as shifts went beyond 11-12 hours, and particularly towards the end of weekend night shifts. He also suggested that an increased likelihood of falling asleep at the wheel may be indicative of an underlying tendency to take more risks when driving. Dalziel proposed that fatigue management education programs for taxi drivers should include a more general approach to risk-taking as well as

information about the relationship of sleeping problems to fatigue. He also suggested that the start and finish times of taxi driving shifts should be examined, as the current practice in Sydney was for 0300h and 1500h changeover times. Clearly a 0300h start time for day shifts and 1500-0300h night shifts could both potentially exacerbate any existing fatigue due to sleep debt and already long shift lengths.

Charlton and colleagues (2003) collected data from 102 New Zealand taxi drivers regarding daily activities, attitudes towards fatigue and levels of driver fatigue. Forty-two percent of these drivers reported driving more than the recommended 11-hour maximum in the previous 24 hours and 39% scored in the "tired" range on the self-rating fatigue measure. Again, however, there was evidence of an optimistic bias regarding their ability to drive safely when fatigued, with only 2% of drivers rating fatigue as a problem for themselves, compared to 25% rating it as "always" or "often" a problem for other drivers. These authors also point out that a concerning finding was that around one-third of taxi drivers rated fatigue as "never" a problem for themselves and almost a quarter said it was "never" a problem for others. This raises the possibility of either a fairly low level of fatigue awareness in these drivers or some inhibition in their questionnaire responses. It may also reflect an impaired ability to self-assess their performance and safety, as discussed above.

Lam (2004) used traffic incident data concerning crashes in New South Wales for the period 1996–2000 to investigate environmental factors associated with crash-related mortality and injury among taxi drivers. Of the 7923 taxi drivers involved in crashes, almost 10% (750) were killed or injured. While female taxi drivers had an increased risk of mortality and injury, two additional factors were also related to increased risk: working the night shift and, to a lesser degree, not carrying passengers on board. The latter finding was explained by the apparent tendency of drivers to speed and engage in risky driving behaviours when rushing to pick up waiting passengers. In addition to the obvious fatigue-related issues associated with night shifts, Lam suggested that the increased risk on night shifts could also be due to poor visual acuity in the darkness. It should be highlighted that this study examined only accidents involving death or serious injury, and did not include more minor crashes.

Investigation into work-related crashes in N.S.W. utilised police crash records and workers compensation data for the period 1998–2002, identifying over 13,000 drivers who were injured or died as a result of a work-related traffic crash (Boufous & Williamson, 2006, 2009). Around 75% of driver casualties occurred while commuting, with the rest occurring in the course of work. Unsurprisingly, transport workers were the most frequent victims of crashes while on duty, with almost half of fatalities from work-related crashes consisting of heavy truck drivers. Importantly, taxi drivers were found to be more than twice as likely as other car drivers to be killed or severely injured overall, as well as for on-duty and commuting crashes. The authors pointed out that "Comprehensive safety strategies aimed at preventing traffic crashes in taxi drivers are needed".

Rowland and colleagues (2007, 2008) administered a range of questionnaires to 182 taxi drivers from a North Queensland region to examine road safety attitudes and behaviours. Somewhat surprisingly, they did not include any measurement of attitudes towards drowsy driving, although it was determined that some taxi drivers readily admitted engaging in unsafe driving practices like speeding. Specifically, drivers who reported greater perceived pressure from employers, customers or other external factors were more likely to engage in a higher level of aberrant driving behaviours.

In an innovative approach, these authors then utilised a Driving Diary as an intervention in a small subgroup of 24 taxi drivers. Drivers were required to record the type and frequency of traffic violations they

committed and to then reflect and comment on their behaviour for 10 working days. Completion of the diary was associated with considerably safer behaviours and attitudes, and safer perceptions of safety climate and driver pressure seven months after the original survey. The authors suggest this was probably due to an increased awareness of risk and subsequent behaviour change. However, it should be noted that these 24 drivers were self-selected and no incentive was offered to participate, so there may be a response bias, in that drivers who chose to take part may have been more aware of the issues or more motivated to change their behaviour. The authors propose that the Driving Diary should not be used alone but should be accompanied with training “highlighting work-related road safety and the benefits of the driving diary”. At the time of publication (2009), the taxi organisation was continuing to utilise the Driving Diary in their new driver training. Clearly, this tool could be adapted and utilised to accompany training about fatigue risk management in taxi drivers.

