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#2

Driving Health

Work-Related Injury and Disease In Australian Truck Drivers

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Executive Summary

Truck driving is the most common occupation in male Australians, employing one in every thirty-three male workers in the nation, or approximately 3% of the national male labour force.

Long-haul truck drivers may be exposed to multiple risk factors in their workplace including long working hours, sedentary roles, poor access to nutritious food, social isolation, shift work, time pressure, low levels of job control, and fatigue.

To date, large Australian studies of truck driver health have focused almost exclusively on safety outcomes such as crashes, near misses, fatalities and traumatic injury. These studies also typically focus their attention on specific causes of those outcomes, including fatigue/shift work and regulatory/ commercial models. In order to identify opportunities to improve health and wellbeing amongst truck drivers, this study takes a more holistic view and seeks to characterize the nature of injury and disease more broadly.

This report, the second from the *Driving Health* study, presents findings from analysis of national workers' compensation claims data in order to:

1. Describe the geographic distribution of work-related injury and disease in Australian truck drivers.
2. Describe the nature, extent and impact of work-related injury and disease in Australian truck drivers by age, socioeconomic status and employer size.
3. Compare rates of compensated work-related fatality in truck drivers to other workers in Australia.

There were 120,742 accepted workers compensation claims lodged by truck drivers over the twelve year study period from 2004 to 2015. A total of twenty-four geographic areas had more than twice the average rate of work-related injury and disease in truck drivers. These areas were typically on the outskirts of major cities and on the border between Victoria and New South Wales.

The average age of truck drivers with accepted workers' compensation claims was 44.5 years. The largest group of claims were from the 35 to 54 years age group, accounting for nearly sixty percent of all claims. The oldest age group of 65+ years recorded the smallest percentage of total claims (2.7%) but were at the highest risk of injury and disease, and recorded median time loss durations much longer than younger drivers. The older drivers also had a statistically significantly higher rate of neurological conditions compared with the other age groups, suggestive of noise induced hearing loss from prolonged exposure to noisy working environments.

Generally, musculoskeletal injury was the most common type of injury for all truck drivers, accounting for approximately 60 percent of all accepted claims. The median duration of time off work following a musculoskeletal injury was 5.2 weeks. In contrast, mental health accounted for a small proportion of accepted claims but the median duration was much longer at 10.3 weeks.

There were 545 compensated work-related fatal injury claims in truck drivers in the 12-year time series, representing 15.1% of all compensated fatal claims across all occupations in Australia during the study period. Truck drivers had a 13 fold higher risk of fatal injury than other workers, and more than three quarters of fatalities in truck drivers were due to vehicle crashes.

In contrast vehicle crashes accounted for less than 17% of the burden of injury and disease when measured as weeks lost from work. Other mechanisms including body stressing, falls slips and trips were responsible for a much greater portion of the non-fatal burden.

Combined, these data support the continued focus on road safety research to reduce the number of fatal work-related injuries in truck drivers, but also support greater preventative effort to reduce the burden of non-fatal injury and disease, as well as a focus on rehabilitation and effective treatment of drivers with work-related health conditions to reduce morbidity.

The findings provide further insight into some specific health conditions in some sub-groups of drivers (for example neurological conditions in older drivers) and identify the geographic regions in which preventive and rehabilitation interventions are most likely to have a positive impact.

This study provides an initial overview of work-related injury and illness in Australian truck drivers over a twelve year time frame, at a population level. Future reports from the *Driving Health* study will focus in more detail on health service and pharmaceutical utilisation of truck drivers and other transport workers, and on specific health risk factors. These reports will include data from health and survey datasets. Our objective is to build an evidence base that can support the development of programs to improve the health of Australia's transport workforce.

Overview of the Project

Rationale

Road freight transport is critical to the national productivity and welfare of Australia. Due to the dispersed population over a vast land area, Australia is heavily dependent on road transport, with over 75% of non-bulk domestic freight carried on roads [1]. The demand for on road freight is expected to increase, with a predicted doubling of freight demands from 2010 to 2030 [1].

At present, there are approximately 200,000 truck drivers in Australia, either for hire or in private fleets [2]. Truck driving is the most common occupation in male Australians, employing 1 in every 33 men of working age [2], or approximately 3% of all male workers in the nation. Australia's long-haul truck driving workforce is rapidly ageing. Despite demand increases, the trucking industry is currently under pressure from severe driver shortages due to low numbers of young, female and indigenous Australians entering the industry. It is anticipated that the rate of recruitment will need to increase by 150% in order to account for the simultaneous pressures of increased road freight service demand and the loss of retiring drivers [3].

