

Nonstandard Schedules and Commuting Motor Vehicle Crashes

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National Institute for Occupational Safety and Health



Disclaimer

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NIOSH Mission

- develop new knowledge in the field of occupational safety and health
- to transfer that knowledge into practice



“Research/Recommendations”

“Regulations”



NIOSH Working hours and fatigue work group

Mission:

To reduce the health and safety risks associated with shift work and long work hours, in addition to promoting the wellness of workers in non-standard schedules



Outline

What we know

- Nonstandard schedules, drowsy driving and motor vehicle crash risk
- Commuting in Canada
- Risk factors for commuting accidents
- What is the law? (Who is responsible?)

Control Interventions

Challenges and Future Directions

Nonstandard schedules



“Nonstandard schedules” definition:

- outside regular 9-to-5 hours
- includes overnight, evening, rotating, irregular shifts

~25% Canadians work in nonstandard schedules (Wong 2011)

Doesn't include

- people who have multiple part time jobs
- early morning workers

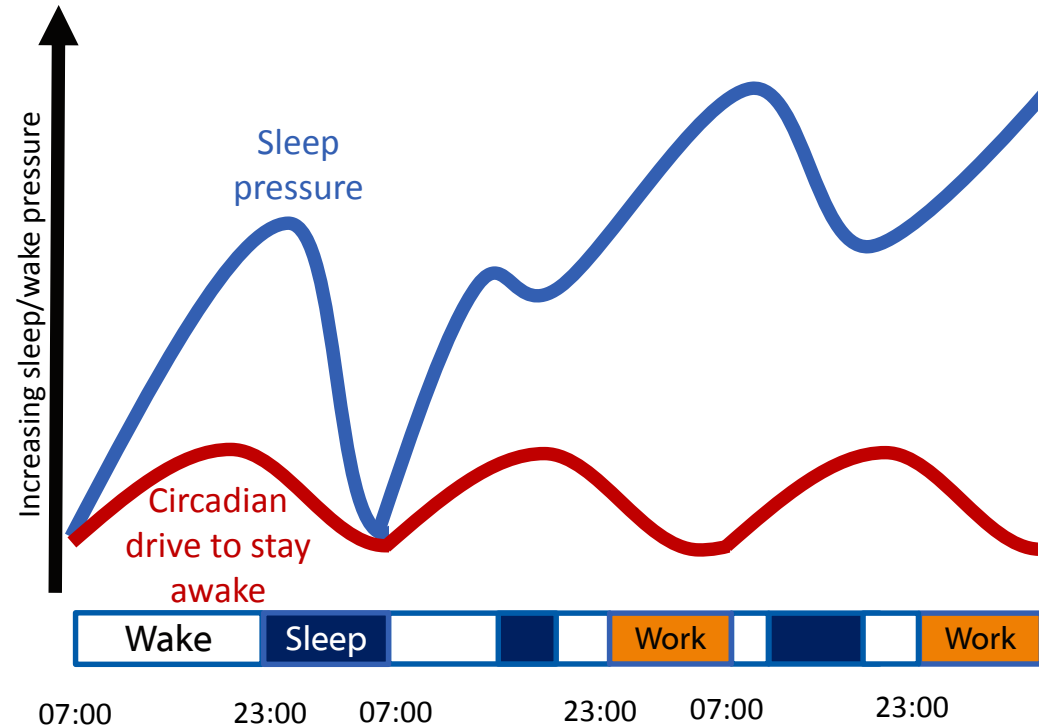
Nonstandard schedules, sleep and cognition

