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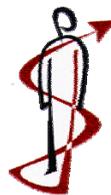


ROAD TRANSPORT WORK AND FATIGUE: A COMPARISON OF DRIVERS IN THE LIGHT AND LONG DISTANCE HEAVY VEHICLE ROAD TRANSPORT SECTORS

July 2006

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ISBN 978-0-9580633-7-1

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ACKNOWLEDGEMENTS

This study was made possible by the generosity of the individual drivers and companies who volunteered their time to take part.

Invaluable assistance in the development and distribution of light and short haul surveys was provided by the NSW Transport Workers' Union, the NSW Road Transport Association, the Courier and Taxi Truck Association, the NSW WorkCover Transport and Storage Industry Reference Group, and Dr Anne-Marie Feyer.

Linda Hayes, Laura O'Neill and Melissa Cooley assisted with the recruitment of light and short haul driver participants.

The light and short haul driver study was funded by an Australian Research Council Linkage Grant (LP0349325). Partnership funding was provided by the Australian Transport and Safety Bureau, the National Transport Commission, the NSW Motor Accidents Authority and the Australian Safety and Compensation Council.

The long distance heavy truck driver study was funded by the National Road Transport Commission.

ABBREVIATIONS

ESS	Epworth Sleepiness Scale
GVM	Gross Vehicle Mass The maximum laden weight of a vehicle as specified by the manufacturer
LGA	Local Government Area
OHS	Occupational Health and Safety
NSW RTA	New South Wales Road Transport Association
NSW TWU	New South Wales Transport Workers' Union
RTA	Roads and Traffic Authority of New South Wales

SUMMARY

The effects of fatigue in light and short haul trucking are largely a mystery as there has been very little research on this issue. While driver fatigue is recognised to be a significant problem for the long distance heavy trucking industry, very little is known about fatigue experiences for drivers of light trucks doing local work. This study aimed to compare the fatigue experiences and effects and the attitudes to fatigue management of short haul light truck drivers and long haul heavy truck drivers in order to understand whether fatigue is a problem for light truck drivers. Benchmarking against the experiences of heavy truck drivers also makes it possible to judge the relative importance of the experience of fatigue for light truck drivers. Results of two surveys, one of long distance heavy truck driving and the other on short haul light truck driving, were compared. The short haul light truck driver study conducted in 2004 involved 321 drivers from urban and regional areas of NSW and was conducted over a 12 month period between 2004 and 2005. The long distance heavy truck driver survey conducted in 1998 involved 1007 drivers from across Australia. The two surveys contained a number of the same or similar questions about the demographic characteristics and fatigue experiences and attitudes of each group of drivers.

The comparison showed that the effects of fatigue while driving was very similar for short haul light truck drivers and long distance heavy drivers in terms of reported safety incidents and their personal experiences of fatigue. Fatigue was a similar experience for both groups of drivers including when it was most likely to occur and the main ways that fatigue affected their driving. There were clear differences, however, in the causes of fatigue for the two groups which were evident on a range of dimensions. Light truck drivers worked day time hours almost exclusively, but the hours were long with significant numbers of stops for pick ups and deliveries and they had to cope with heavy traffic whereas heavy truck drivers did night work, a significant number did extremely long working hours, did more monotonous rural highway driving and spent time waiting for loading and unloading. Compared to long distance heavy drivers, fatigue in light vehicle drivers was more likely to be manifest in impairments in their ability to deal with the demands of an urban driving environment, such as poor awareness of traffic and poor attention to signs, having near misses or colliding with something. On the other hand long distance heavy vehicle drivers were more likely than light vehicle drivers to show impairments in dealing with the demands of a non-urban driving environment (failing to maintain speed and running off the road) and the demands of controlling a very large vehicle (poor gearing and poor steering). These differences suggest that the nature of fatigue-related incidents will be shaped by the type of demands that the driving environment places on the driver. Drivers' reports of contributors to fatigue and of the strategies available to them to manage fatigue were also consistent with the types of demands that light and heavy truck drivers face. It was notable that light truck drivers were less likely to see fatigue as a significant problem for the industry than long distance heavy truck drivers, despite reporting significant effects of fatigue both personally and on road safety. There is

clearly a need for action to address fatigue in the light trucking sector. This includes reducing the impact of the factors identified as contributors to fatigue in short haul light trucking but also simply raising awareness of light truck drivers of the importance of driver fatigue for personal and road safety and of the most effective approaches to fatigue management.

1 INTRODUCTION

It is widely accepted in Australia and internationally that long distance heavy truck drivers are at significant risk of driver fatigue. This group of road users have been the subject of an increasing number of studies looking at fatigue experiences and effects all of which reinforce the importance of fatigue as a risk factor for unsafe driving and crashes. Exposure to long hours of monotonous driving and other work, night work and little time for adequate recovery sleep are the recognised as most important reasons for greater fatigue in long distance truck drivers (Morrow and Crum, 2004). Furthermore the problem has long been recognised by government and the transport industry in most countries and has resulted in mandatory limitations on working hours for long distance truck drivers.

In contrast, the possibility of driver fatigue in short haul, light truck drivers has had little attention. Light trucks account for around 80 percent of freight vehicles in Australia (Bureau of Transport and Regional Economics, 2003), yet very little is known about the experiences of fatigue and its effects on the capacity of short haul light truck drivers to drive safely. Undoubtedly, the job of short haul, light truck drivers is different to that of long haul, heavy truck drivers, but how is it different and what factors make fatigue more or less likely for short haul light truck drivers? The few studies that have been conducted of short haul drivers suggest that they view fatigue as less of a problem compared to long haul, heavy truck driving because they do day rather than night work, they are able to break up driving with many stops and they can sleep in their own bed each night (Hanowski, Wierwille, Gellatly, Dingus and Carroll, 1999). Nevertheless, the single field study that has been conducted of short haul light truck drivers showed that fatigue was a factor in short haul light trucking and that it typically preceded safety incidents in which the driver was at fault (Hanowski, Wierwille and Dingus, 2003), however this study was not able to identify factors in the work of short haul light truck driving that increased the risk of driver fatigue.

There is clearly a need to look at the fatigue experiences of short haul light truck drivers to determine whether driver fatigue is a significant problem in this sector of the transport industry. If fatigue is found to be a problem for this sector, it will be important to develop strategies to reduce its effects. To interpret the results from a study of light truck drivers and to benchmark the effects of fatigue in light trucking it would be worthwhile to compare the experiences of short haul light truck drivers with those of long distance heavy truck drivers for whom fatigue is accepted to be a problem. In addition, comparisons between the two sectors should broaden our understanding of the causes of driver fatigue as a study of light truck driving would look at the influence of a wider range of factors on fatigue experiences while driving.

This aim of this investigation was to compare the fatigue experiences, effects and attitudes to fatigue management strategies of short haul light truck drivers with those of long distance heavy truck drivers. This comparison was possible because the same or similar questions were asked of drivers from light and

heavy trucking sectors in two separate surveys. The light trucking survey was conducted between 2004 and 2005 in urban and regional areas of NSW (Friswell, Williamson and Dunn, in press) and the long distance heavy trucking survey was conducted in 1998 with a national sample of drivers (Williamson, Feyer, Friswell and Sadural, 2001).

2 METHOD

2.1 STUDY DESIGN

This report describes the results of a comparison of short haul light truck drivers and long haul heavy truck drivers about the extent to which they experience driver fatigue while working and the characteristics of their work. This comparison is part of a larger study of the light, short haul transport sector which involved surveys of drivers and company representatives. Reports have also been produced separately for the results of the driver survey and the survey of company representatives. This report is a description of the results of the light, short haul truck driver survey where they can be compared to those of a previous study of heavy, long haul truck drivers because the same questions were asked in both surveys.

For the purposes of the study, light vehicles were defined as rigid body trucks and vans up to 12 tonnes Gross Vehicle Mass (GVM) and used for the transport of goods or materials, excluding tools of trade. As we were interested in the short haul light trucking sector, recruitment of light vehicle drivers to the study was also limited to those drivers doing work that was within a 100km radius of home base. Heavy vehicles were those over 12 tonnes GVM and long haul work was defined as at least a 300km radius from home base. Although a range of definitions of light and heavy vehicles are used by various agencies, 12t GVM provided a logical point of division for examining driver fatigue because, at the time the study was conducted, drivers of vehicles larger than 12t GVM were subject to the National Driving Hours Regulations whereas drivers of vehicles up to 12t GVM were unregulated. In addition, the definition of short haul work was consistent with the definition of 'local' work in the National Driving Hours Regulations. Again, this was one of a number of different definitions of short haul work in use, but had the advantage of being tied to the regulatory requirements in place when the study was being conducted.