As shown in our first report, truck drivers have high rates of work-related injury and illness compared to other Australian workers [4]. Long-haul truck drivers may be exposed to multiple risk factors in their workplace including long working hours, sedentary roles, poor access to nutritious food, social isolation, shift work, time pressure, low levels of job control, and fatigue [5, 6, 7, 8]. A study conducted by Macquarie University, which surveyed 559 truck drivers, found that a high proportion of participants reported working long hours carrying unsafe loads [9]. More than 10% of truck drivers stated that they worked more than 80 hours a week and over 80% reported working more than 50 hours per week. Another Australian study reported that drivers have a disproportionately high risk of suicide than workers in other male dominated occupations [10]. Poor health status resulting from working conditions will contribute to lower quality of life both during working life and after retirement.

Understanding the health and wellbeing of people employed in the transport industry is critical to ensuring the most effective and efficient allocation of resources to prevention and rehabilitation efforts. To date, the large Australian studies of truck driver health have focused almost exclusively on safety outcomes such as crashes, near misses, fatalities and traumatic injury [4, 11, 12, 13]. These studies also typically focus their attention on specific causes of those outcomes, including fatigue/shift work and regulatory/commercial models. In order to identify opportunities to improve health and wellbeing amongst truck drivers in the transport industry, this study takes a more holistic view and seeks to characterize the nature of injury and disease more broadly.

Objectives

This report presents findings from analysis of national workers' compensation claims data. The specific objectives of this analyses were:

1. To describe the geographic distribution of work-related injury and disease in Australian truck drivers.
2. To describe the nature, extent and impact of work-related injury and disease in Australian truck drivers by age, socioeconomic status and employer size.
3. To compare rates of compensated work-related fatality in truck drivers to other workers in Australia.

Methods

Data Sources

We conducted a population based, retrospective cohort study based on claims data collected from the National Dataset for Compensation-based Statistics (NDS)[14]. The NDS is compiled from workers' compensation claims data from all nine of the state, territory and Commonwealth workers' compensation systems. The database contains information on the injured worker, their employer, job characteristics, injury or disease details, and claims outcomes. To calculate rates of accepted claims, we also accessed data on the number of workers covered by workers' compensation. This was derived from Labour Force data by the Australian Bureau of Statistics (ABS) and provided by Safe Work Australia.

Ethics approval for use of NDS claims data was received from Monash University Human Research Ethics Committee (approval number 2017-10758-14006).

Study Population and Measurement

Data drawn for this study were restricted to accepted workers' compensation claims lodged by working age adults (≥15 years) with a date of lodgment between the 2004 and 2015 financial years (1/07/2003 to 30/06/2015). Data from Commonwealth workers' compensation systems (Comcare, Seacare) was excluded from this study due to incomplete data. All other major Australian state and territory workers' compensation systems were included.

Individual data extracted from the NDS for analysis included: age at date of injury, year of injury, postcode, occupation (Australian and New Zealand Standard Classification of Occupations (ANZSCO), Type of Occurrence Classification System (TOOCS) codes for injury nature, mechanism. Truck drivers were identified using the ANZSCO codes (3-digit code 733)[15].To account for coding differences between the workers' compensation systems, types of work-related injury and disease were categorized using a modified version of the TOOCS version 3, as per prior studies [16]. We focused on six major categories including fractures, musculoskeletal injury (MSK), neurological injury, mental injury, other traumatic injury, and other diseases [Appendix 1].

Age was converted to categorical variable by 10-year grouping. Socioeconomic status was measured by using the Index of Relative Socio-Economic Disadvantage (IRSD), from quintile 1 (most disadvantaged) to quintile 5 (least disadvantaged). Employer size was classified as four categories: 1-19 employees, 20-199 employees, 200-999 employees and 1000+ employees. It should be noted that employer size information is largely missing in New South Wales and Queensland. Therefore, data from these two states were excluded from the analysis regarding employer size. For claims resulting in time loss (at least one hour of paid income compensation), the duration of time lost was measured by dividing the total number of compensated hours by the average weekly number of hours worked prior to claim, as per the method previously described [17].

