

The Application of a Proxy Measure to Estimate the Incidence and Characteristics of Driver Fatigue in Motor Vehicle Crashes

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Abstract

This research sought to describe the incidence and characteristics of fatigue as a contributing factor in reported road crashes in Western Australia, 2009-2013, through a comparative analysis of police reported fatigue-related crashes and the application of the Australian Transport Safety Bureau (Dobbie, 2002) post-crash operational definition for fatigue crashes. The two measures showed differences in the number and type of crashes identified to be fatigue-related. A combination of the two showed that up to 17.6% of all reported fatal crashes and 8.3% of all reported hospitalisation crashes could be identified as fatigue-related. A revised post-crash measure of fatigue was recommended.

Background

The reported incidence of fatigue in road crashes range from 2.6% of fatalities in the USA (NHTSA, 2014) to 16.5% of fatal crashes in New South Wales (NSW Centre for Road Safety, 2015). Most Australian jurisdictions, including Western Australia, do not formally report statistics for fatigue-related crashes because of validity and reliability measurement concerns. New South Wales and Queensland apply a post-crash proxy of fatigue to supplement the police identification of fatigue using variations of an operational definition advanced by the Australian Transport Safety Bureau (ATSB) (Dobbie, 2002). This study compares crashes assessed by WA Police for fatigue with those identified from the application of the ATSB definition to improve the estimate of the incidence in Western Australia and to identify common risk factors for fatigue-related crashes.

Method

All reported Western Australian motor vehicle crash records (n=186,585) involving drivers/riders of motorised vehicles for the period 2009-2013 were retrieved from the Integrated Road Information System. The subset of police attended crashes (n=16,741) were analysed to describe the incidence of police reported fatigue crashes and associated risk factors. The ATSB operational definition (Table 1) was subsequently applied to the dataset of police attended crashes and the analyses repeated and the findings compared. The ATSB operational definition was also applied to the larger dataset of all reported crashes to estimate the incidence beyond just police-attended crashes.

Table 1. Australian Transport Safety Bureau operational criteria for a fatigue crash

Exclusion Criteria	Crash occurred on a road with a posted speed limit below 80km/hour Crash involved a pedestrian Crash involved a driver who had no authority (i.e., unlicensed) to drive at the time of crash Crash involved a driver with a Blood Alcohol Concentration level $\geq 0.0500\text{gm}\%$
Inclusion Criteria	Single vehicle crash occurring between midnight-6.00am or 2.00pm-4.00pm Head-on crash in which neither of the involved vehicles was overtaking at the time of the crash

Adapted from Dobbie (2002)

Summary Results and Discussion

Selected summary results are presented in Table 2. For police attended crashes, the incidence of fatigue was highest when assessed by police compared with that determined from the application of the ATSB definition across all outcomes (9.8% versus 4.8%) and by injury severity (fatalities and hospitalisation). The correspondence between the two measures in the identification of fatigue was highest for fatal crashes (27.3%) compared with hospitalisation crashes (20.5%) and all injury outcomes (16.1%). The relatively low level of correspondence between the measures was due to the restrictive exclusion and inclusion criteria of the ATSB operational definition. For example, 65% (n=633) of police reported single vehicle fatigue-related crashes were excluded because they occurred outside the ATSB critical inclusion time. Application of the ATSB definition to all reported crashes (attended and non-police attended) increased the total number of possible fatigue-related crashes to n=2,498. After adjusting for the number of crashes that were mutually identified to be fatigue-related, a combination of the measures suggested that up to 17.6% of all reported fatal crashes, 8.3% of all reported hospitalisation crashes, and 2% of all reported crashes across all injury outcomes for the period could be fatigue-related.

Table 2. *The number and proportion of fatigue-related crashes identified from WA Police reports and the application of the ATSB operational definition, by injury outcome, Western Australia 2009-2013*

Source of Identification/Severity	Yes		Fatigue No		Total	
	n	%	n	%	n	%
WA Police Report						
Crashes attended by police and assessed for fatigue (all severities)	1,644	9.8	15,097	90.2	16,741	100
-Hospitalisation	419	12.8	2,856	87.2	3,275	100
-Fatality	55	19.2	231	80.8	286	100
ATSB Operational Definition						
Crashes attended by police and assessed for fatigue (all severities)	811	4.8	15,930	95.2	16,741	100
-Hospitalisation	230	7.0	3,045	93.0	3,275	100
-Fatality	38	13.3	248	86.7	286	100
All reported motor vehicle crashes (all severities)	2,498	1.3	184,087	98.7	186,585	100
-Hospitalisation	479	4.9	9,305	95.1	9,784	100
-Fatality	104	12.7	718	87.3	822	100

Separate multivariate analysis of police identified and ATSB identified fatigue-related crashes revealed a number of common driver (age) and crash risk (injury severity; location, day of week) factors but inconsistent findings for driver sex (males) and vehicle type (trucks and heavy vehicles).

Conclusions

A post-crash proxy measure has the potential to supplement the identification of fatigue among crashes not attended by police but the definition must reflect an evolving 24-hour lifestyle and associated changes in driving behaviour that may influence the occurrence of fatigue.

References

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