Both light and heavy driver surveys were designed to be self-administered but were also suitable for interview administration. Self-administered surveys were distributed with a reply paid envelope. All study participants received a Participant Information Statement that described the purpose of the study and their rights as research participants and all survey forms were anonymous. Informed consent was obtained from any drivers completing the survey as an interview. The studies were approved by the University of New South Wales Human Research Ethics Committee.

2.2 SAMPLING AND RECRUITMENT

Full details of the sampling and recruitment for both surveys can be found in the full reports of each study (Williamson, Feyer, Friswell & Sadural, 2001; Friswell, Williamson and Dunn, in press). For the light trucking survey, drivers

were recruited by approaching drivers at truck stops or through companies in seven geographic areas of NSW including Sydney, the Hunter, Illawarra, Central Coast, Central West, Wagga Wagga and Coffs Harbour regions. These areas were selected to obtain coverage of drivers from urban and regional areas and as they also had high registrations of light vehicles. Combined, these areas accounted for 55.3% of light commercial vehicle registrations in the NSW, with 37.6% located in the Sydney region. Regional companies were over-sampled to ensure that at least one-quarter of the final sample of drivers were from regional areas to allow comparisons between urban and regional drivers. Light and short haul companies were identified in each region using Yellow Pages phone listings and each company was contacted individually to establish first whether they met the two main criteria for recruitment to the study (using trucks less than 12 GVM and doing work within a 100km radius of the home depot) and were willing to participate. Where the company was willing to participate, they were asked to distribute survey materials to the light and short haul drivers working at their company or to allow researchers on site to distribute surveys and/or arrange driver interviews. In almost all cases distribution was by the company. Surveys were also distributed by the Courier and Taxi Truck Association to their members and a small number of surveys were distributed directly to interested drivers by researchers at delivery sites and truck stops.

Recruitment of drivers for the heavy trucking survey involved approaching drivers at truck stops in city and rural locations in all states except Western Australia, Tasmania and the ACT. Roughly equal numbers were distributed in Queensland and NSW, followed by Victoria, South Australia and the Northern Territory. Drivers were approached and invited to participate in the study either in the form of a face-to-face interview or a self-administered version of the questionnaire. Further details can be found in Williamson, Feyer, Friswell and Sadural (2001).

2.3 SURVEY INSTRUMENTS

Both the light and heavy truck driver surveys were developed in consultation with industry stakeholders, including representatives from companies, industry associations, union and government industry advisory groups. Draft surveys were then developed based on the information provided but in the case of the light trucking driver survey also drawing on the driver survey used in the previous research in the long distance heavy vehicle road transport industry and the earlier heavy truck driver survey (Williamson, Feyer, Friswell & Sadural, 2001). Each survey was then trialled with volunteer drivers and feedback was also invited from the transport and OHS agencies funding the study, as well as from the Transport Workers Union. Each survey was then modified in response to feedback. Both surveys could be completed in an interview or self-administered format. The questions in both formats were identical.

Both final driver surveys consisted of multiple choice questions organised into sections. The questions that overlapped between the two surveys covered

the following: 1) basic demographic information about the drivers, 2) the organisation of drivers' work, 3) drivers' experiences of and views on fatigue. Details of the overlapping questions are outlined below.

1) Driver Information: Drivers were asked about background information about themselves (age, sex) as well information about their family responsibilities (marital status and number and age of children).

2) Work Information: Light and heavy truck drivers were asked about the nature of their job and their industry experience. Questions were included on the nature of drivers' current employment (employee or owner, prime or subcontractor, payment system) as well as the size and primary business of the companies for which they worked. Drivers were also asked about the vehicles they drove, the distances they usually travelled and the type of freight tasks they undertook. Drivers were also asked about the amount and timing of their work and the breakdown of their work tasks, as well as external constraints on the timing and predictability of their work.

3) Fatigue: Both light and heavy truck drivers were asked about their views on the size of the fatigue problem in their industry sector and for themselves. They were asked about their own experiences of fatigue (frequency, onset, susceptible times of day, effect on driving skills generally and role in unsafe driving events in the past year). They were also asked to identify the factors that they believed contributed to their own fatigue, and to assess the helpfulness of a variety of personal and corporate or government strategies either for dealing with fatigue as it occurred or for managing it better.

Drivers were also asked to complete the Epworth sleepiness scale in order to assess their level of daytime sleepiness (ESS, Johns, 1991). This scale measures typical daytime sleepiness levels by asking respondents to describe eight everyday situations by rating the likelihood that they would fall asleep in each. The ratings are made on a scale from 0 (would never doze) to 3 (high chance of dozing) and the overall score out of 24 is the sum of the eight ratings. ESS scores over 10 have been found to be increasingly associated with sleep pathology, whereas scores of zero to ten are proposed to represent the range of 'normal' or non-excessive levels of daytime sleepiness. The ESS measures typical daytime sleepiness regardless of its cause so that high scores may not be due to sleep disorders but caused by any factors (work, family demands, pain) that chronically limit a person from obtaining the optimum amount of sleep that they require to maintain alertness during the day.

2.4 RESPONSE RATES

For the light trucking survey 2073 companies were telephoned and successful contact was made with nearly three-quarters of them (73.9%). Of the companies where contact was made, half (49.8%, 763 companies) were identified as using light trucks and so eligible for the study and were invited to

participate. Just over two-thirds of these companies agreed to take part (69.9%, 533 companies) resulting in 3,899 driver surveys distributed through companies. In addition, a further 55 surveys were handed out at truck stops in Sydney. A total of 321 surveys were returned; a response rate of 8.1 percent. Due to this low response rate, attempts were made to establish whether the companies where surveys were distributed and the drivers who responded were representative of the light and short haul transport sector. Comparison of the characteristics of the eligible companies and those willing to participate indicated that the distribution of surveys was representative in terms geographic location and the type of freight carried. The type of company for the drivers who returned surveys was also largely similar to that of the companies who distributed them, with the exception that Sydney drivers were slightly under-represented compared to regional drivers and the waste sector was under-represented compared to the number of surveys distributed.

For the heavy vehicle survey, 1007 completed returns were obtained from 2014 questionnaires, with a 50 percent overall response rate. For the self-administered questionnaire 1449 questionnaires were distributed and 484 were returned, giving a response rate of 34 percent. Of the 565 interviews started, 522 were completed, giving a response rate for interviews of 92 percent.

2.5 ANALYSIS

For this analysis, responses of drivers from the light vehicle, short haul survey were compared to those of the heavy vehicle, long haul drivers in the earlier survey on questions that were similar between the two surveys. The light trucking survey results included a small number of drivers who drove rigid vehicles over 12t GVM, but did short haul work (n=31). These drivers were not included in this comparison.

Comparisons between driver groups on categorical measures were conducted using Chi-square tests or Fishers Exact tests when the number of participants was insufficient for Chi-square. Independent samples t tests or nonparametric Mann-Whitney tests were used for comparisons of continuous variables.

Because of the exploratory nature of the survey, a liberal strategy was adopted whereby alpha was set at 0.05 for all analyses. All analyses were conducted using SPSS software.

3 RESULTS OF DRIVER SURVEY

3.1 DRIVER CHARACTERISTICS

Table 1 summarises personal and family characteristics of the light vehicle drivers and the long distance heavy vehicle drivers who participated in each survey.

The driver groups were similar in that they were almost exclusively men, yet they differed significantly on a number of other characteristics. The light vehicle drivers were four to five years older than the long distance heavy vehicle drivers surveyed previously and were more likely to be currently in an ongoing relationship. In both groups, approximately three quarters of the respondents had children, but long distance heavy vehicle drivers tended to have slightly larger families. Long distance heavy vehicle drivers also reported around six years additional experience in their industry than the light vehicle drivers, but both groups contained many very experienced drivers.