Analysis Strategy

First, descriptive analysis was performed to summarize the counts of accepted claims by geographic area, age, IRSD and employer size. The type and mechanism of injury were also described across age, IRSD and employer size categories.

Claim rates were calculated using the labour force estimates as the denominator, and expressed as the number of claims per 1000 covered workers. We note that this does not account fully for exposure as workers may work range of hours, and working hours may vary by occupation and other factors. However nationally consistent data on working hours was not available for this study.

State-standardised claim rates were used to explore the geographic distribution of work-related injury. Standardisation by state averages was required due to the significant variation in workers' compensation claim rates between states. We first calculated the rate of claims by truck drivers per 10,000 workers for each post-code. Second, we converted the rate of claims by postcode to the rate at larger statistical local areas by aggregation. The Statistical Local Area (SLA) is an Australian Standard Geographical Classification (ASGC) defined area. Third, we calculated the rate of claims by truck drivers per 10,000 workers for each state and territory. For each statistical local area, we expressed the local area rates as a function of the relevant state rate. A value of 1 indicates that the local area rate is equivalent to state average rates. These state standardised rates were then classified into five categories, where lower figures represent a lower rate of compensated work-related injury and disease, and higher figures represent a greater relative rate of compensated work-related injury and disease:

- Very low: less than 25% of the state average
- Low: 25% to 50% of the state average
- Median: 51% to 150% of the state average
- High: 151% to 200% of the state average
- Very high: more than 200% of the state average

Time loss calculations were limited to data up to the end of the 2012 financial year to allow for a minimum follow-up period of 3 years for all claims. Time loss data was right censored at a maximum cumulative duration of 260 weeks.

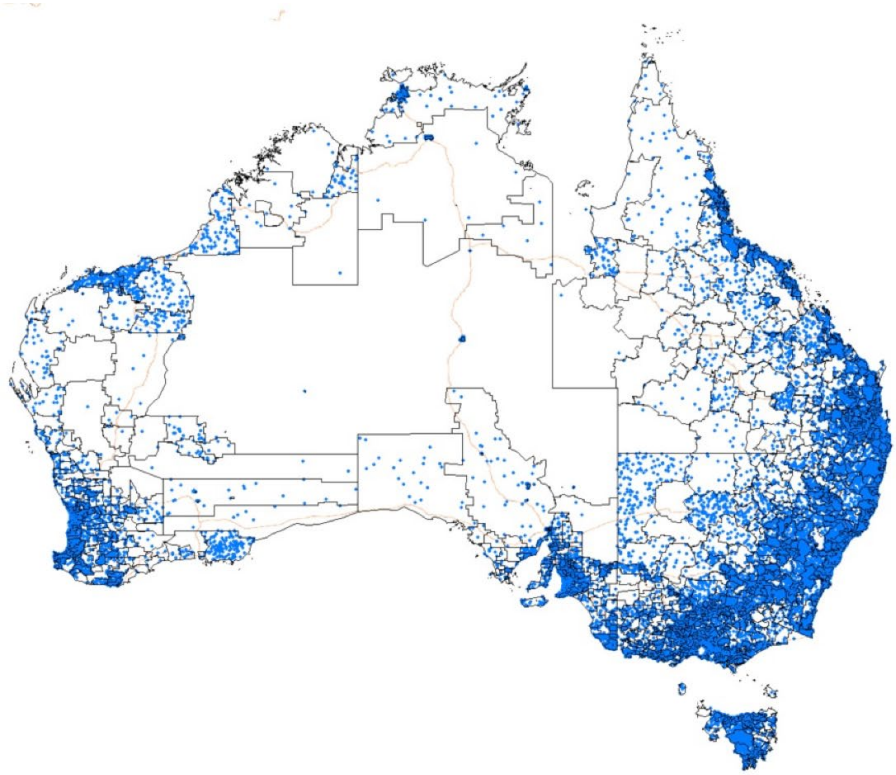
Negative binomial regression was used to determine Incidence Rate Ratio (IRR) and 95% confidence intervals (95% CI) for the comparison of claim rates across age groups. The 35 to 44 years age group was set as the reference group. The regression model was performed on all accepted claims data by truck drivers over the study period, and adjusted for four time periods (2004-2006, 2007-2009, 2010-2012, and 2013-2015) and jurisdiction. A series of additional regression models adjusted for time period and jurisdiction were conducted to investigate the differences in the IRR of injury type across age groups. Quantile regression was used to explore the differences of median duration of time loss by age, type and mechanism of injury. All analyses was conducted using Stata IC/14 [18]. The ArcMap 10.5 and Microsoft Power BI were used for data visualisation.

