

# Sleepiness and fatigue



- Sleepiness (sometimes termed tiredness or fatigue) is one of the leading factors contributing to road crashes.
- A driver who has been awake for 17 hours has a driving ability similar to that of a driver with a blood alcohol concentration (BAC) of 0.05, and after 21 hours, similar to a BAC of 0.15.<sup>1</sup>
- Fall-asleep crashes are usually severe, resulting in serious injury and death, as the driver often makes no attempt to avoid or prevent the crash.

## State of the Road A Fact Sheet of the Centre for Accident Research & Road Safety - Queensland (CARRS-Q)

### THE FACTS

- Driver sleepiness is particularly dangerous because it can affect anyone, no matter how experienced a driver they might be. Driving when becoming sleepy is a high risk behavior.
- Sleepiness contributes to 20-30% of all deaths and severe injuries on the road. This means it is as much a contributor to the road toll as are speeding and drink driving.<sup>1</sup>
- The contribution of sleepiness may be higher in particular crash types, such as fatal single vehicle semi-trailer crashes.
- Sleepiness contributes to workplace impairment (including driving tasks), just as drugs and alcohol do. However, unlike drugs and alcohol which can be measured to assess risk, measuring and thus combating sleepiness in the workplace is difficult.
- There are currently no well-validated technologies that can reliably<sup>2</sup> detect sleepiness for all drivers on the road, although there are a number of very promising new devices that could be useful in conjunction with other fatigue management strategies.
- Road safety agencies rely on assessments by police attending crashes, and on statistical surrogates (i.e. specific crash criteria such as the timing, number of vehicles involved, and speed zone parameters) to determine the prevalence of sleepiness-related crashes. Though police officers are trained to perform such assessments, it is thought that the role of sleepiness in crashes is underestimated.

### *When are sleepiness-related crashes most likely to occur?*

- Sleepiness becomes a factor in all trips that occur during normal sleep times, or at any time the driver has previously been deprived of sleep. This risk may be increased if the driver is taking medication or driving alone.
- Consistent with natural dips in alertness associated with the human circadian rhythm, sleep-related motor vehicle incidents peak between 2-6am and 2-4pm.<sup>3</sup>
- Australian national data indicates a significant increase in fatigue-related crashes in holiday periods such as Christmas and Easter.<sup>4</sup>

If you are feeling sleepy, stop driving immediately. There is no cure for sleepiness, except sleep.

### *Where are sleepiness-related crashes most likely to occur?*

- In a 1998 Australian study of fatigue-related crashes<sup>5</sup>, New South Wales had the highest percentage of fatal crashes involving driver fatigue (22%) and the Northern Territory had the highest rate of fatigue-related crashes per 100 million vehicle kilometres travelled (0.66). 16.7% of the national fatal fatigue-related crashes occurred in Queensland.
- The relative risk of dying as a result of a fatigue-related crash in rural areas of Queensland is 13.5 times higher than the risk in urban areas.<sup>6</sup>

- It is now known that many sleepiness-related crashes also occur in urban areas.<sup>3</sup>
- Long straight stretches of road are particularly dangerous for sleepiness-related crashes.

### *Who is most at-risk of a sleepiness-related crash?*

Driver sleepiness affects everyone, however those at higher risk of a sleepiness-related crash are:

- Young drivers and riders are most at risk. Almost two thirds of sleepiness-related crashes involve young adults.<sup>3</sup>
- Male drivers and riders - research indicates that 75% of fatigued drivers and riders involved in single vehicle crashes were male.<sup>5</sup>
- Rural drivers and riders.
- Drivers and riders aged over 50 years are more often involved in fatigue crashes in the afternoon (12-6pm).<sup>6</sup>
- Shift workers and people with long work hours (particularly on their trips home from work). Shift workers are 6 times more likely to be involved in a sleepiness-related crash than other workers.<sup>7</sup>
- Commercial drivers including heavy vehicle drivers. Commercial drivers spend long hours on the road, frequently drive at night, many keep highly irregular schedules and may keep irregular sleep schedules. This lifestyle can cause chronic sleep deprivation. It is estimated that 1 in 3 fatal articulated truck crashes involve fatigue (compared with 1 in 6 for other fatal road crashes that do not involve a truck). However usually the truck driver is not at fault. The truck driver was the fatigued



party in only 1 out of every 6 fatal fatigue crashes involving an articulated truck and another vehicle.<sup>5</sup>