Table 1: Characteristics of drivers from light vehicle and long distance heavy vehicle surveys

		Current survey - light vehicle (≤12t GVM) drivers	1998 survey - long distance heavy vehicle drivers	Statistical test result
Sex		<i>n</i> =269	<i>n</i> =1006	
		%	%	$X^2_{(1)}=0.32$
	Male	98.1	98.6	ns
Age	Years	<i>n</i> =267	<i>n</i> =1001	
	Mean (SD)	43.9 (11.5)	39.8 (9.6)	M-W Z=5.55
	Median	44	39	$p<0.001$
	Range	18-67	19-76	
Relationship		<i>n</i> =268	<i>n</i> =1006	
		%	%	$X^2_{(2)}=8.55$
	Single	13.8	18.7	$p=0.01$
	Current relationship	77.6	68.5	
	Previous relationship	8.6	12.8	
Children		<i>n</i> =268	<i>n</i> =1005	
		%	%	$X^2_{(1)}=0.83$
	Has children	76.1	78.7	ns
	Number of children	<i>n</i> =203	<i>n</i> =789	
	Mean (SD)	2.4 (1.1)	2.8 (1.4)	M-W Z=3.26
	Median	2	3	$p=0.001$
	Range	1-7	1-10	
Experience	Years in sector	<i>n</i> =266	<i>n</i> =996	
	Mean (SD)	12.4 (9.3)	17.6 (9.9)	M-W Z=7.82
	Median	10	16	$p<0.001$
	Range	0.04-40	1-51	

X^2 = Chi square test; t = independent samples t -test; M-W = Mann Whitney test; Fe = Fisher's Exact test; tav = test not reported because assumptions violated by small n ; ns = not significant ($p>0.05$)

3.2 WORK CHARACTERISTICS

Light vehicle drivers and the long distance heavy vehicle drivers differed in the nature of their work (see Table 2). While the majority of drivers in both groups were employees, light truck drivers were more likely than heavy truck drivers to be owner drivers and operators. Among owners, the majority of light vehicle drivers worked as painted subcontractors, whereas the largest group of long distance heavy vehicle owners worked as independent subcontractors.

Fleet size estimates were also recorded for drivers in both surveys. Light vehicle drivers were asked specifically about the number of light trucks or vans their employer operated, whereas long distance heavy vehicle drivers were asked about the number of trucks that their company operated, without specifying heavy trucks so their estimates could have included some light trucks as well. Nevertheless, employee light truck drivers were more likely to report working for companies with larger fleets. In particular, more light vehicle drivers reported working for companies with fleets over 50 vehicles than heavy truck drivers while heavy vehicle drivers were more likely to work for medium companies with 11-50 trucks. For owner drivers there was no difference in the fleet size reported for light or heavy truck drivers as almost all reported having one to four vehicle fleets.

As might be expected, there were marked differences between the light vehicle drivers and the long distance heavy vehicle drivers in the types of freight tasks they undertook. Table 2 compares those categories of freight tasks that were included in both surveys. Overall, light vehicle drivers were significantly more likely than heavy vehicle drivers to report doing express delivery work and carrying building materials. In contrast, long distance heavy vehicle drivers were significantly more likely to report carrying general or mixed freight, refrigerated produce, groceries, machinery, and bulk goods. There were, however, a number of differences in the way this question was asked of drivers in each transport sector. The light truck drivers were also asked about courier and taxi truck work (37.0%), non-refrigerated perishable food transport (7.5%), and waste transport (5.0%) whereas the long haul heavy drivers were also asked about livestock carrying (6.6%), farm produce (20.2%), and car carrying (3.9%).

Light and long distance heavy vehicle drivers were also remunerated in very different ways. The majority of light vehicle drivers were paid an hourly rate whereas the majority of long distance heavy vehicle drivers were paid a piece-rate or productivity-based rate in terms of the kilometres travelled or the tonnage of freight that they transported.

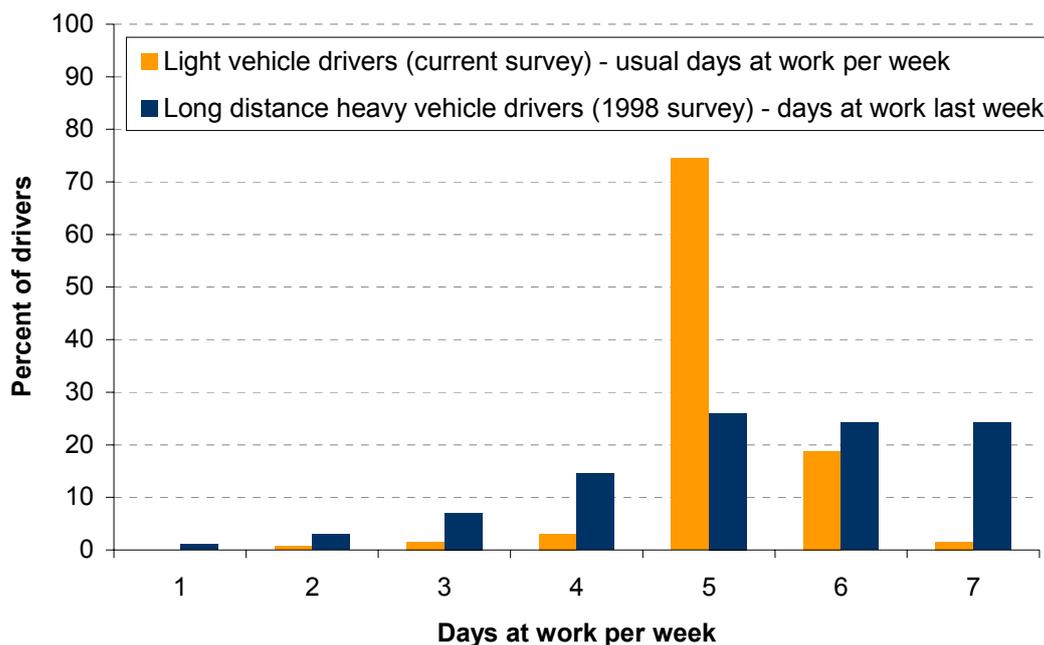
Table 2: Characteristics of work for light vehicle drivers from current survey and long distance heavy vehicle drivers from 1998 survey

	Current survey - light vehicle ($\leq 12t$ GVM) drivers	1998 survey - long distance heavy vehicle drivers	Statistical test result
Employment type	<i>n</i> =270	<i>n</i> =1004	
	%	%	$X^2_{(2)}=53.14$
Employee driver	55.2	69.2	$p<0.01$
Owner driver or operator	44.8	30.8	
Type of owner	<i>n</i> =119	<i>n</i> =265	
	%	%	$X^2_{(3)}=47.25$
Prime contractor	18.5	22.3	$p<0.001$
Painted subcontractor	58.8	25.3	
Independent subcontractor	15.1	45.3	
Other	7.6	7.2	
Fleet size	<i>n</i> =149	<i>n</i> =686	
	%	%	$X^2_{(4)}=30.45$
Of employer (if employee)			$p<0.001$
1-4 vehicles	24.2	30.9	
5-10 vehicles	21.5	22.3	
11-50 vehicles	18.1	29.7	
>50 vehicles	34.9	16.0	
Unknown	1.3	1.0	
	<i>n</i> =149	<i>n</i> =686	
	%	%	X^2
Own (if owner)			tav
1-4 vehicles	99.2	98.0	
Freight tasks	<i>n</i> =270	<i>n</i> =1003	
	%	%	
Express	32.2	18.5	$X^2_{(1)}=23.63$ $p<0.001$
General/mixed	24.1	50.0	$X^2_{(1)}=58.11$ $p<0.001$
Building materials	20.7	14.5	$X^2_{(1)}=6.32$ $p=0.01$
Dangerous goods	13.3	11.2	$X^2_{(1)}=0.97$ ns
Manufactured goods	11.5	11.8	$X^2_{(1)}=0.02$ ns
Refrigerated transport	9.6	24.1	$X^2_{(1)}=26.90$ $p<0.001$
Removals	9.3	2.9	$X^2_{(1)}=21.40$ $p<0.001$
Machinery	7.0	14.6	$X^2_{(1)}=10.66$ $p=0.001$
Bulk	3.3	12.5	$X^2_{(1)}=18.83$ $p<0.001$
Groceries	3.0	17.6	$X^2_{(1)}=36.93$ $p<0.001$
Payment type	<i>n</i> =267	<i>n</i> =1002	
	%	%	$X^2_{(5)}=524.21$
Flat hourly rate	58.1	5.5	$p<0.001$
Flat day	3.0	3.1	
Flat weekly rate	14.2	4.9	
Flat item/delivery/load rate	6.4	12.9	
Kilometre or tonnage rate	7.1	65.6	
Other (inc multiple types)	11.2	8.1	