#### **Section Summary:**

**Taxi drivers are more than twice as likely to be killed or seriously injured while driving at work or while commuting. Taxi drivers are prone to fatigue-related risks, made worse by the very nature of the work which often requires long hours and driving at all times of the 24-hour day. Factors associated with an increased crash risk in taxi drivers include longer shifts (particularly longer than 11-12 hours) and shorter total break times during shifts. However, there may be differences in these effects between owner-drivers, full-time permanent drivers and part-time or irregular drivers. Taxi drivers exhibit an optimistic bias concerning their ability to drive fatigued and generally seem to display a low level of awareness of fatigue risks. There are likely to be drivers at even greater increased risk of fatigue due to undiagnosed or untreated sleep disorders.**

## **Current Legislation/Tools in Other Jurisdictions**

### **Western Australia**

The W.A. Department for Planning and Infrastructure published the “Fatigue Management: A Code of Practice for the West Australian Taxi Industry” (2009), developed in conjunction with WorkSafe and other key industry stakeholders. This Code sets out a number of standards regarding fatigue management and hours of work, which are to be used as benchmarks for drivers, operators and taxi companies to assess whether they are meeting their Duty of Care. In the absence of specific legislation, this Code of Practice (COP) is to be referred to and is the standard to which industry stakeholders will be held accountable. The COP is distributed to drivers twice as part of their training: first, as part of their training; and then again after they pass the practical driving test and graduate as taxi drivers.

The W.A. Taxi Regulator stated that, because of the difficulty in policing fatigue management in the taxi industry, they see their main role as being educational. In the case of a possible fatigue-related incident occurring, it would be WorkSafe who investigated and they would refer back to the COP. The Regulator reported that the issue of fatigue awareness and management is likely to be more of a problem for part-time taxi drivers than full-time drivers, since many part-time drivers either have another job or undertake study. He said that many of these drivers are international students who do not seem to understand the critical need for adherence to the recommended maximum of 14 hours work in any day (including other work and study in addition to their driving shift).

The Regulator also reported that a leading taxi operator in W.A. (who coordinates around 90% of W.A. taxis) has recently introduced a formal operating procedure whereby drivers are automatically switched off the system 12 hours after logging on. However, he stated that this did not necessarily stop taxi drivers from operating independently after this time.

## **Northern Territory**

The Northern Territory Government Department of Lands and Planning has published the Northern Territory Taxi Drivers and Operators Code of Conduct (2010), developed through consultation between the Taxi Industry, the Transport Services Division of the Department of Lands and Planning, and other key user groups. The Code has been approved by the Director, Commercial Passenger (Road) Transport, pursuant to Section 72 (1) of the Commercial Passenger (Road) Transport Act. It is designed to advise taxi drivers and operators of their responsibilities and obligations to apply with applicable legislation, and provides a set of guidelines for minimum taxi industry protocol and standards of customer service. It has a fairly limited section on fatigue management, as follows:

### ***Fatigue Management***

*Under NT Work Health Legislation all employers have a duty of care to provide a safe workplace. The Commercial Passenger Vehicle industry is no different.*

*Employers have a duty of care to identify the hazards in the workplace, assess the risks and control the risks. In this case the hazard is the effect of fatigue which can be caused by the extended periods that drivers may spend behind the wheel of the taxi transporting passengers and themselves from location to location. The risk assessment can be high and the control is to implement a fatigue management system in accordance with the Northern Territory Fatigue Management Code of Practice.*

The N.T. Taxi Regulator stated that he was not aware of any major issues concerning fatigue in taxi drivers and said that, if there were any incidents, there is a formal complaints mechanism which would then be followed up. He expressed the view that most taxi trips in his jurisdiction were quite short (generally a maximum of around 25 minutes), so fatigue may not be as much of an issue compared to drivers in the heavy vehicle industry. However, he did acknowledge that fatigue may be a concern for taxi drivers towards the end of a long shift, or if the driver was taking medication that might affect alertness.

