

Driver Fatigue: What we know and what we don't know

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About me..

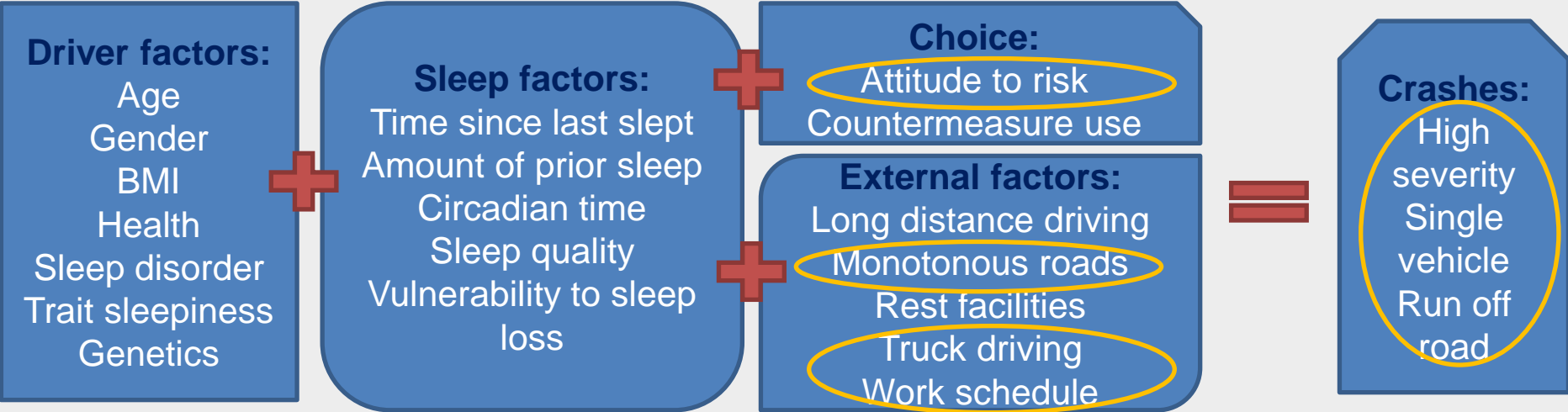
- Senior Lecturer of Human Factors in Transport Safety, Loughborough University
- Transport Safety Research Centre (TSRC) Loughborough University 2016-present
- Previously worked in Australia at Monash University Accident Research Centre (MUARC; 2011-2013) and the Centre for Accident Research and Road Safety Queensland (CARRS-Q; 2013-2016)
- CBiol. Chartered Biologist from the Royal Society of Biology, European Sleep Research Society member, Working Time Society member.

My areas of expertise...

- Transport safety research
(13 years experience – Quantitative and Qualitative methods)
- Sleepiness and safety
- Driver sleepiness and driver fatigue
- Driving simulators, on-road studies, focus groups, interviews
- Professional driver safety – trucks, buses, trains

What do we know about driver fatigue?

Estimated contributing to 15–30% road crashes (Åkerstedt, 2000, Bioulac et al., 2017, Connor et al., 2002)



What does driver fatigue look like?



Driver fatigue on low speed roads

- Do drivers have fatigue related crashes on low speed roads?
- Are low speed road crashes different if fatigue is involved?



Filtness, A. J., Armstrong, K. A., Watson, A., & Smith, S. S. (2017). Sleep-related vehicle crashes on low speed roads. *Accident Analysis & Prevention*, 99, 279-286

Crash data investigation

10 years of Queensland police crash reports
- 1 January 2000 to 31 December 2009

Public road \leq 60 km/h, where at least one of:

- person was killed or injured
- vehicle was towed
- greater than \$2500 of damage to property other than vehicle

Attending police officers identify contributory factors including 'fatigue/fell asleep'

Crashes resulting from medical conditions and deliberate acts are excluded.



Do drivers have fatigue related crashes on low speed roads?