Research Findings

Work-related Injury and Disease by Geographic Area

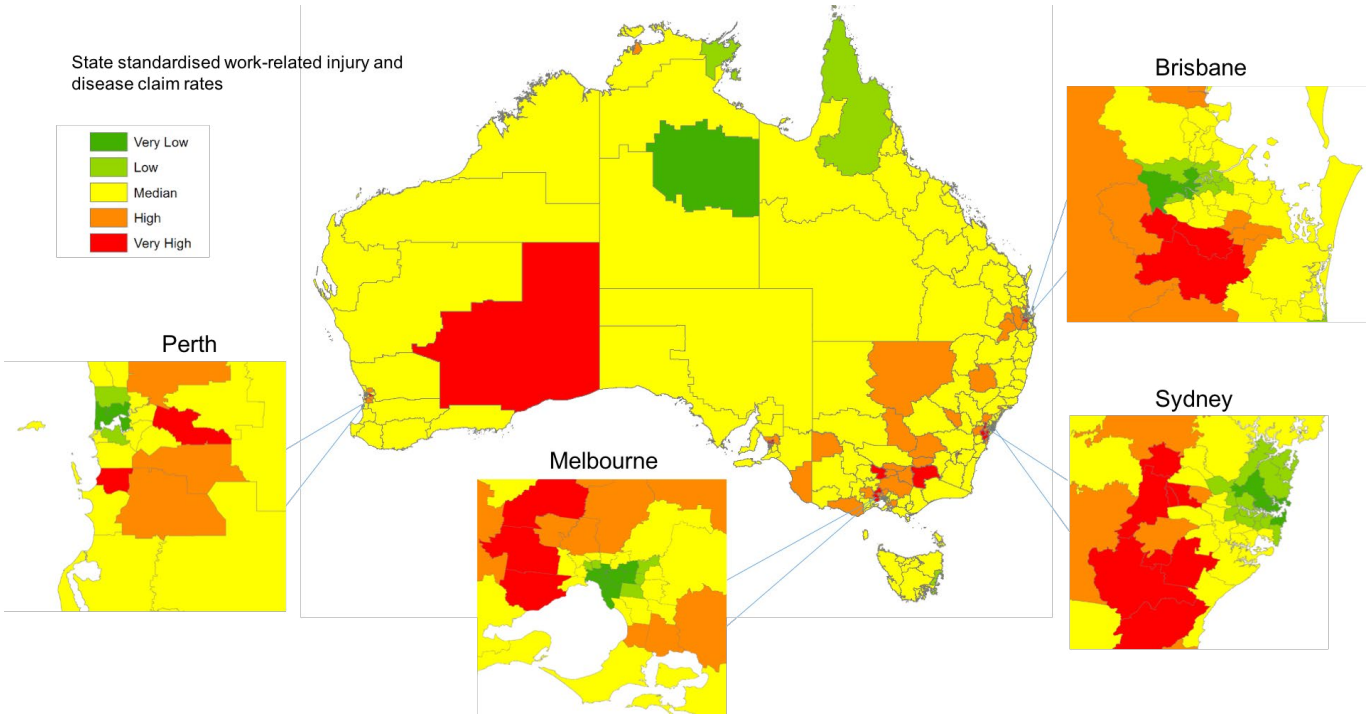
In total, there were 120,742 accepted workers compensation claims lodged by truck drivers over the 12-year study period. Just over one third (34.7%) of total claims were lodged in New South Wales followed by 18.7% in Queensland, 18.2% in Victoria, 14.8% in Western Australia, 8.9% in South Australia, 2.7% in Tasmania, 1.1% in the Northern Territory and 0.8% in the Australian Capital Territory. Figure 1 maps the dispersion of claims nationally by injured worker postcode of residence.

Figure 1 Distribution of work-related injury and disease claims in truck drivers



State standardised work-related injury and disease claim rates by Statistical Area Level 3 are mapped in Figure 2. Generally, the state-standardised rates were found to be very low to median in areas within major cities. Areas on the outskirts of major cities tended to have high or very high claim rates, in addition to the areas on the border between New South Wales and Victoria.