## **South Australia**

South Australia do not have any regulations or policies specifically related to fatigue in taxi drivers. The S.A. Taxi Regulator pointed out that there is a generic reference in Schedule 5 (2) of the South Australian Passenger Transport Regulations 2009 (under the Passenger Transport Act 1994) which could relate to fatigue, but it is under the heading of Small Passenger Vehicle Operators, not Taxi Drivers (see below):

### ***2—Small passenger vehicle operators***

*The operator of a passenger transport service involving the use of 1 or more small passenger vehicles must—*

*(m) ensure that a driver who has worked for more than 5 hours in another job does not commence work as a driver without a break.*

Interestingly, the Schedule does mention the importance of taxi drivers not taking drugs to overcome fatigue, but does not refer directly to the risks associated with fatigue itself (see below):

#### **4—Taxi drivers**

*A taxi driver must—*

*(d) not take drugs as a means of overcoming fatigue, ensure that he or she does not have any concentration of alcohol in his or her blood while driving, and observe the laws that relate to driving under the influence of drugs.*

The S.A. Taxi Regulator also expressed concerns about the difficulty of policing fatigue management and raised the question of whose responsibility it would be: the Regulator or OH&S officials. He said that, in theory, it is possible, as drivers have to log on using a Personal Identification Number (PIN) to get into dispatch. But this would not exclude drivers unofficially sharing taxis.

### **Australian Capital Territory**

The A.C.T. Office of Transport does not have any formal documentation or policies in place regarding driver fatigue in taxi drivers. The A.C.T. Taxi Regulator commented that they are exempt from existing Heavy Vehicle and Bus laws regarding fatigue. Some transport industry fact sheets mention that driver fatigue can be dangerous, but it was reported that there is no real policy or standard. It was suggested that taxi drivers in the A.C.T. may be in some ways different to drivers in other jurisdictions, as most taxis are not on the road 24 hours a day: about 50% of the taxis finish working around 2230h when the last plane lands at the airport, and; from midnight, only about 25% of the fleet are operational, although this figure is likely to be higher on weekends.

In addition, the average shift length for these drivers is 8-10 hours, which only occasionally extends to 12 hours. Anecdotally, the Regulator said that log on information sometimes indicated that a taxi had been operational for 24 hours, but it is suspected that this is probably due to drivers unofficially sharing taxis. A.C.T. taxi drivers typically work one of two shifts, an early or a late, with the early shift commencing at 0500h.

The Regulator stated that there had been one reported incident of a “cranky” driver who told the customer he had driven for a long time. There had been no other reported incidents relating to driver fatigue. The N.T. Taxi Regulator expressed views similar to those expressed by the W.A. Regulator concerning part-time taxi drivers, who may have second jobs or study. She said that many of these drivers are international students who work more than the allowed 20 hours per week, in addition to their study requirements, but the Immigration Department was reported to have recently “cracked down” on this.

### **Victoria**

The Victorian Taxi Regulator reported that fatigue in taxi drivers has been a concern for the Victorian Taxi Directorate (VTD) for some time, and the issue was highlighted by a highly publicised incident in 2010. In The Age newspaper on April 21, 2010, Professor Russell Gruen (surgeon at The Alfred and Monash University) wrote an article entitled “Sleep-deprived cabbies are driving themselves to death”. He told of how a visiting Canadian colleague described to him a lucky “near miss” when his taxi driver fell asleep at the wheel while taking him to Melbourne Airport.

The VTD has since developed draft Fatigue Management Guidelines for the Victorian Taxi Industry and is in the process of developing a policy position relating to fatigue in taxi drivers. These Guidelines will initially

be used voluntarily and seen as a “best practice” guide, but certain provisions may be legislated in the future, particularly if the taxi industry is slow to adopt the recommended principles.

The Regulator also echoed sentiments expressed by other jurisdictional taxi regulators regarding the difficulty of regulating driver fatigue in part-time taxi drivers, many of whom engage in other jobs or study. He raised the question of how can drivers be encouraged to take responsibility about their non-driving hours to ensure that they are fit-for-duty while driving taxis?