Yes

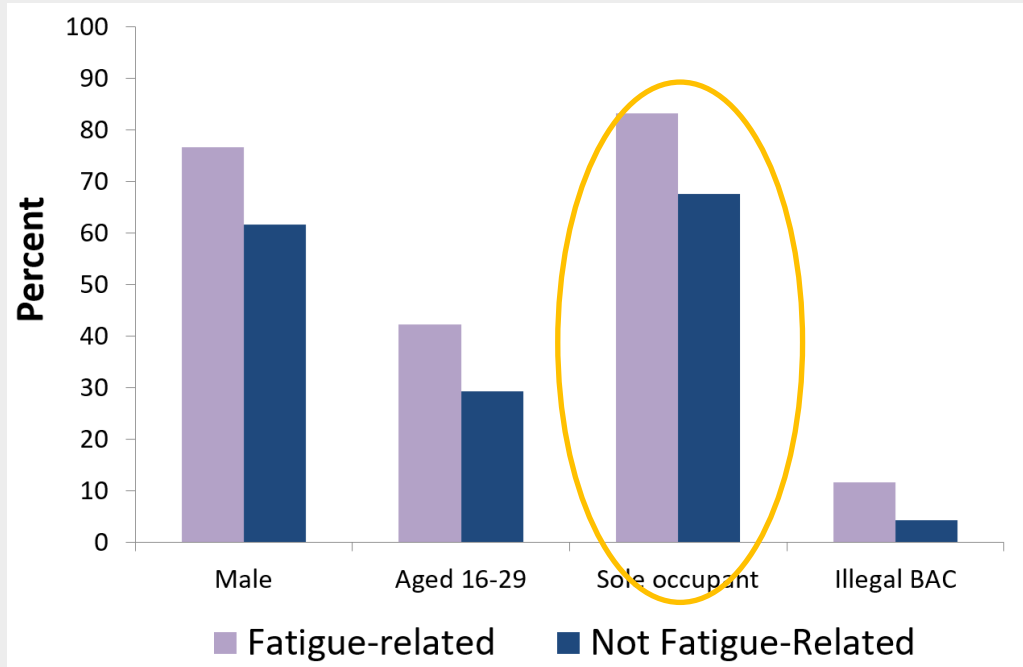
- 1,411 (0.5%) = fatigue-related.
- 273,733 total drivers/riders had a crash on ≤ 60 km/h road

For context:

- 3,449 (5.3%) = fatigue-related.
- 65,205 drivers/riders total had a crash on ≥ 100 km/h speed zone



Are low speed road crashes different if fatigue is involved?

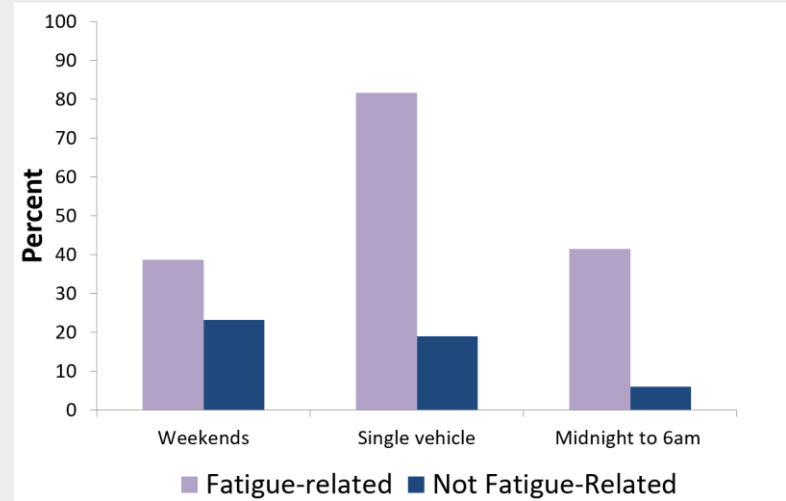
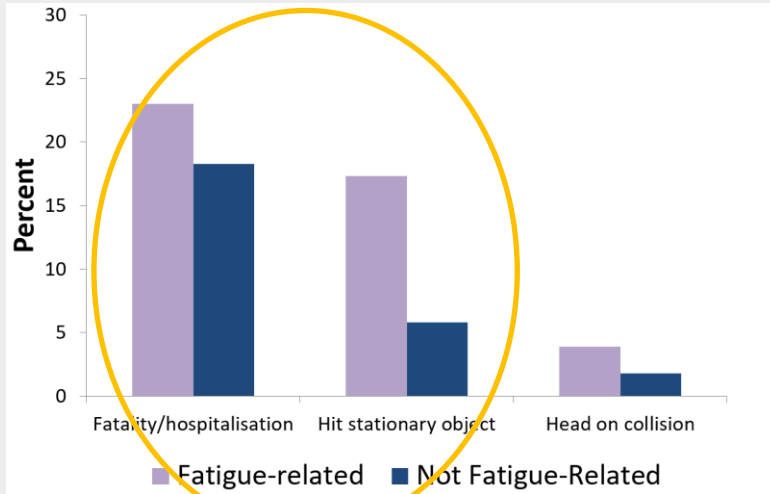


Vehicle operators

Crashes on ≤ 60 km/h roads

- Gender: $\chi^2(1) = 132.6$, $p < .001$, $\phi_c = .02$
- Age: $\chi^2(6) = 163.5$, $p < .001$, $\phi_c = .03$
- Sole occupant: $\chi^2(1) = 156.8$, $p < .001$, $\phi_c = .02$
- Illegal BAC: $\chi^2(1) = 187.9$, $p < .001$, $\phi_c = .03$

Are low speed road crashes different if fatigue is involved?