X^2 = Chi square test, tav = test not reported because assumptions violated by small n; ns = not significant ($p>0.05$)

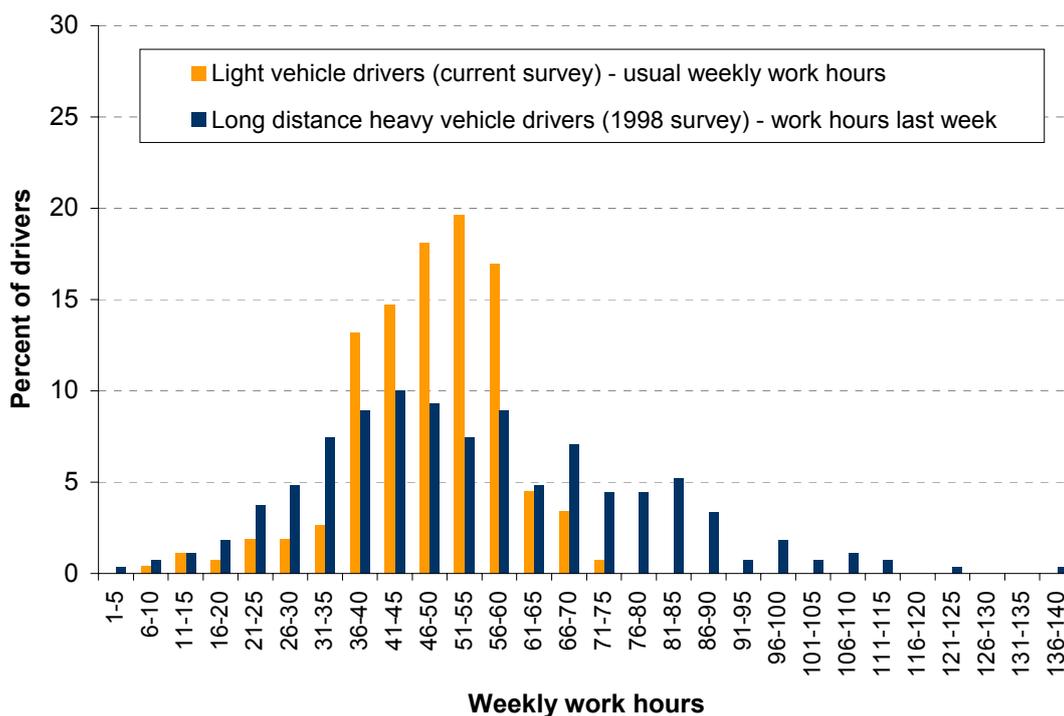
Information about drivers' working hours was gathered in different ways in the two surveys. For long distance heavy vehicle drivers, the basic unit of time organisation is typically a 'trip', rather than a shift, work day or work week. Trips can last for many days and may involve a continuous cycle of work and rest around the 24-hour clock. Long distance heavy vehicle drivers also may not repeat the same trip on a regular basis. In contrast, the work of light and short haul drivers is typically organised according to discrete work days and work weeks. As a consequence, light and short haul drivers were asked to report on their usual weekly working hours, whereas long distance heavy vehicle drivers were asked to complete a record of their actual work and rest times over a single week. In addition, while there was almost complete data from the light truck drivers, only 269 of the long distance heavy vehicle drivers (26.7%) provided complete work information about their last seven days. It was possible to make some comparisons between light and heavy truck drivers, namely comparisons of their weekly work patterns. These included the number of days that drivers were at work per week (Figure 1), the number of hours worked per week (Figure 2, and whether or not drivers worked any time in the night hours between 00:00 and 06:00.

Figure 1: Number of days at work per week reported by light vehicle drivers from current survey and long distance heavy vehicle drivers from 1998 survey



Both light and long distance heavy vehicle drivers worked a median of five days per week. Heavy vehicle drivers were much less consistent than the light vehicle drivers with approximately one quarter of long distance heavy vehicle drivers reporting each of a five-day, six-day or seven-day week whereas almost three quarters of light vehicle drivers worked a five-day week. Overall, long distance heavy vehicle drivers worked significantly more days per week than the light vehicle drivers (Mann-Whitney $Z=3.12$, $p=0.002$).

Figure 2: Weekly working hours reported by light vehicle drivers from current survey and long distance heavy vehicle drivers from 1998 survey



Despite working different numbers of days per week, the groups did not differ significantly on the number of hours worked per week (Mann-Whitney $Z=1.60$, $p=0.11$). The median hours usually worked by light vehicle drivers was 50.0 (range=10-75) whereas the median hours worked in the last week by long distance heavy vehicle drivers was 50.5 (range=3-139). Despite this, as shown in Figure 2 there appeared to be differences between the driver groups in the percentage of drivers who did very long hours per week. Long distance heavy vehicle drivers were much more likely to report very long weekly work hours. None of the light truck drivers reported more than 75 hours work in their usual week, however, around one-fifth of the long haul heavy truck drivers reported more than 75 hours in their last week. This discrepancy is likely to be at least partly due to an artefact of the different ways in which the data were collected for the two groups. In capturing usual working hours, the data for light vehicle drivers would, by definition, not capture any of the more extreme variations about these usual hours, whereas the actual work hours in the last week reported by the long distance heavy vehicle drivers may capture

longer than usual weekly hours. Further evidence for this explanation can be seen in light vehicle drivers' responses to the question of whether they worked similar hours each week. Around 10 percent (9.3%) reported that their weekly hours varied over the last three months with variation from 30 to 120 hours per week. Of these, 35 percent reported weeks of more than 60 hours. This suggests that the difference in weekly working hours between light and long distance heavy vehicle drivers may be less than indicated in Figure 2.

There was a clear difference between long distance heavy vehicle drivers and light vehicle drivers in their experience of night work ($\chi^2_{(1)}=193.67$, $p<0.001$). Although only 16.3% of light vehicle drivers worked shifts that overlapped the midnight to dawn period (00:00-06:00am), more than three quarters (77.0%) of heavy vehicle drivers reported work in this period in the last week.

In summary, light truck drivers showed a number of important differences from long haul, heavy truck drivers in the characteristics of their work. Light truck drivers were more likely to be subcontractors but to work as painted rather than independent subcontractors. Employee light truck drivers were more likely to work for larger companies than long distance, heavy vehicle drivers. Light and heavy truck drivers were also distinguished by the nature of their remuneration, with light truck drivers mainly paid on flat time-based payments while the greater majority of heavy truck drivers were paid on a productivity-based payment. Light truck drivers did more regular work than heavy truck drivers as most worked five day weeks and did no night work. The two sectors differed less on their weekly working hours, with half of the drivers in both sectors doing more than 50 hours in a week. Fewer light truck drivers did extremely long hours compared to long distance heavy truck drivers.

3.3 FATIGUE EXPERIENCES

Drivers in both surveys were asked about their views and experiences of fatigue while driving for work. Table 3 shows that, on the one hand, light truck drivers were less likely to report that fatigue was a major problem in their industry than long distance heavy vehicle drivers, but on the other hand, they were slightly more likely to report that fatigue was a personal problem compared to long distance heavy vehicle drivers. Light truck drivers also had significantly higher Epworth Sleepiness Scale scores and a significantly higher percentage of light truck drivers had ESS scores above the criterion of 'normal' sleepiness, suggesting that excessive daytime sleepiness was more common among the light vehicle drivers than among the heavy vehicle drivers.

In both surveys drivers were asked about the frequency and timing of their experiences of fatigue, however the format of these questions differed slightly between the two surveys. In the long distance heavy vehicle survey it was assumed, because of the 24-hour nature of their work, that all long distance heavy vehicle drivers would experience fatigue at some time while working and all drivers were asked all questions about fatigue. For the light trucking survey, as very little information was available about the timing, amount or nature of light trucking work, the participating light truck drivers were given the option of reporting that they never experienced fatigue while driving for work. Around 10 percent of light truck drivers responded in this category and consequently were exempted from answering further questions about fatigue experiences. This difference means that the heavy truck driver survey results could overestimate the number of drivers affected by fatigue but underestimate the magnitude of fatigue effects on drivers as some drivers may have been included who did not experience fatigue whereas the light trucking survey results would not.