## **New South Wales**

The New South Wales (NSW) Taxi Council published a document entitled “OHS Awareness for Taxi Operators”, which includes fatigue in the Risk Management Tables for NSW Taxi Operators. “Managing fatigue while driving” is listed as a “Hazard” and “Motor accidents leading to injury or death. Trauma.” are listed as “Risks”. The recommended Controls are:

- *Driver to study Taxicare Plus Module 7: OHS – Section 3 “Safe Driving and Fatigue Management”.*
- *Driver to be counselled on taking regular rest periods.*
- *Staff advised of fatigue dangers when driving to and from the workplace.*

The Regulator reported that there was no regulation of taxi driver fatigue at all in NSW and again mentioned the difficulty in addressing the issue given the number of taxi drivers who work another job or study. He stated that the average shift lengths for NSW taxi drivers are 10-12 hours and a 12-hour maximum is specified in the bailment agreement between taxi drivers and operators. However, he expressed that it is likely that some drivers exceed these limits, particularly over the weekend period.

## **Tasmania**

We have spoken to the Tasmanian Taxi Regulator, but she declined to speak on the phone and instead requested a written enquiry. The enquiry was sent in November 2010, but no reply was received.

## **Queensland**

Taxi drivers in Queensland are prohibited from driving while fatigued, under section 10 of the Transport Operations (Passenger Transport) Standard 2010. However, there are no regulations specifically related to taxi driving hours and it is difficult to identify fatigued drivers.

The Queensland Taxi Strategic Plan 2010-2015 includes as one of its strategies “Enhance fatigue management requirements for all taxi drivers”, and it is understood that this project is part of this strategy.

The Queensland Government has produced an Information Bulletin on Fatigue Management for Passenger Transport operators generally, but it is fairly broad and much of the focus is on heavy vehicles and buses. This document does state the importance of training drivers and all personnel on “the prevention of fatigue” and of developing formal fatigue management programs.

### **Section Summary:**

**Taxi drivers are prohibited from driving while fatigued under general Road Safety and OHS legislations. However, there are no actual regulations in place which can be enforced in any of the jurisdictions examined. Even if there were, there is no easy direct measure of fatigue, as there is for alcohol and other drugs. Additional factors need to be considered for part-time taxi drivers, as many have others commitments such as second jobs or study. Several jurisdictions have recently developed Guidelines and/or other documents to inform taxi drivers and operators of the risks of fatigue and ways of managing this risk. These documents include a significant volume of practical and otherwise useful information that can be emulated and/or used as part of education programs.**

## **Additional Considerations**

### **Individual Differences**

It has been established that there are individual differences in the amount of regular sleep people need to function well. There is also increasing evidence of individual differences in fatigue susceptibility, with some people apparently more sensitive to the effects of sleep deprivation and resultant fatigue (see Knippling et al., 2004 for review). Recent research has identified a possible genetic basis for these individual differences (for example, see Rajaratnam, Lavendan, Birznierks & Klerman, 2010).

Van Dongen et al. (2004) found that the influence of individual differences in susceptibility to alertness loss was greater than the effect of sleep deprivation length. They summarise their findings as follows:

"In this study involving repeated exposure to sleep deprivation under carefully controlled laboratory conditions, we found that neurobehavioral impairment from sleep loss was significantly different among individuals, stable within individuals, and robust relative to experimental manipulation of sleep history. Thus, this study is the first to demonstrate that inter-individual differences in neurobehavioral deficits from sleep loss constitute a differential vulnerability trait" (Van Dongen et al. 2004).

Importantly, there also seems to be significant individual variation in the ability to predict imminent involuntary sleep episodes (Itoi et al., 1993, cited in Knippling et al., 2004).

### **Sleep Disorders**

Individuals with untreated sleep disorders are at increased risk of driving fatigued than those without sleep disorders or those with treated sleep disorders. The most common sleep disorders are insomnia, sleep apnoea and restless legs syndrome. These will not be discussed in detail in this report. However, the benefits of identifying and treating sleep disorders in professional drivers are considerable. Berger and colleagues (2004) describe the results of treating 225 truck drivers previously diagnosed with sleep apnoea: the trucking company measured a 73% reduction in preventable accidents, a driver retention rate 2.3 times higher than the global rate, as well as improved productivity, reduced sick leave, and lower operational disruption rates.