Crash characteristics from Crashes on ≤ 60 km/h roads

Severity: $\chi^2(3) = 36.5$, $p < .001$, $\phi_c = .01$ Nature: $\chi^2(10) = 4434.2$, $p < .001$, $\phi_c = .13$ Day of the week: $\chi^2(6) = 230.7$, $p < .001$, $\phi_c = .02$ Number of vehicles: $\chi^2(2) = 3551.5$, $p < .001$, $\phi_c = .02$ Time of day: $\chi^2(6) = 230.7$, $p < .001$, $\phi_c = .02$

What we know and what we don't know: Fatigue crashes

Fatigue crashes are most likely to involve

- Young
- Males
- Hitting a stationary object, and
- Be high severity (fatal/serious injury)

What we know and what we don't know: Fatigue crashes

Crash data 'Know':

- Strongest indicator of risk/safety measure
- Large sample size
- Real world relevance
- **Under-reported**

Crash data 'Don't Know':

- Only includes crashes reported to the police.
 - Of drivers who had a fatigue related incident in the past 5 years, only 45% had police involvement (Armstrong et al 2013)
- Police officers say they have difficulty identifying fatigue (Radun et al 2013)
- Inconsistency of reporting between police officers. Particularly in lower severity crashes.

Professional driver fatigue

- Do city bus drivers in stop start traffic experience driver fatigued?



Miller, K. A., Filtness, A. J., Anund, A., Maynard, S. E., & Pilkington-Cheney, F. (2020). Contributory factors to sleepiness amongst London bus drivers. *Transportation Research Part F: Traffic Psychology and Behaviour*, 73, 415-424.

London Bus Drivers

- > 9000 buses operate on ~700 different routes
- London bus network carries ~ 2.5 billion passengers annually
- ~ 25,000 bus drivers (8% females)
- 10 independent bus operating companies



Bus driver fatigue

Research programme aim: Understand the extent and nature of fatigue, the contributing factors to fatigue, and what solutions could be implemented to address fatigue.

<http://content.tfl.gov.uk/bus-driver-fatigue-report.pdf>

- What is the self-report prevalence of sleepiness amongst London bus drivers?

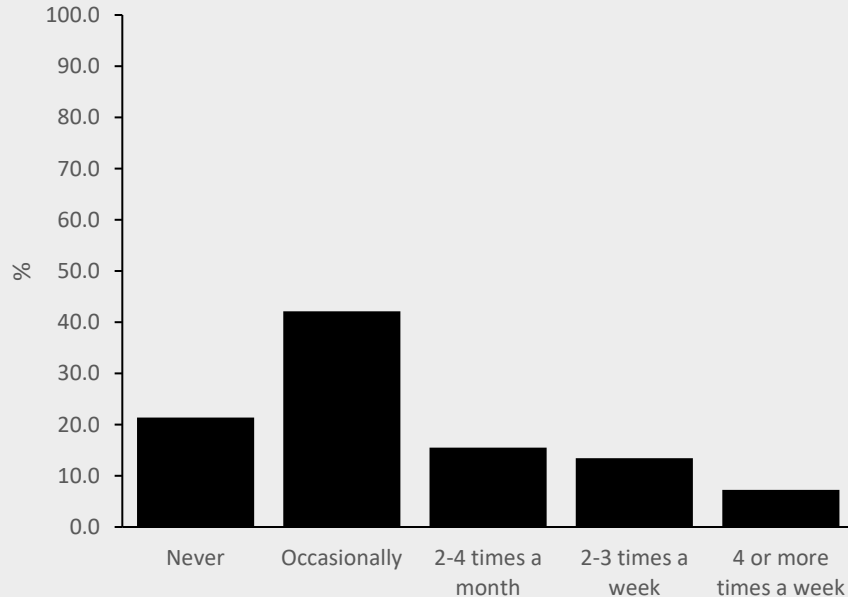
Bus driver survey

- 1,353 London city bus drivers (86% male)
- Age $M = 45$ years (Range = 20-73y, $SD = 8.46$ y)
- 96% worked full time as bus drivers
- Hours worked per week, full time drivers $M = 45$ (Range = 35-75h)
- Part time drivers worked 12 to 35h a week ($M = 25$ h)
- 46% worked fixed rosters, 54% worked rotating rosters

Results

– How often do you have to fight sleepiness in order to stay awake while driving the bus?

- In the past 12 months, have you fallen asleep whilst driving the bus?