To examine the effect of this difference in reporting fatigue experiences, an analysis was also conducted in which only light and heavy truck drivers who reported experiencing fatigue at least occasionally were included to be sure that only drivers who definitely reported fatigue were included. This therefore also excluded those in each truck driver group who reported experiencing fatigue rarely and those heavy truck drivers who would have reported never experiencing fatigue if the question had been asked that way. The results were extremely similar for all of the fatigue-related questions to those found when the rarely cases were included. This suggests that any differences between light and heavy truck drivers on fatigue experiences are not simply a function of format of the question. The analysis of fatigue experiences therefore included drivers who experienced fatigue rarely.

As shown in Table 3, the time to onset of fatigue was significantly shorter for light vehicle drivers who experienced fatigue while driving for work than the long distance heavy vehicle drivers. Light truck drivers reported experiencing fatigue after around 6 hours starting work on average, whereas for long

distance heavy truck drivers fatigue onset occurred after around twice as many hours.

Table 3: Fatigue experiences of light vehicle drivers from current survey and long distance heavy vehicle drivers from 1998 survey

		Current survey - light vehicle (≤12t GVM) drivers	1998 survey - long distance heavy vehicle drivers	Statistical test result
Fatigue a problem	<i>In industry sector</i>	<i>n=268</i>	<i>n=997</i>	
		%	%	$X^2_{(3)}=149.46$
	No	13.8	3.5	$p<0.001$
	Minor	47.4	20.6	
	Substantial	26.1	35.8	
	Major	12.7	40.1	
	<i>For driver personally</i>	<i>n=268</i>	<i>n=1003</i>	
		%	%	
	No	22.0	29.8	$X^2_{(3)}=9.15$
	Minor	50.0	48.9	$p=0.03$
	Substantial	20.9	15.2	
	Major	7.1	6.2	
Daytime sleepiness	ESS Score ¹	<i>n=245</i>	<i>n=945</i>	
	Mean (SD)	7.8 (4.1)	7.0 (3.8)	M-W Z=2.82
	Median	8	6	$p=0.005$
	Range	0-20	0-24	
	% scores over 10	24.9	17.9	$X^2_{(1)}=6.14$ $p=0.01$
Fatigue onset lag	Hours after starting work	<i>n=204</i>	<i>n=852</i>	
	Mean (SD)	6.3 (2.9)	12.0 (9.2)	M-W Z=11.77
	Median	6.0	10.0	$p<0.001$
	Range	0-15	0.5-100	

X^2 = Chi square test, M-W = Mann Whitney test

¹ ESS = Epworth Sleepiness Scale, where scores range from 0 to 24 with higher scores reflecting greater typical daytime sleepiness levels. Scores of 10 or less typify sleepiness levels in a 'normal' population without sleep pathology.

Figure 3 shows the times of day when light and long distance heavy vehicle drivers who experienced fatigue reported they were susceptible to fatigue while working. Clearly, the patterns of fatigue susceptibility will be governed by the times when truck drivers are at work. Unfortunately, it was not possible to determine the number of heavy truck drivers who work at each hour of the day because their working hours were very variable. Long distance heavy truck drivers were much more likely to report fatigue in the early hours of the morning, between 02:00 and 06:00 but they were also much more likely than light truck drivers to be working then. Nevertheless, the few light truck drivers who work in the midnight to dawn period were more likely to report fatigue in this time period. Both light and heavy driver groups showed a period of elevated fatigue susceptibility in the afternoon between 13:00 and 18:00 hours.

Figure 3: Percentage of light and long distance heavy vehicle drivers who report susceptibility to fatigue at each hour of the day while driving for work

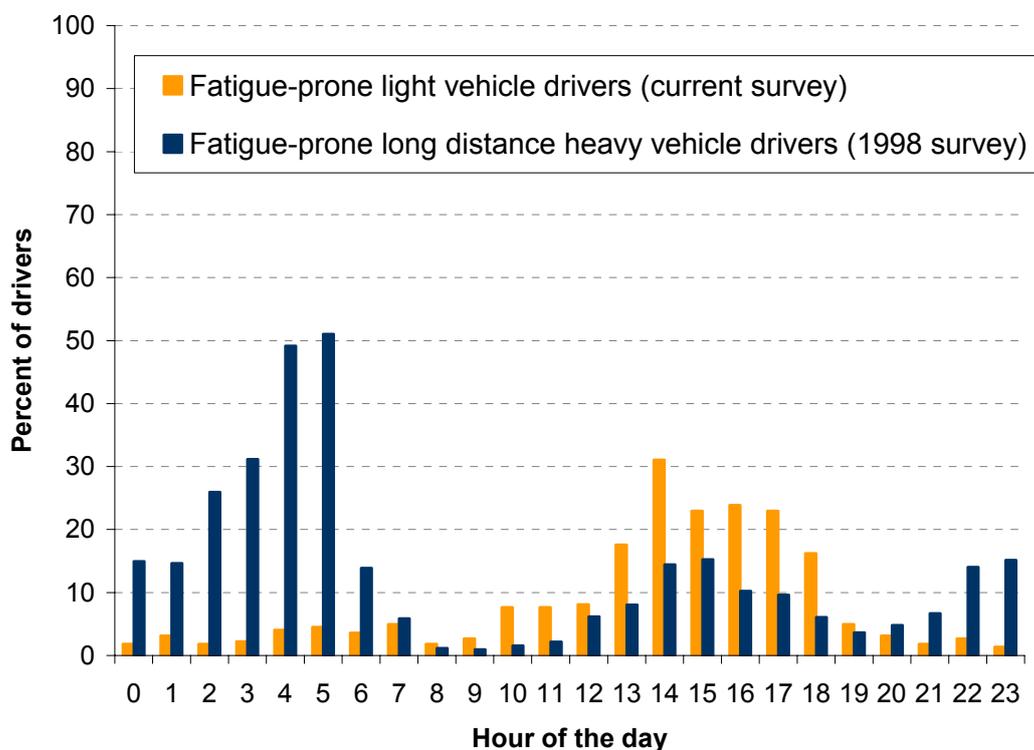
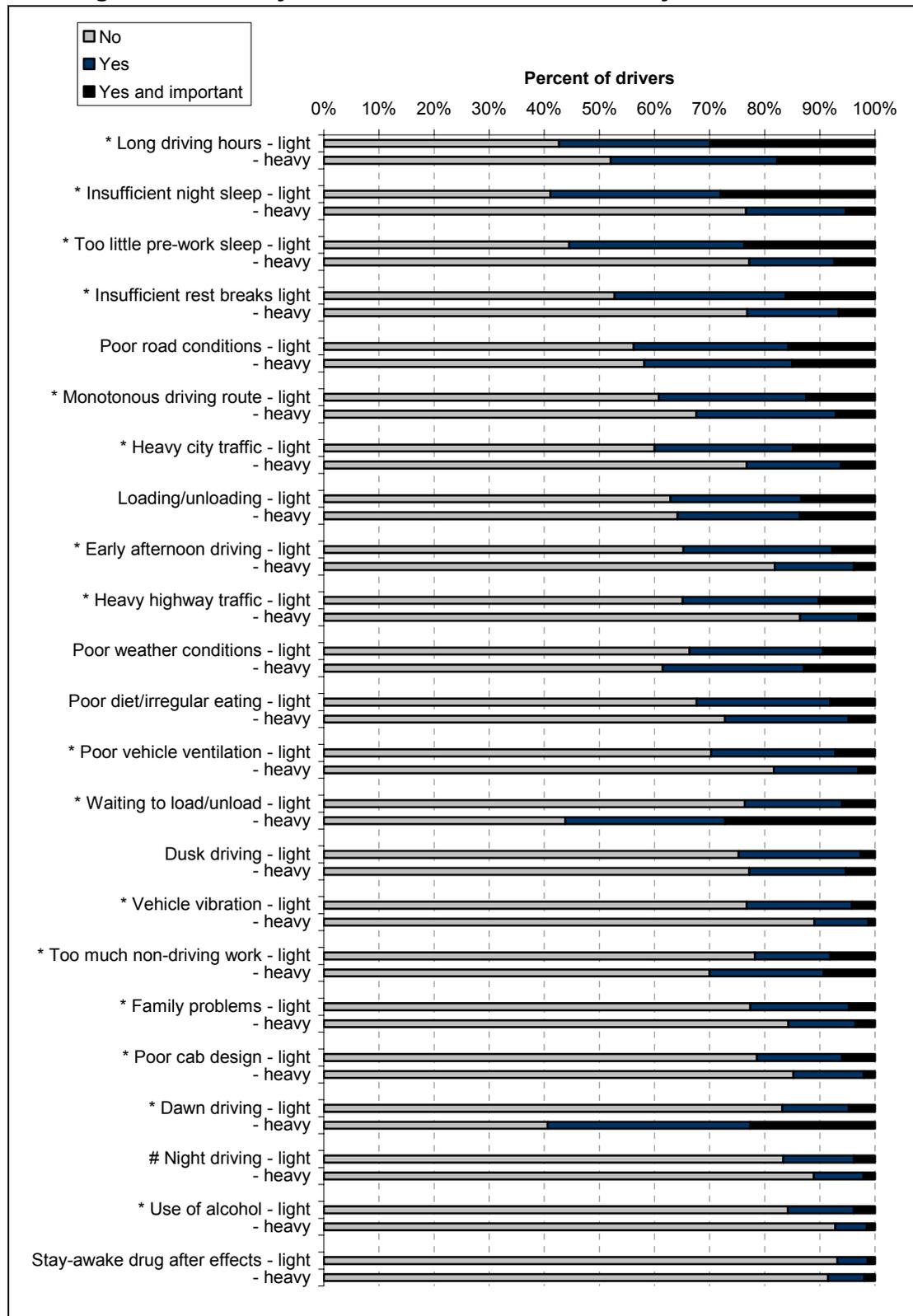