As reported earlier, Dalziel (1999) identified the importance of considering sleep disorders as a risk for fatigue in taxi drivers. Firestone and colleagues (2009) investigated the distribution of risk factors for obstructive sleep apnoea syndrome (OSAS) among 241 taxi drivers in New Zealand. Eighteen percent of drivers scored at or above the threshold for a significant probability of moderate-severe OSA, with Maori

and Pacific drivers being particularly at risk. The authors concluded that “it is plausible that a substantial proportion of taxi drivers may have moderate to severe OSA” and that there is a clear need for health promotion to improve awareness and understanding of sleep-related disorders in the taxi industry.

In a further study, Firestone and Gander (2010) conducted focus groups with 27 taxi drivers identified as having a high risk for OSA. These drivers described an avoidance of health issues and dissatisfaction with their general practitioners, with the three main reasons identified as contributing to these attitudes being “lack of knowledge”, “deliberate avoidance”, and “fear of loss of employment and income”. It is proposed that (1) drivers need education about the safety risks of insufficient sleep and OSAS, (2) safe driving policies need to be developed to manage driver fatigue, and (3) clear guidelines are required for drivers, managers and healthcare professionals concerning the diagnosis and treatment of sleep disorders and any consequences for driver licensing.

There have been some innovative initiatives undertaken in the Australian Heavy Vehicle Industry to address the issue of sleep disorders and fatigue. For example, the National Road Transport Operators Association, NatRoad, has funded a research program titled "The value of rest: Investigating the impact of rest opportunity on sleep length and quality in Australian Truck Drivers". This project includes a phase related to testing simple, portable devices for helping to diagnose specific sleep disorders while drivers are sleeping at home or in the sleeper cab of their truck while away working. The data collection for this study, coordinated by Integrated Safety Support on behalf of NatRoad, will be completed in January, 2011, and public versions of the findings and final report will be made available prior to July, 2011. Another recent innovation utilised by the road transport industry has been the development of a sleep disorders management program for industry. The Australian company that has developed this program, SleepRisk Solutions, uses cutting-edge medical models in ways that are economical, streamlined and simple for industry to apply in working environments. More information about the SleepRisk Solutions work can be found on their website, which is [www.sleeprisk.com.au](http://www.sleeprisk.com.au).

## **Age**

Age is an important factor that affects sleep and recovery, performance and fatigue. Some researchers suggest that older people need less sleep (Pollack, Wagner, Moline & Monk, 1994). However, most other research indicates that older subjects simply have more difficulty sleeping and therefore obtain less sleep (Foret, Bensimon, Benoit & Vieux, 1981; Bliwise, 1993; Harma, 1995). That is, sleep and recovery is harder to obtain as we get older but this does not represent a reduced need for recovery.

With reaction time, and other sensitive laboratory tasks, performance generally declines with increasing age (Monk, Buysse, Reynolds, Jarrett & Kupfer, 1992; Philip, Taillard, Quera-Salva, Bioulac & Åkerstedt, 1999). However, older individuals have often honed more experience and appropriate coping skills, and have fewer domestic responsibilities (Härmä, 1995). Taken together, any negative effects of age on sleep and performance may be able to be offset by experience and domestic situations that make recovery easier (such as not having young children in the house).

## Closing Statement

Driver fatigue is a complex multi-factorial challenge in the taxi industry and there is no “quick fix” to address the problem. On the contrary, for example, introducing new restrictions on driving hours as an intended limiter of fatigue may actually increase fatigue risk if people take on additional employment to make up for the reduction in taxi driving income. A related issue to be addressed is the fairly widespread belief, even by some regulators, that short driving trips made by taxi drivers are not fatiguing. The suggestion that fatigue is a long distance driving issue may historically explain some of the reasons why so little has been done up until this point in time.

Many of the relevant factors - including long work hours and low levels of fatigue education - have been detailed in this report. It is imperative to note that the factors discussed are meaningful in isolation, but are also likely to interact with each other. For example, someone who has been awake for 20 consecutive hours, and has worked 12 consecutive hours, is likely to be significantly more impaired than if they were one or the other. In addition, the importance of considering individual situations and inter-individual differences cannot be overemphasized. Such individual differences include the basic need for recovery sleep, the ability to sleep or nap at any time of the 24-hour day, daily commute length and the ability to predict imminent involuntary sleep episodes.