Figure 2 State-standardised work-related injury and disease claim rates in truck drivers by Statistical Area Level 3



Areas with very high state-standardised claim rates are summarized in Table 1. Each of these areas has a claim rate that is at least twice the state average. The highest rate is observed in Fyshwick—Pialligo—Hume with a rate of work-related injury and disease 3.6 times the ACT average. There are 24 areas with rates of injury and disease at least two times the state average for truck drivers. Eight of these occur in New South Wales, seven in Victoria, three in Western Australia, three in Queensland, two in South Australia and one in the ACT.

TABLE 1 STATISTICAL LOCAL AREAS WITH VERY HIGH STATE-STANDARDISED CLAIM RATES

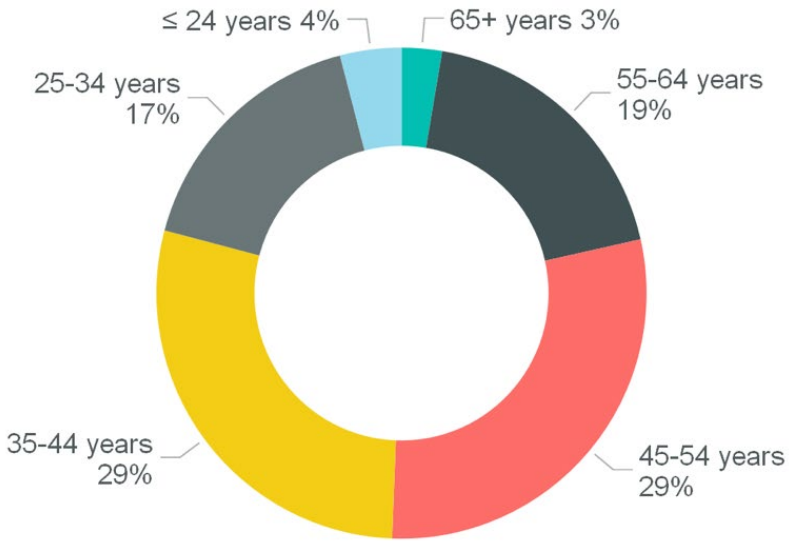
Statistical local area level 3 name	State	State-standardised rate
Fyshwick—Pialligo—Hume	ACT	3.58
St Marys	NSW	3.11
Browns Plains	Queensland	3.01
Camden	NSW	2.60
Wollondilly	NSW	2.37
Penrith	NSW	2.35
Mount Druitt	NSW	2.35
Goldfields	WA	2.34
Illawarra Catchment Reserve	NSW	2.34
Springfield - Redbank	Queensland	2.30
Playford	SA	2.24
Macedon Ranges	VIC	2.19
Jimboomba	Queensland	2.19
Wodonga—Alpine	VIC	2.16
Gawler—Two Wells	SA	2.16
Richmond—Windsor	NSW	2.13
Melton—Bacchus Marsh	VIC	2.12
Kwinana	WA	2.06
Campaspe	VIC	2.06
Wyndham	VIC	2.03
Campbelltown (NSW)	NSW	2.01
Kalamunda	WA	2.01
Shepparton	VIC	2.00
Mildura	VIC	2.00

This mapping exercise shows that work-related injury and disease among truck drivers is not uniformly distributed by geographic area. A relatively small number of geographic areas carry an excess rate of injury and disease, and these areas tend to be clustered on the outskirts of major cities and along major trucking routes in the south-eastern states.

WORK-RELATED INJURY AND DISEASE BY AGE, SOCIOECONOMIC STATUS AND EMPLOYER SIZE

The average age of truck drivers with accepted workers' compensation claims was 44.5 years. The largest group of claims were from the 35 to 54 years age group, accounting for nearly 60% of all claims (red and yellow sections in Figure 3). The oldest age group of 65+ years recorded the smallest percentage of total claims (2.7%), followed by those aged less than 24 years (4.0%).

Figure 3 Work-related injury and disease claims in truck drivers between age groups



As shown in Figure 4, truck drivers were over-represented in the second and third socioeconomic status quintiles (IRSD Quintile 2 and 3), and only 12% of claims were lodged by workers living in an area with a higher socioeconomic status (IRSD Quintile 5).