Figure 4 summarises light and long distance heavy vehicle driver judgements about the factors that contributed to their experience of fatigue and which were judged as the most important contributors. Long driving hours was judged as a fatigue contributor by large percentages of both light and heavy truck drivers, however there were some clear differences in the views of light and long distance heavy truck drivers about some of the other factors that contributed to their driver fatigue while working. For light truck drivers the most common fatigue contributors included insufficient night sleep, too little pre-work sleep and insufficient rest breaks while for long distance heavy truck drivers they included dawn driving and waiting to load and unload. Light truck drivers were also more likely than long distance heavy truck drivers to report heavy city and heavy highway traffic and early afternoon driving as fatigue contributors. Some factors were included as fatigue contributors by at least one-third of both groups of drivers. These included poor road conditions, loading and unloading and poor weather conditions.

The same patterns were seen for the fatigue contributors judged to be most important. For both light and long distance heavy truck drivers long driving hours was judged to be an important contributor to fatigue by many drivers, with nearly half of the light drivers (47.8%) who reported it as a contributor also reporting it as one of the most important contributors and an even higher percentage of long distance heavy drivers (62.9%) also doing so. The differences between the driver groups were also the same with most light truck drivers reporting lack of sleep as important and most heavy truck drivers reporting the dawn driving and waiting to load and unload as important.

Figure 4: Contributors to fatigue of light vehicle drivers from current survey and long distance heavy vehicle drivers from 1998 survey



light' = light vehicle drivers from current survey; 'heavy' = long distance heavy vehicle drivers from 1998 survey

* X² test, p<0.05

X² test, marginal effect, p=0.054

Table 4 summarises the frequency with which drivers used various strategies to deal with fatigue while driving for work and also how helpful the drivers found these strategies. The most popular fatigue management strategies used by drivers also differed between the two groups. The main strategies used by light truck drivers were those that could be used while driving such as music, ventilation, eating and caffeine-containing drinks. Long distance heavy truck drivers on the other hand were most likely to use stopping to nap or rest in addition to the on-road strategies of music, ventilation and caffeine drinks. This picture changed however for the strategies rated as most helpful where among the strategies reported by the largest proportions of drivers who used them in both driver groups were napping, resting, and stay awake drugs.

In the long distance heavy vehicle driver survey, drivers were asked to indicate whether they thought a range of company and government strategies should or should not be implemented to help them better manage fatigue. In the current survey, light vehicle drivers were presented with a number of the same strategies and asked to rate how helpful they thought they would be. This provided an opportunity to compare light and long distance heavy truck drivers on how positively they viewed each potential fatigue management strategy. Table 5 compares the percentage of long distance heavy vehicle drivers who thought the strategies should be implemented with the percentage of light vehicle drivers who thought the strategies would be at least somewhat helpful.

Light vehicle drivers were more likely than long distance heavy vehicle drivers to respond positively to easing unreasonably tight schedules, provision of fatigue management information and training, and reducing driving hours for fatigue management. Long distance heavy vehicle drivers were more likely than light vehicle drivers to respond positively to educating the public about trucks (although large percentages of drivers in both groups endorsed this strategy), more efficient loading and unloading, not having to load and unload, and permitting the use of stay-awake drugs. The two groups of drivers did not differ in their views about improved roads, increased pay rates for drivers and policing to prevent stay-awake drug use.

Table 4: Fatigue management strategies employed by light vehicle drivers from current survey and long distance heavy vehicle drivers from 1998 survey

Strategy	Driver group	n	% who never use strategy	% who rarely use strategy	% who sometimes use strategy	% who often use strategy	Statistical test result	% of users finding strategy helpful	Statistical test result
Stop to rest	Light vehicle	210	24.3	24.8	34.3	16.7	$X^2_{(3)}=115.29$	42.8	$X^2_{(1)}=43.56$
	Long distance heavy vehicle	915	5.4	13.1	39.0	42.5	$p<0.001$	18.9	$p<0.001$
Stop to nap	Light vehicle	209	54.5	16.3	20.1	9.1	$X^2_{(3)}=466.53$	49.5	$X^2_{(1)}=14.84$
	Long distance heavy vehicle	935	2.7	10.6	33.6	53.2	$p<0.001$	30.1	$p<0.001$
Eat while driving	Light vehicle	210	17.1	12.4	32.9	37.6	$X^2_{(3)}=47.32$	17.8	$X^2_{(1)}=30.19$
	Long distance heavy vehicle	869	33.0	21.1	26.4	19.6	$p<0.001$	5.0	$p<0.001$
Caffeine drinks	Light vehicle	219	20.1	16.9	33.8	29.2	$X^2_{(3)}=60.45$	23.4	$X^2_{(1)}=1.53$
	Long distance heavy vehicle	938	7.9	9.1	28.7	54.4	$p<0.001$	19.3	ns
Smoking	Light vehicle	205	68.8	2.9	5.4	22.9	$X^2_{(3)}=29.14$	26.6	$X^2_{(1)}=1.33$
	Long distance heavy vehicle	908	48.5	2.9	7.3	41.4	$p<0.001$	20.3	ns
Stay awake drugs	Light vehicle	204	96.6	0.5	1.0	2.0	$X^2_{(3)}=67.26$	28.6	Fe
	Long distance heavy vehicle	877	68.6	9.0	12.3	10.0	$p<0.001$	24.0	ns
Stop to eat	Light vehicle	216	13.4	19.0	43.1	24.5	$X^2_{(3)}=1.13$	36.9	$X^2_{(1)}=103.99$
	Long distance heavy vehicle	911	12.1	18.9	41.2	27.9	ns	8.4	$p<0.001$
Non-caffeine drinks	Light vehicle	205	27.8	22.0	29.3	21.0	$X^2_{(3)}=1.46$	16.2	$X^2_{(1)}=17.73$
	Long distance heavy vehicle	861	31.7	20.9	28.9	18.5	ns	5.8	$p<0.001$
Music or radio	Light vehicle	223	11.7	9.4	23.3	55.6	$X^2_{(3)}=3.91$	35.0	$X^2_{(1)}=36.87$
	Long distance heavy vehicle	925	10.4	6.2	22.7	60.8	ns	15.9	$p<0.001$
Adjust ventilation	Light vehicle	215	11.6	13.5	38.1	36.7	$X^2_{(3)}=1.87$	28.4	$X^2_{(1)}=26.39$
	Long distance heavy vehicle	906	14.2	12.4	34.5	38.9	ns	13.1	$p<0.001$

X^2 = Chi square test, Fe = Fisher's Exact test, ns = not significant ($p>0.05$)

Table 5: Company and government fatigue management strategies viewed positively by light vehicle drivers from current survey and long distance heavy vehicle drivers from 1998 survey