However, despite all of the inherent complexity, critical system elements can be determined and managed using a risk-based approach. This is true at the level of individuals, taxi operators, enforcement and investigation agencies, and the regulators. Completing such a process will require ongoing efforts, since the urgent need to manage fatigue in taxi drivers is only just becoming realised in many jurisdictions simultaneously, and there is a dearth of existing science or guidance highly relevant for the industry.

Some Australian jurisdictions have recently begun addressing the issue of fatigue in taxi drivers and have developed supporting documentation. A couple of jurisdictions are also in the process of potentially developing policies and legislation to manage fatigue in the taxi industry, but there is widespread concern about the practical realities of enforcement. There seems to be a particular problem with new and part-time taxi drivers, who often work another job or have study commitments.

Clearly, the successful management of fatigue-related risks in Queensland taxi drivers will require an ongoing and multi-tiered approach. In recent years, fatigue risk management in mature organisations has evolved from a more prescriptive framework (for example, setting maximum work hours) towards a risk-based approach, in line with the International Standard for Risk Management ISO 31000. In fact, the traditional prescriptive approach can sometimes lead to an increased risk: for example, setting maximum shift lengths at 12 hours would likely result in some taxi drivers taking second jobs to supplement their income, and it is even more difficult to monitor and/or regulate time outside of taxi driving. Another risk would be that a maximum shift length of 12 hours, for example, may actually discourage some potential new drivers from entering the industry or result in some existing drivers leaving the industry, which is already experiencing a driver shortage.

However, there are several strategies and recommendations that could be considered for any regulatory options for managing fatigue in Queensland taxi drivers. Foremost, in line with ISO 31000, it is imperative to communicate and consult with all key stakeholders, including drivers, operators, and industry bodies such as the Taxi Council of Queensland, the Taxi Drivers Association and the Taxi Industry Health and Safety Committee, throughout the process. Greater engagement of the industry in addressing the issue of fatigue is likely to result in an increased acknowledgement of the shared responsibility of fatigue management and a greater acceptance of any resultant strategies.

In the shorter term, following consultation with the industry, the following recommendations are suggested:

1. **Communication:** It is recommended that material initially be developed and disseminated to existing and new taxi drivers (as well as to operators and all taxi industry stakeholders) to raise awareness of the risks of fatigue and to highlight the shared responsibility of fatigue management.
2. **Work hours:** Given the frequent long work hours reported by taxi drivers, it is imperative to develop clear hours of work limits (including clear instructions for individual reductions where second jobs, study requirements or other commitments are known). As discussed earlier, a risk-based approach is likely to be more effective than a prescriptive approach, as setting a maximum taxi driving shift length of 12 hours for example could actually increase fatigue-related risks. It is also critical to include recommendations for regular breaks during driving shifts.
3. **Safety metrics:** Consideration needs to be given to what safety metrics are possible that are likely to drive improved safety, and how these can be linked to audit, assurance and incident investigation activities (for example, data from loggers into dispatch or the inclusion of fatigue-related questions on incident report forms). These data could provide valuable information to establish the context of the problem of fatigue in taxi drivers and to monitor and review any initiatives that are implemented to address the issue.

In the longer term, again after extensive consultation with all relevant stakeholders, the following strategies are recommended:

4. **Training:** There is a clear need for education and training around managing the risks of fatigue in taxi drivers. Topics to be covered should include: the causes, symptoms and consequences of fatigue; the importance of early identification of fatigue and the difficulty of self-assessment; sleep disorders and sleeping problems; and medications and substance use. This should be provided to existing taxi drivers and to new drivers as part of their induction. Given the high immigrant and English-as-a-second-language populations of taxi drivers, all written and training material may need to be translated into several languages depending on the identified needs. Training should also be provided to operators and managers.
5. **Health care:** In order to effectively manage fatigue risk, it is also recommended that the issues of untreated sleep disorders, and sleeping problems in general, are addressed systematically and proactively within the taxi industry. Given that in some areas the need for additional drivers is high, such programs would need to be implemented in a way that will not discourage new drivers to enter the industry. Other factors that may contribute to fatigue, including medical conditions, use of medications that impact on sleep and/or alertness, and stress (with its negative impact on recovery sleep), should also be addressed systematically and proactively. This could perhaps be incorporated into the current medical assessments and medical certificates required for all drivers.
6. **Legislation/documentation:** It may be useful to consider a 2-phase approach to the regulation of fatigue in taxi drivers. Initially, it may be sufficient to develop clear guidelines for drivers, operators and managers around fatigue management. If the level of voluntary uptake of these guidelines is deemed to be inadequate after a period of time, it may then be necessary to develop more stringent policies and procedures for the taxi industry with respect to fatigue, including the requirement for operators and drivers to develop and implement a risk-based fatigue risk management program.