- Passenger cars are the main vehicles involved in fatigue crashes. In a 1998 national study, 70% of fatigued drivers and riders involved in single vehicle crashes were driving passenger cars at the time of the crash.<sup>5</sup>
- People with medical conditions (e.g. sleep disorders). It is difficult to specify exactly how many people suffer from Obstructive Sleep Apnoea (OSA), where the airway collapses during sleep and breathing is interrupted. The effect of this sleep disruption can be excessive fatigue during the daytime and slowed response times. Whilst OSA is conservatively estimated to affect approximately 5% of the general population, the condition appears to be more prevalent in commercial drivers. A 2004 study estimated that 50% of more than 3,000 commercial drivers studied were at risk for sleep apnoea. The prevalence of OSA is probably increasing due to the 'obesity epidemic'. People with untreated OSA have an increased likelihood for a crash, up to a five-fold increase in their risk.<sup>8</sup> Despite this, a large proportion of people with OSA remain undiagnosed and untreated. Drivers whose OSA has been treated are generally fine to drive, but still have the responsibility to obtain adequate sleep and to use their treatment before driving.<sup>9</sup> In Australia, the cost to the community of drowsy driving road accidents is estimated to be \$2 billion every year.<sup>10</sup>
- Sleepiness may interact with other road safety risks. For example, if you have had some alcohol but are below the legal level for driving, sleepiness can make you more dangerous than either sleep or alcohol alone.<sup>11</sup>

### *How does sleepiness affect driving?*

Driving while tired increases the risk of being involved in a crash where someone is injured or killed. The effects of sleepiness on a driver include:

- Impaired performance;
- Loss of attention;
- Slower reaction times;
- Impaired judgement;
- Increasing probability of falling asleep; and
- Subjective feelings of drowsiness or tiredness.

## Ensure you're getting enough sleep and quality sleep. 7-9 hours sleep per night is recommended for adults.

### *Warning signs of fatigue*

- Wandering in the lane or over lane lines;
- Changes in speed, especially slowing down without reason;
- Heavy eyelids and difficulty keeping eyes open;
- Poor concentration;
- Boredom;
- Restlessness;
- Yawning;
- Drowsiness;
- Head nodding; and
- Microsleeps (brief sleep episodes that can be as brief as a few seconds).

### *Contributory factors to fatigue*

- Insufficient sleep before starting to drive (the number 1 contributor, by far);
- Long periods awake;
- Poor quality sleep;

- Disruption of the daily cycle of waking and sleeping (i.e. driving when you would normally be asleep);
- Sustained mental or physical effort;
- Inadequate rest breaks;
- Stress;
- Environmental stresses (e.g. heat, noise, vibration, climate, illumination); and
- Illness or pain.

## Common strategies drivers adopt when feeling sleepy such as turning the music up, opening the windows, or turning on the air conditioning have been proven not to work.<sup>14</sup>

### TIPS FOR STAYING SAFE

Do not begin a drive if you are already feeling tired. If you notice signs of sleepiness, these strategies may help:

- Ensure you **regularly get enough sleep**. Most people need 7-9 hours sleep per day and young people often require more than that.<sup>12</sup>
- **Get a good night's sleep** before travelling (don't stay up late packing and planning).
- **Avoid driving at the high risk times** (during your normal sleep times).
- **Take frequent breaks**, whenever you need one (a rest break at least every 2 hours is currently recommended).
- Both drivers and passengers should **be alert to the signs** of sleepiness and how to take action. The only cure for sleepiness is to get enough sleep. **If you are feeling sleepy, stop driving immediately.**
- Plan to **share driving on long trips**, but only if they aren't sleepy as well. Don't feel embarrassed if you have to ask someone to take over the driving—better to be safe than sorry.
- **A short nap of 10-20 minutes** will prevent some fatigue, but allow time to recover from your sleep before continuing.<sup>13</sup>
- **Consuming a caffeine drink may help**, but note that it takes 20 minutes from consumption to start taking effect.
- **Avoid travelling long distances after a full day's work.**
- **Seek medical advice if you regularly feel sleepy**, or have noticed problems with your sleep.
- **Be aware of the effects of medications** you are taking (some may increase drowsiness). See your pharmacist or GP for advice on your current medication schedule.