Circadian disruption

Sleep impairment

- poorer quality
- shorter duration
- poorer recovery sleep during the day

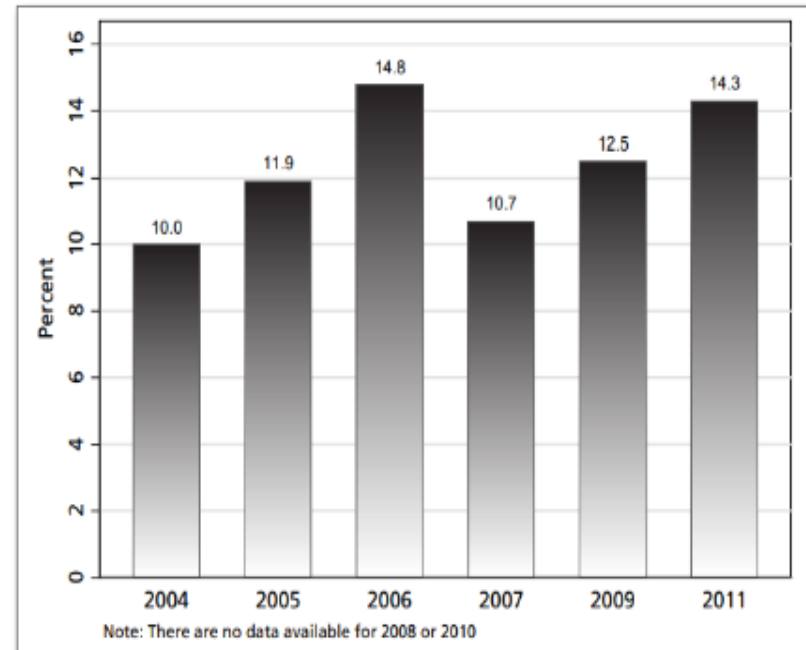
Cognitive impairment



Drowsy driving in Canada

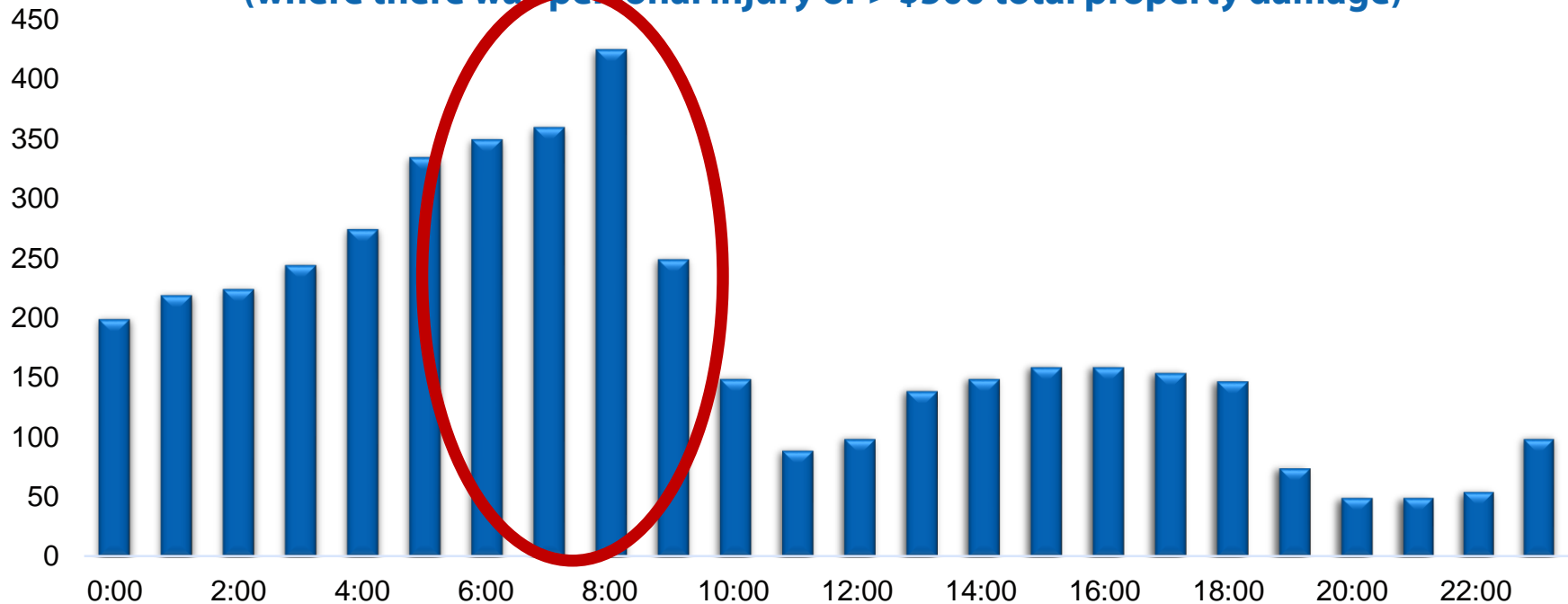
- 20% have fallen asleep or nodded off while driving in the past year
 - 33% had been driving **for less than an hour**
 - 30% between 9 pm – 6 am
- 20% of serious crashes may be due to fatigued or drowsy driving
- 61% rated drowsy driving as “a very or extremely serious problem”