An additional issue to be addressed is the fairly widespread belief, even by some regulators, that short driving trips made by taxi drivers are not fatiguing. The suggestion that fatigue is a long distance driving issue may historically explain some of the reasons why so little has been done up until this point in time. Such a cultural understanding can only be addressed over time, with the sharing of relevant crash data, reports from drivers, and other valid sources.

The Queensland Department of Transport and Main Roads is to be commended for taking the initiative to address the challenges of managing fatigue in the taxi industry. With ongoing, risk-based efforts, the largest current exposures can be addressed first, and programs of work can be developed for continuing to reduce fatigue-related fatalities, injuries and damages in the future.

## **Biographical information for the report authors**

### **Dr Adam Fletcher, PhD, MAICD (Executive Director - Integrated Safety Support)**

Adam Fletcher is recognised globally as a specialist in the management of fatigue-related risk. He has extensive experience developing, implementing and auditing fatigue management systems, and has been awarded a research PhD for investigating the measurement and prediction of fatigue in 24-hour work environments. His consulting work in a wide variety of industries has included significant projects offshore as well as many projects in Australia. Recent projects have included:

- As Principal Consultant, led the global development and implementation of the Qantas Group Integrated Fatigue Risk Management Program, which is applicable to over 23,000 safety-sensitive Qantas employees.
- As Principal Consultant, led research projects to better understand local/tribal beliefs, attitudes and understanding of safety, sleep, fatigue, shift work and related issues in remote mining operations for BHP Billiton in Kalimantan (Borneo), Indonesia.
- As one of two fatigue management experts, led the review and enhancement of Airservices Australia's existing Fatigue Risk Management System and the expansion of the system's applicability from Air Traffic Controllers to include personnel employed in Aviation Rescue and Fire Fighting and Technical and Asset Services (engineering).
- As an employed Research Psychologist, co-developed models of sleep deprivation, fatigue impairment and performance for the US Army, based at the Walter Reed Army Institute of Research in Washington, D.C., in the United States.

### **Dr Paula Mitchell, PhD, MAPS (Senior Consultant - Integrated Safety Support)**

Dr Paula Mitchell is a registered psychologist with over 20 years experience in research, clinical practice and corporate consultancy, specialising in sleep, fatigue and shiftwork. Paula's consultancy work has included the development and delivery of driver fatigue risk management programs and shiftwork risk management programs; risk assessments and development of policies and procedures to improve shift operations and maximise shiftwork adjustment; and the development and delivery of fatigue-related training programs and educational materials.

Paula graduated with a Bachelor of Science (Honours) and a PhD from Monash University. Her PhD examined caffeine and individual differences in the human body clock and she was then offered a post-doctoral research fellowship in Chicago, investigating the use of bright light therapy to help adjustment to shiftwork. Her post-doctoral work led to her winning an Australasian Sleep Association Travel Grant and an American Sleep Disorders Association/Sleep Research Society Trainee Fellowship.

In addition to her consultancy and research experience, Paula has lectured extensively on sleep, fatigue and the body clock to undergraduate, postgraduate and Diploma of Occupational Health and Safety students. She has presented many papers at both national and international conferences, has been an invited speaker at numerous industry conferences and professional meetings. A particular interest of Paula's has been community road safety, having served on the Executive Committee of RoadSafe Central Highlands. Among the major projects Paula was responsible for in this role was the development of a community driver fatigue awareness program, the implementation of the 'Fit To Drive' program, and the mobile phone awareness campaign which won the prestigious Victorian 2005 Frank Green Road Safety Award.