Figure 4 Work-related injury and disease claims in truck drivers between socioeconomic status group. IRSD = Index of Relative Socioeconomic Disadvantage

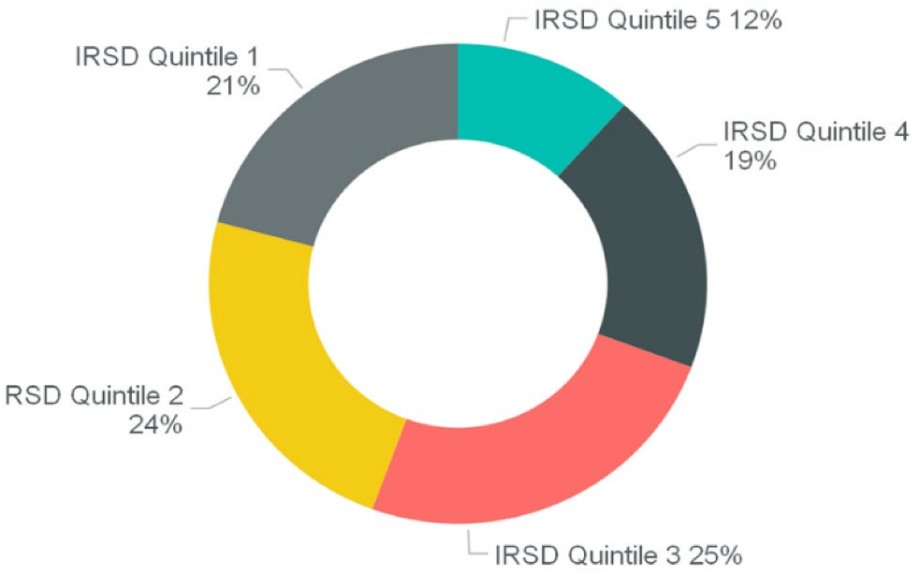


Figure 5 shows the distribution of accepted claims by employer size. Just over one-third (35%) of all claims for truck drivers arose from employers with between 20 and 199 employees. Employers with between 1 and 19 employees, 200 to 999 employees and 1000+ employees each accounted for 21% to 22% of total claims.

Figure 5 Work-related injury and disease claims in truck drivers between employer size groups

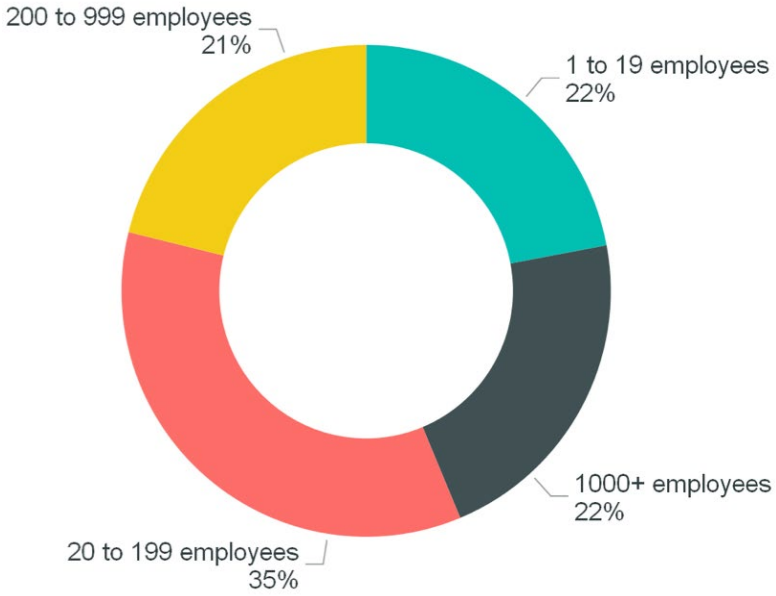


Figure 6 and Figure 7 further demonstrate the distribution of the most common injury type, mechanism and body part in truck drivers by age, employer size and IRSD categories. Generally, musculoskeletal injury was the most common type of injury for all truck drivers [Figure 6]. However, it should be noted that older truck drivers had a larger proportion of neurological injury claims than other age groups. In addition, the percentage of claims due to neurological injury tended to increase with age. Compared with those employed by smaller employers, truck drivers employed by larger employers tended to have a larger proportion of MSK injury and smaller proportion of other traumatic injury and fracture. There was no significant difference in the distribution of claims across socioeconomic groups.