Self-report of drowsy/fatigued driving



Number of fatigue-related crashes by time of day

North Carolina 1990 – 1992 fatigue-related crashes from police reports
(where there was personal injury or > \$500 total property damage)



Fatigue and accidents in transport operations



Major causes of fatigue are:

- the time of day of the transport operation (e.g. night/early morning)
- a long duration of wakefulness
- inadequate sleep
- pathological sleepiness (sleep apnea, etc.)
- prolonged work hours (not necessarily operating the vehicle)

All associated with nonstandard shifts

Commuting vs other forms of driving

Commuting is a routine activity resulting in less vigilance and attention (Elfering 2012)

Drivers are more easily distracted during commuting, often focusing on work demands (Brosschot 2005, Grebner 2004)

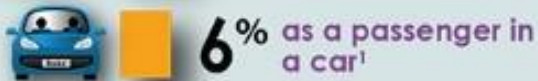
Professional drivers have more training, are more heavily regulated and better at identifying when their driving is impaired by fatigue

(Masa 2000)



Commuting in Canada

In 2016, 15.9 million Canadians commuted to work...



1. Includes car, van, truck or SUV

Driving commuting:

- Average commute to work = 24 min
- 7% spent at least one hour each day to get to work
- Median distance = 8 km
- 67% drive alone
- 12% workers with no fixed workplace
(construction, administrative and support, waste management and remediation, **transportation and warehousing**)

Risk factors for commuting accidents

Workplace factors:

Night shift work (Gold 1992, Di Milia 2007, Scott 2007, Swanson 2012, Di Milia 2012)

Extended work hours (Kirkcaldy 1997, Barger 2005, Scott 2007, Swanson 2012)

Occupation

- Women: health and community services (Hours 2011)
- Men: professional drivers, manual workers, sales representatives, clerical staff (Hours 2001, Charbotel 2001 & 2010, Chiron 2008)
- Non-professionals (Carter 2001), independent contractors (Di Milia 2007)

Work stress / Time pressure (Chiron 2008, Elfering 2012a, Elfering 2012b, Kirkcaldy 1997)

Risk factors for commuting accidents

Environmental factors:

Increasing length of commute (distance and time) (Kirkcaldy 1997, Akerstedt 2004, Lee 2016, Chiron 2008, Di Milia 2007 & 2012)

Early morning hours and late rush hour (Charbotel 2010, Zepf 2010)

Distracted driving (i.e. mobile phones) (Di Milia 2012)

Individual characteristics:

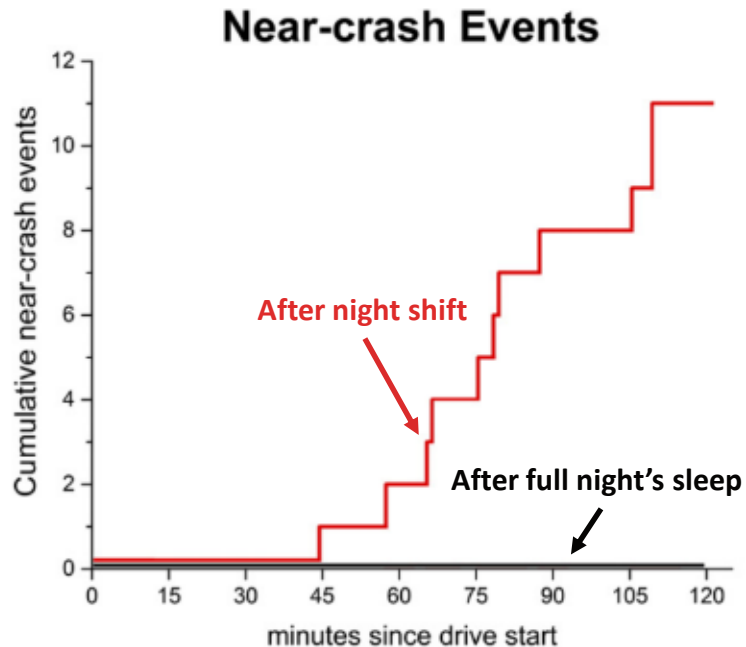
Age

- greater risk among 25-34 years of age (Charbotel 2001, Zepf 2010)
- men > 55 years, protective effect for accidents (Chiron 2008), but greater risk for fatal accidents (Charbotel 2001)

Sleep problems / impaired sleep (Carter 2001, Swanson 2012, Di Milia 2007, Di Milia 2012)

Sleepiness (Akerstedt 2004, Di Milia 2012)

Time to motor vehicle crash following night shift



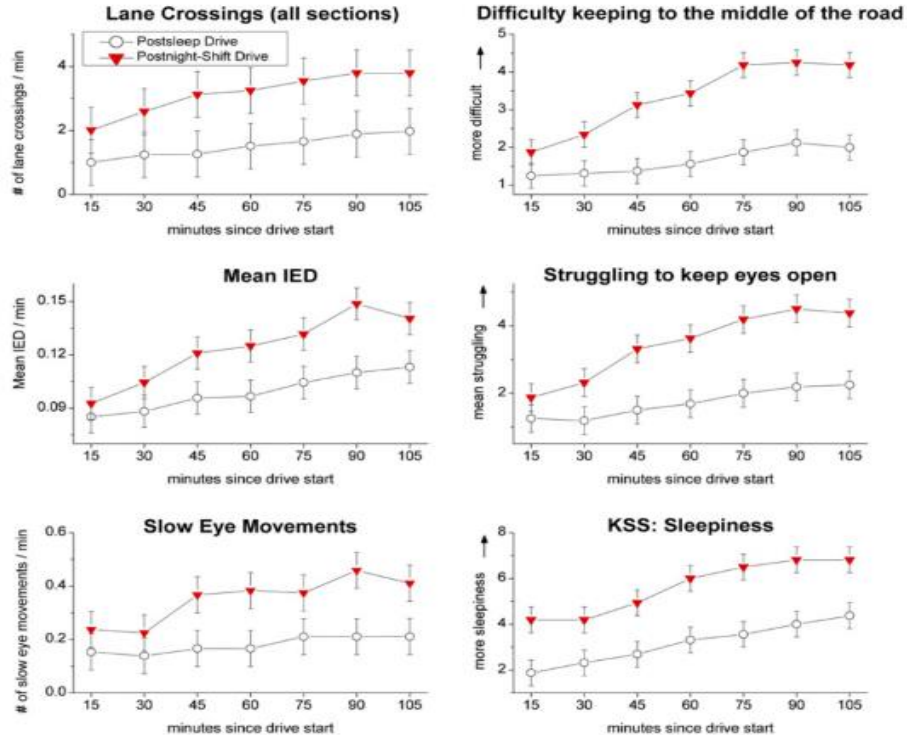
Test drive after a full night's sleep vs after a night shift

N = 16

- No near-crashes following full night's sleep
- 38% of post-night shift test drives ended in near crashes
- 44% of post-night shifts were terminated early for safety reasons

Closed track – no influences of traffic volume, distractions, etc

Time to motor vehicle crash following night shift



Deficits in driving performance and physiological indicators of drowsiness were evident **only 15 minutes** into the drive

Limitations to studies

Surveys / Descriptive studies

Questionable reference categories

- Driving after night shift vs Driving after a full night's sleep
- Night shift vs Flexible shifts

Simulator/closed track studies

Only considered commute from work to home

Limited industry groups (e.g. mining, health care professionals)

Generalizable to Canadians?