- 36.3% at least 2-4 times a month
- 20.8% at least 2-3 times a week
- 16.6% had fallen asleep at least once in the last year

Results

- In the past 12 months, have you ever had a road crash/ 'close call' while driving the bus because you were sleepy?
 - Do you think your employer knows this crash/ 'close call' was because you were sleepy?
-
- **5.5%** had a sleep related **road crash**
 - Of those who had a crash, **77%** said employer **would not** know this was due to sleepiness
 - **36.7%** had a sleep related '**close call**'
 - Of those who had a 'close call' , **88%** said employer **would not** know this was due to sleepiness



What we know and what we don't know: Professional driver fatigue

Stop start traffic does not prevent driver fatigue.

Bus drivers regularly fight sleepiness and the majority do not talk to their employer about it.

What we know and what we don't know: Professional driver fatigue

Survey's 'Know':

- Strongest indicator of individual experience
- Large sample size
- **Under-reported**

Survey's 'Don't Know':

- Low response rate (~5%)
- Self-report
- Dependent on recall
- Single point in time (Autumn 2018)



Public perception of driver fatigue



Driver fatigue on YouTube

- How is driver fatigue portrayed on YouTube?

**Hilarious girl
falling asleep
while driving**

Uploaded by [jeffmj420](#) on
May 2, 2011



Hawkins, A. N., & Filtness, A. J. (2017). Driver sleepiness on YouTube: A content analysis. *Accident Analysis & Prevention*, 99, 459-464.

Method

- Systematic search 5 years YouTube videos. (2nd December 2009–2nd December 2014)
- Google trends analysis confirmed each term as a popular search

“sleepy driving”, “driving sleepy”, “tired driver”, “drowsy driver”, “falling asleep while driving”, “driver fatigue”, “sleeping driver”, “tired driving”, “driving tired”, “fatigue driving”, “drowsy driving”, “driving drowsy” and “sleepy driver”

559 videos identified

(2/12/09 – 2/12/14)

117 excluded (exclusion e.g. toy cars, passengers falling asleep, music performance, video game footage)

442 relevant

Reception by outlook

		Is dangerous	amusing	Does not impact driving	Can be overcome
		n=399	n=17	n=14	n=12
Views	Total	1,642,321	313,905	11,533	20,331
	Mean per video	4,116	18,465	824	1,694
Likes	Total	4,156	1,299	29	281
	Mean per video	11	76	2	42
Comments	Total	1,113	215	16	129
	Mean per video	3	13	1	4

What we know and what we don't know: Public perception of driver fatigue

- Most YouTube videos of driver fatigue show it as dangerous
- Videos trivialising the danger are most viewed and liked
- Some people think that driver fatigue is funny

What we know and what we don't know: Public perception of driver fatigue

YouTube 'Know':

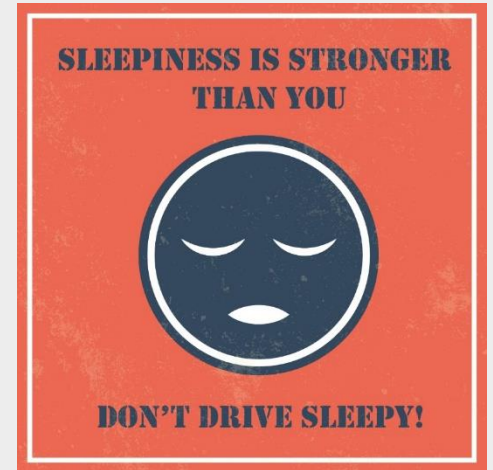
- Observation of culture/attitudes without influence.

YouTube 'Don't Know':

- What the viewers and uploaders think of the videos
 - Dash-cam crash footage was classified dangerous even from entertainment themed channels.
- What the impact watching these videos has on viewers.
- **Would drivers stop if their vehicle told them they were tired?**

What do we know about driver fatigue?

- Everybody sleeps, everybody gets sleepy, every driver has the potential to become fatigued.
- Sleep is a biological need.
- If the body/brain needs to sleep it will do.
- Crashes are avoidable. Manage the factors that can lead to driver fatigue and enable drivers to do something about it



What don't we know about driver fatigue?

- How to accurately detect fatigue (no breathalyser equivalent)
- At what point it becomes dangerous / how much fatigue is too much?
- How to definitively confirm fatigue as contributing factor to crashes after the event
- How to engage drivers for take over of semi-autonomous vehicle
- How to eliminate fatigue for autonomous vehicle monitors
- Which individuals are pre-disposed to driver fatigue e.g. genetic marker
- Someone else's experience of fatigue
- Optimising individualised countermeasures
- How to get everyone talking about driver fatigue / eliminate under reporting
- How to get all drivers to take fatigue seriously and act on fatigue detection alerts
- Predicting performance decrement/failure
- Mechanism for sleepiness performance decrement (prior to being asleep)
- How fatigue influences all skills required for safe driving e.g. situation awareness, hazard perception
- Why we sleep!
- Etc....



What does driver fatigue look like?



Acknowledgments



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Thank you!

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