## WHAT IS BEING DONE TO PREVENT FATIGUE-RELATED CRASHES?

### Policy and legislation

- The National Road Safety Strategy<sup>1</sup> and Queensland Road Safety Strategy provide a framework for national and state road safety initiatives, including those targeting fatigue-related crashes. This strategy recognises fatigue as a significant behavioural factor in road death and injury.
- Fatigue driving in Queensland is regulated by four means<sup>6</sup>:
  - Transport Operations (Road Use Management – Fatigue Management) Regulation (Qld) 1998;
  - Transport Operations (Passenger Transport) Standard (Qld) 2000;
  - Transport Operations (Road Use Management) Act (Qld) 1995; and
  - Criminal Code Act (Qld) 1899.
- The National Transport Commission introduced Heavy Vehicle Driver Fatigue Legislation in September 2008 in Queensland, New South Wales, Victoria and South Australia. The legislation, targeting all parties in the supply chain, requires enhanced management of driver fatigue and setting revised work and rest hours for drivers. A national survey of Australian transport companies in 2002<sup>15</sup> revealed that though awareness of the dangers of fatigue was high, changes in operational practice were significantly lagging. The legislation aims to address this shortfall.

### Education

- Mass media education campaigns aim to heighten driver awareness of the dangers of fatigued driving. In addition, educational initiatives are run by motoring organisations (e.g. RACQ), local police divisions, high-risk industries (e.g. mining) and fleet companies.

**Be aware of the effects of medications you are taking (some may increase drowsiness). See your pharmacist or GP for advice.**

### Environment

- Road engineering treatments that address run-off-road and head-on crashes can assist to make the environment more forgiving, reducing the chance of a fatigue-related crash or its severity if it does occur. Divided roads, audio tactile line marking, removal of roadside hazards (e.g. trees, poles and culverts) and profile



- line markings are used throughout the road network and particularly target black spot areas.
- The reduction of driver monotony by making the road environment more interesting (e.g. curved rather than straight roads, scenic routes) may assist to prevent driver fatigue, but the benefits of this approach need to be tested.
  - There are over 500 rest areas, heavy vehicle stopping areas and points of interest such as scenic lookouts in Queensland. These aim to reduce of number of fatigued drivers by encouraging regular rest breaks. The Queensland “Driver Reviver” program operates in many rest areas during holiday periods.

**Take a break every two hours on longer trips.**

### Research

- Australian research has focussed on:
  - The development, trial and evaluation of road safety countermeasures designed to prevent and combat fatigue;
  - Improved definitions of sleepiness-related crashes,
  - Analysis of statistical trends in sleepiness-related crashes,
  - Reviews of the best international literature; and
  - Surveys of high risk groups.
- There has been extensive research aimed at developing on-board driver monitoring and crash prevention devices to reduce fatigue risks, but the effectiveness of these as a crash prevention measure remains unproven. Such technology has included alarm rest break reminders and devices designed to monitor brain wave activity, eye movement, steering wheel movement and levels of energy and concentration.<sup>2</sup>

### CARRS-Q'S WORK IN THIS AREA

- Developing potential new measures of sleepiness (including ocular electroencephalogram, and performance measures).
- Studies of a wide range of objective physiological measures of fatigue.
- Surveys of driver exposure to sleepiness and their on-road compensation strategies.
- Investigation of the effects of shiftwork on driver sleepiness.
- Investigation of the interaction between risk taking and sleepiness in young drivers.
- Investigation of the effects of other social factors (including having a new baby) on driver sleepiness.
- Development of new strategies to improve sleep in people with OSA and other sleep disorders, in young adults, and in children.
- Assessment of potential new strategies to combat sleepiness on the road, including evaluation of nap breaks, bright light and caffeine as countermeasures.

CARRS-Q's Sleepiness and Fatigue research publications can be accessed with the reference list or at QUT ePrints (<http://eprints.qut.edu.au/>) by searching 'Fatigue, Sleepiness'.

**Avoid driving at high risk times (when you'd normally be asleep). The periods 2-6am and 4-6pm are the most dangerous for a sleepiness-related crash.**

## FUTURE DIRECTIONS

The National Road Safety Strategy 2011-2020<sup>1</sup> recommends that research on direct remedies (including technological solutions) should be supported and evaluated.

Future national priorities may include:

- Pilot operational field trials of driver and vehicle devices that measure drowsiness crash risk using metrics based on ocular dynamics or carriageway position, including back to base monitoring of data.
- Development of more effective public information campaigns and education resources about fatigue for all road users, with a particular focus on educating novice drivers.
- The development of a nationally standardised definition of a “fatigue crash” and improved fatigue crash reporting systems which are reliable, accurate and nationally standardised. Current reporting systems fail in all three areas.
- Improved training of general practitioners to increase the identification, education and treatment of patients with sleep disorders.
- Improved training and guidance for police officers to more accurately recognise fatigue-related crashes.
- Monitoring the national and international findings of research on driver fatigue.
- The implementation of improved road design countermeasures to prevent fatigue crashes.



Sleepiness is **one of the leading causes** of road crashes. It is particularly dangerous because **it can happen to anyone**, no matter how experienced a driver they might be.

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