International Labour Organization



Definition:

“an accident occurring on the habitual route, in either direction, between the place of work or work-related training and: (i) the worker's principal or secondary residence; (ii) the place where the worker usually takes his or her meals; or (iii) the place where he or she usually receives his or her remuneration; which results in death or personal injury”

Global workplace fatality estimates (Takala 1999):

- 49% at work
- 19% traffic accidents at work
- 32% commuting accidents

Basic recommendations (2002):

- establish and implement a national system for the recording, notification and investigation of occupational accidents, occupational diseases, **commuting accidents**, dangerous occurrences and incidents

Fatigued driving laws

United States



Federal bill: “Maggie’s Law” (2003) – to provide education to the public and law enforcement officials, and to create a formal code to report fatigue-related accidents

Laws (driver involved in a **fatal** accident has been without sleep for 24 consecutive hours):

- Arkansas (2013): “fatigue driving” as “negligent homicide”
- New Jersey (2003) - “fatigued driving” as “vehicular homicide”

Canada



RCMP recognizes fatigued driving as a “distracted driving”

Premise for fatigued commuting accident cases

Dram Law – a business/host who serves alcohol to an obviously intoxicated person is liable for injuries sustained by third party as a result of the intoxicated person



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Fatigued commuting accident cases



Robertson vs Norfolk & Western Railway Company (West Virginia 1983)

- 19 year old forced to extend usual shift to 27 hours in physically demanding labor
- Obvious signs of fatigue among workers

Laverty vs McDonald's Restaurants (Oregon 1995)

- high school senior worked 17 hours following a full school day (after 5 night shifts in the prior week)
- McDonald's had scheduling policies regarding working students; knowledge of prior fatigue commuting accidents

Escoto vs Nabors Drilling (Texas 2009)

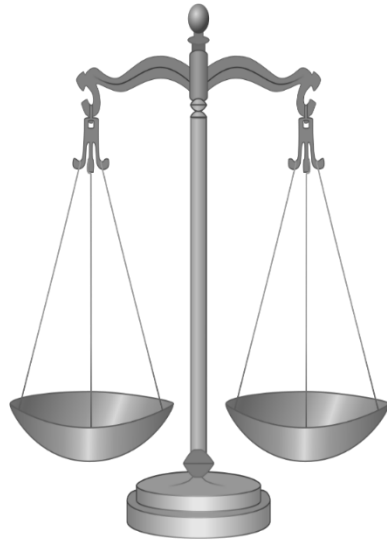
- 12 hour shifts (compared to 8 hours with other companies), no structured break schedule
- Knowledge of fatigue, but did not provide adequate training

Who is responsible?

Criminal Code Section 217.1: Criminal liability to organizations, their representatives and supervisors for violations resulting in injuries or death

Employer

- “Excessive” scheduling
- knowledge that worker was fatigued
- control over the employees
- provision of resources for workers (e.g. transportation, napping areas, training)