Strategy	Driver group	n	% of drivers viewing strategy positively ¹	Statistical test result
<i>Ease unreasonable/tight schedules</i>	Light vehicle	206	83.0	$X^2_{(1)}=4.84$
	Long distance heavy vehicle	959	75.9	p=0.03
<i>Information/training on fatigue</i> ²	Light vehicle	212	82.1	
	Long distance heavy vehicle – co.	959	65.1	$X^2_{(1)}=23.14$
	Long distance heavy vehicle – govt.	988	68.9	$X^2_{(1)}=23.14$ both p's<0.001
<i>Shorter driving hours</i>	Light vehicle	204	77.9	$X^2_{(1)}=371.91$
	Long distance heavy vehicle	988	13.9	p<0.001
<i>Improved roads</i>	Light vehicle	206	91.7	$X^2_{(1)}=1.98$
	Long distance heavy vehicle	988	94.3	ns
<i>Increased pay rates for drivers</i>	Light vehicle	209	67.0	$X^2_{(1)}=3.30$
	Long distance heavy vehicle	959	73.2	ns
<i>Policing stay-awake drugs</i>	Light vehicle	197	52.3	$X^2_{(1)}=0.21$
	Long distance heavy vehicle	988	50.5	ns
<i>Educate public about trucks</i>	Light vehicle	203	88.7	$X^2_{(1)}=9.58$
	Long distance heavy vehicle	988	94.5	p=0.002
<i>More efficient loading/unloading</i>	Light vehicle	208	69.2	$X^2_{(1)}=24.35$
	Long distance heavy vehicle	959	83.9	p<0.001
<i>Not having to load/unload</i>	Light vehicle	203	57.1	$X^2_{(1)}=4.55$
	Long distance heavy vehicle	959	65.1	p=0.03
<i>Permitting stay-awake drugs</i>	Light vehicle	202	10.9	$X^2_{(1)}=53.55$
	Long distance heavy vehicle	988	37.4	p<0.001

X^2 = Chi square test; ns = not significant (p>0.05)

¹ In the current survey, light vehicle drivers who reported that a strategy was at least 'somewhat helpful' were considered to have a positive view, compared with drivers who reported that a strategy was 'not at all helpful'. In the 1998 survey, long distance heavy vehicle drivers who reported that a strategy should be pursued were considered to have a positive view, compared with drivers who reported that a strategy should not be pursued.

² Long distance heavy vehicle drivers in the 1998 survey were asked separately about whether their company and the government should provide information and training on fatigue management, whereas the source of the information and training was not specified in the current survey.

Both light and long distance heavy truck driver surveys included questions on the impact of fatigue on driving and road safety. Their responses are summarised in Table 6.

Table 6: Fatigue effects on driving and road safety reported by light vehicle drivers from current survey and long distance heavy vehicle drivers from 1998 survey

	Current survey - light vehicle ($\leq 12t$ GVM) drivers	1998 survey - long distance heavy vehicle drivers	Statistical test result
Fatigue effects on driving skills			
	<i>n</i> =236	<i>n</i> =977	
<i>Driving is worse</i>	%	%	$X^2_{(1)}=0.007$
Yes	71.6	71.3	ns
	<i>n</i> =169	<i>n</i> =694	
<i>How is it worse?</i>	%	%	X^2
Poor traffic awareness	45.0	24.5	$p<0.001$
Poor attention to signs	32.0	20.9	$p=0.002$
Driving too slowly	27.8	53.2	$p<0.001$
Poor gearing	22.5	55.6	$p<0.001$
Poor steering	32.0	41.1	$p=0.03$
Slow reactions	58.0	56.1	ns
Poor braking	18.9	14.0	ns
Poor signalling	13.6	11.0	ns
Speeding	8.3	8.9	ns
Poor overtaking	7.1	9.5	ns
Dangerous events due to fatigue at work in last year			
	<i>n</i> =209	<i>n</i> =923	
<i>Had near miss</i>	%	%	$X^2_{(1)}=31.97$
Yes	65.1	43.4	$p<0.001$
	<i>n</i> =204	<i>n</i> =909	
<i>Collided with something</i>	%	%	$X^2_{(1)}=33.51$
Yes	22.1	12.0	$p<0.001$
	<i>n</i> =201	<i>n</i> =924	
<i>Ran off road</i>	%	%	$X^2_{(1)}=10.72$
Yes	19.4	31.0	$p<0.001$
	<i>n</i> =209	<i>n</i> =940	
<i>Nodded off/Fell asleep</i>	%	%	$X^2_{(1)}=0.81$
Yes	45.0	48.4	ns

X^2 = Chi square test; ns = not significant ($p>0.05$)

In both surveys more than two-thirds of drivers who experienced fatigue reported that fatigue made their driving worse. While there was no difference in the proportions of light and long distance heavy vehicle drivers who reported that their driving was worse when they were fatigued, there were differences, in the types of fatigue-related driving impairments reported by the two groups. Light vehicle drivers were significantly more likely to report that fatigue produced poorer awareness of traffic and poorer attention to traffic signs. On the other hand, long distance heavy vehicle drivers were more

likely to report driving too slowly, poorer gearing and poorer steering as symptoms of fatigue. The groups did not differ in their reporting of slowed reactions, which was the most commonly reported symptom for both groups, or of poorer braking, poorer signalling, speeding, and poorer overtaking, but these were the least common fatigue symptoms reported for both groups.

Drivers in the two groups differed in their experiences of adverse road safety events resulting from fatigue in the last year. Light vehicle drivers were significantly more likely than long distance heavy vehicle drivers to report that they had a near miss (near crash) and had actually collided with something as a result of fatigue while driving for work over the last year. Long distance heavy vehicle drivers, on the other hand, were more likely than light vehicle drivers to have run off the road due to fatigue while working. Importantly, there was no difference in the proportions of light and long distance heavy vehicle drivers who had nodded off or fallen asleep while driving in the past year. In both groups, nearly half of the drivers who experienced fatigue at all while driving for work had gone to sleep while driving.

In summary, a notable percentage of light and heavy truck drivers reported fatigue as a substantial or major problem, although light truck drivers were more likely to report that fatigue was a personal problem than were heavy truck drivers. In contrast, whereas the majority of long distance heavy truck drivers saw fatigue as an important problem for their industry sector, comparatively few light truck drivers shared this view. Light truck drivers also differed from heavy truck drivers on a number of fatigue indices including the Epworth sleepiness scale, and the timing of onset of fatigue within a shift, but not on the time of day when fatigue was most likely. The two driver groups did not differ on the major contributor to fatigue and the main effects of fatigue while driving, but they did differ on a number of the additional contributors and effects. Both driver groups reported experiencing dangerous events due to fatigue while driving over the last year, with nearly half of both groups reporting falling asleep at the wheel at least once. The two groups differed on the types of fatigue management strategies they used to reduce their driver fatigue, but they did not differ on the strategies that they viewed as most helpful for fatigue management.

4 DISCUSSION

The results of this study suggest that fatigue may be as much a problem for light and short haul transport drivers as it is for long distance heavy vehicle drivers. The survey of light and short haul truck drivers indicates that fatigue is a common experience for many drivers in the light and short haul transport sectors. Over a quarter of the drivers surveyed reported that fatigue was a substantial or major problem for them personally and more than a third experienced fatigue at least once a week while working. Very few drivers (one in ten) never experienced fatigue while driving for work.

It was possible to put these findings into a context, by comparing the survey results for light vehicle drivers to those of a large group of long distance heavy vehicle drivers surveyed in 1998. Long distance heavy vehicle drivers have been considered to be particularly vulnerable to developing driver fatigue because their work has traditionally incorporated many of the known risk factors including long working hours, work during the circadian low between midnight and dawn, long monotonous driving experiences and short or compromised sleep opportunities (Stutts, Wilkins, Osberg, Vaughn, 2003). Nonetheless, the comparison showed that light and short haul drivers were slightly more likely to report that fatigue was a problem for them personally than were the long distance heavy vehicle drivers.

The importance of fatigue for light and short haul truck drivers was also demonstrated in the reports of incidents of falling asleep at the wheel, which were as common for light truck drivers as for heavy truck drivers, and reports of collisions and near miss incidents which light truck drivers reported more often than heavy truck drivers. The fatigue experiences of the two driver groups were also similar in other ways. Both reported that fatigue affected their driving skills especially by slowing their response times and both reported fatigue experiences at similar times of day. In addition, light truck drivers reported experiencing fatigue fairly early in the shift and much earlier than long haul heavy truck drivers. All of this evidence points in the same direction; light truck drivers experience fatigue in similar ways to long distance heavy truck drivers and the experiences of fatigue are at least as much a problem for light truck drivers as for long distance heavy truck drivers.

This is a somewhat unexpected finding as long distance heavy truck drivers have traditionally been treated as most at risk of driver fatigue. It raises the question of why light truck drivers experience driver fatigue. The on-road study of local short haul truck drivers by Hanowski et al (2003) also demonstrated that fatigue-related incidents were quite common for this type of trucking, but that study was not able to evaluate the relative severity of the problem of fatigue for local short haul drivers nor was it able to determine why fatigue occurred. The results of the current survey provide evidence for possible reasons for high levels of fatigue in short haul light trucking. One possible explanation is that light truck drivers are simply sleepier than heavy drivers as more light truck drivers scored in the range of excessive daytime

sleepiness on the Epworth Sleepiness scale than heavy truck drivers. It is possible that sleepy long haul truck drivers do not stay in the industry due to the incompatibility of sleepiness and the significant demands of doing long haul work. It may be that some heavy truck drivers move into the light trucking industry as a result. This alone could not account for the levels of fatigue in light truck drivers however, as the difference between the two groups of drivers on the percentages scoring outside the 'normal' range on the sleepiness scale was only around seven percent. Other factors must also be important for generating fatigue for light truck drivers.

Most obviously, both light and long distance heavy truck drivers did similar long hours of work each week. While a subgroup of long haul heavy drivers did extremely long work hours, 50 percent of light truck drivers reported doing between 50 and 75 hours per week. The nature of this work differed between the two groups though. Where long distance heavy truck drivers worked at night and did more consecutive days of depot to depot type driving on interstate and rural highways (Williamson, Feyer, Friswell and Sadural, 2001), light truck drivers did only day work, worked more regular five days or less, but did short driving segments with many stops often in heavy traffic. It seems that the driver fatigue experienced by long haul heavy truck drivers was mostly the result of the monotony of long hours with few other activities than driving whereas driver fatigue for light truck drivers resulted from pressure to produce a large amount of driving and delivery work in daytime business hours.

Driver reports of the factors that contribute to their fatigue and their reports of how their driving is affected by fatigue also support these differences. Light truck drivers were distinguished by reporting too little sleep before and between shifts, afternoon driving and heavy traffic whereas heavy truck drivers cited waiting to load or unload and dawn driving. These contributors are consistent with the different experiences for each type of driver, but these experiences result in the same outcome; greater driver fatigue. Differences in the reported affects of fatigue on driving for the two groups of drivers are also consistent with the sorts of demands they experience. For light truck drivers fatigue affected their traffic awareness and their ability to pay attention to signs which are common experiences in city traffic. For heavy truck drivers, on the other hand, fatigue affected their vehicle handling skills which is consistent with the demands of efficient long distance driving.

Differences in the strategies light and long distance heavy truck drivers use to help manage fatigue also support the argument that different work demands produce fatigue in each driver group. Heavy truck drivers mainly reported using strategies that have a lasting effect on fatigue such as rest, sleep, caffeine and stay awake drugs. Light truck drivers, on the other hand, reported temporary strategies that are used while driving like music or the radio and eating while driving when it is not possible to stop to rest or nap. It seems that the work of long distance heavy truck drivers provide them with greater access to the more effective fatigue management strategies, although since a significant proportion of their work is at night, they may also need them, whereas the pressure for light truck drivers to make pick ups and

deliveries during the work shift means that they only have access to fatigue management strategies that can be employed while they are continuing to work. Importantly, both groups acknowledged lasting strategies as the most helpful ways of managing driver fatigue indicating that light truck drivers are aware of the most efficient approaches to managing fatigue and would presumably use them if they could.

A final possible reason for the similarity in fatigue reporting from the two sectors is that there has been increasing awareness of fatigue and fatigue management in the long distance heavy trucking industry over the last decade. Comparison of long haul heavy truck drivers' views across the 1990's showed a decrease in the percentage of drivers reporting fatigue as a substantial personal problem of around 10 percent (Williamson, Feyer, Friswell and Sadural, 2001). It may be that improvements in fatigue management by long haul heavy truck drivers mean that their fatigue experiences are now no worse than those experienced by light truck drivers. Nevertheless, the levels of fatigue experienced by both groups are cause for concern. Nearly half of the drivers in both groups reported nodding off or falling asleep at least once in the last year and others reported running off the road or collisions. These are outcomes that cannot be ignored.

Even though light truck drivers reported fatigue as a personal problem as often or more than long distance heavy truck drivers, they were less likely than long distance heavy truck drivers to see fatigue as an important problem for the industry. Certainly, there has been much less overall concern in the light trucking sector about driver fatigue. Limits on working hours have been a feature of the long distance heavy trucking sector since the 1930's and more recent activities around alternative approaches to fatigue management have really emphasised the issue for the industry. There has been no such activity in the light truck sector. Light truck drivers' knowledge of driver fatigue is likely to have resulted from driver education aimed at the general driving public rather than at professional drivers which is why a significant number of them acknowledge that it is a personal problem but not an industry problem. Altogether, the results of this study indicate that there are work pressures and demands in light trucking that make fatigue a problem for the industry and not just for individual drivers.

The results of this study suggest some directions for action to reduce the fatigue experiences of light truck drivers. These include responding to some of the strategies suggested by light truck drivers including reducing pressure on these drivers by easing unreasonable schedules that do not allow sufficient time for rest, sleep and recovery between work shifts. This should also include reviewing the length of work days and reviewing the extent that light truck drivers feel pressured to maximise the number of pick ups and deliveries required in each shift.

Another clear direction for action is improving awareness of driver fatigue as an occupational safety problem in the light trucking sector. This was suggested by the results of this analysis and by light truck drivers themselves. While education is a necessary, but not sufficient strategy for fatigue

management, the mismatch between light truck driver reports of their own fatigue but not perceiving driver fatigue as a problem in their industry clearly needs to be addressed. Importantly, most light truck drivers called for better information and training on fatigue, so providing an excellent opportunity to intervene to ensure that light truck drivers and their companies are aware of fatigue and have the necessary knowledge to do what they can to minimise its effects on driving.

This analysis also highlighted some areas where further research would be helpful for understanding the extent and causes of fatigue for light truck drivers. This includes whether abnormal daytime sleepiness is a particular problem for light truck drivers and the extent to which it contributes to their driver fatigue experiences. Further work is also needed on the actual working hours of light truck drivers to gain a better understanding of the range of hours worked in general and by light truck drivers doing different transport and freight tasks.

It was possible to do this comparison study as many of the same questions were asked of light and long distance heavy truck drivers in two separate surveys. Due to differences in the nature of their work, it was not always possible to ask the questions in exactly the same way. This limited the direct comparison between driver groups for some questions and limited the interpretation of the results. Despite this problem, however, light and long distance heavy truck drivers reported very similar experiences of fatigue. A further possible limitation of the comparison was the six year time difference between the two survey studies. While there have been continuing activities in the area of driver fatigue for the long distance heavy trucking sector which would have been likely to change the views and experiences of drivers, this was not the case for the light trucking sector so light truck driver experiences of fatigue are not likely to have changed very much over the last six years. Lastly, the response rate for the light truck driver survey was low and considerably lower than for the heavy truck driver survey. This issue was discussed at some detail in the full report of the driver survey (Friswell, Williamson and Dunn, in press). There does not appear to be a notable bias in the representation of light truck drivers in the study sample on a number of variables. The low response rate, however, may be further evidence of the impact of work and time pressures on light truck drivers since unlike long distance truck drivers who must take mandatory breaks, light truck drivers did not have enough time unaccounted for in their work day to complete a survey.

In conclusion, this comparison of light and long distance heavy truck drivers provided evidence that light truck drivers are experiencing fatigue in similar ways to long distance heavy truck drivers. The comparison showed that fatigue is an unrecognised problem in the light trucking sector that is of a similar magnitude to that seen in the long haul heavy truck sector. The work-related sources of fatigue are not the same for light and heavy trucking, however, so different approaches will be needed to manage fatigue in the two sectors.

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