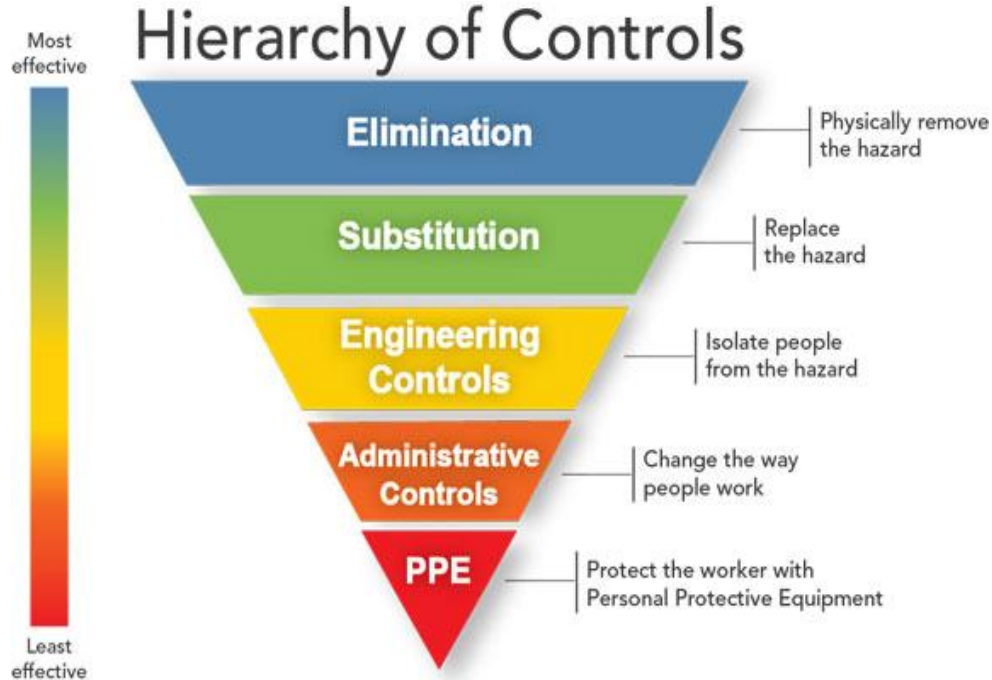
Employee

Choices:

- obtaining regular, sufficient quality sleep
- working extra shifts
- use employer resources
- drive home fatigued-impaired

reasonable care to avoid damage that would be reasonably anticipated

What can we do?



Elimination / Substitution

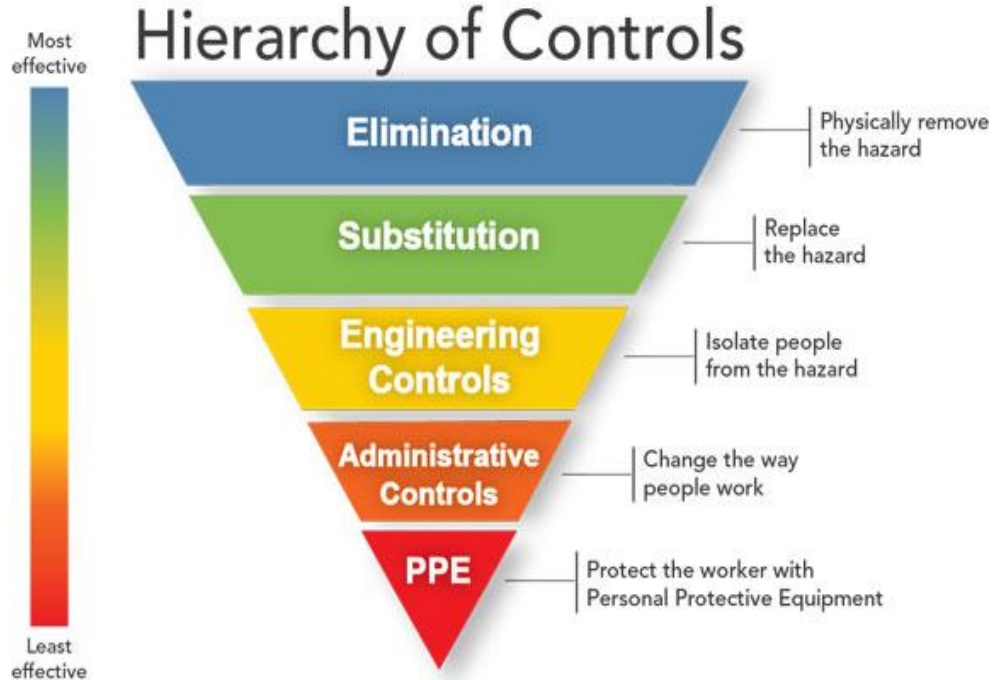
Alternative modes of transportation

- Public transit
- Autonomous vehicles (?)
- Carpooling / Employer transport

Community planning

- Walkable communities

What can we do?



Engineering / Administrative Controls

- Napping areas in workplaces
- Roadway improvements
- In-vehicle monitoring / sensors
- Fatigue Risk Management
- Teleworking
- Safety culture

Challenges and Future Directions



When is an employee officially off the clock?

- "Where the employee may be deemed to be pursuing a business errand and a personal objective simultaneously, he will still be acting within the scope of his employment." (Felix v. Asai, 1987 Cal.App.)

Evolving work arrangements

- Not all work is confined to a static location
- Independent contractors

Use of personal or company vehicles for work and commute

Motor vehicle crash investigations – commuting/fatigue related?

What are commuting behaviours in Canada? (Risk Assessment)



Thank you!

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