Body stressing was the most common mechanism of injury for all truck drivers [Figure 7]. Claims due to sound and pressure became more common in older truck drivers. Truck drivers working for larger employers seemed to have a higher proportion of claims due to body stressing, whilst truck drivers working for smaller employers had a higher proportion of claims due to falls, trips and slips of a person, and vehicle incidents and other. Similarly, the difference in mechanism of injury between socioeconomic groups was not significant.

Figure 6 Types of injury by age, socioeconomic status, and employer size groups in truck drivers

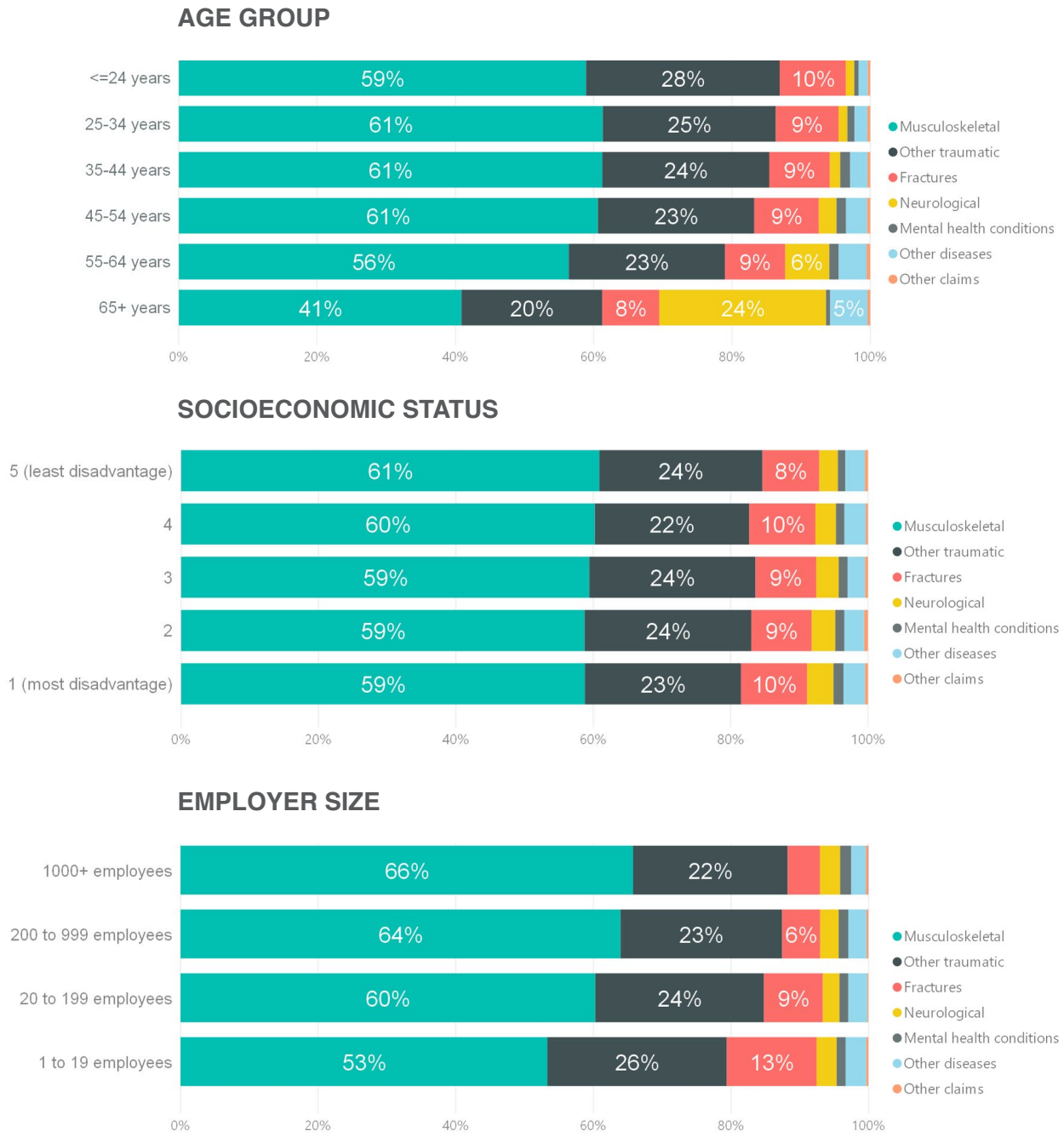
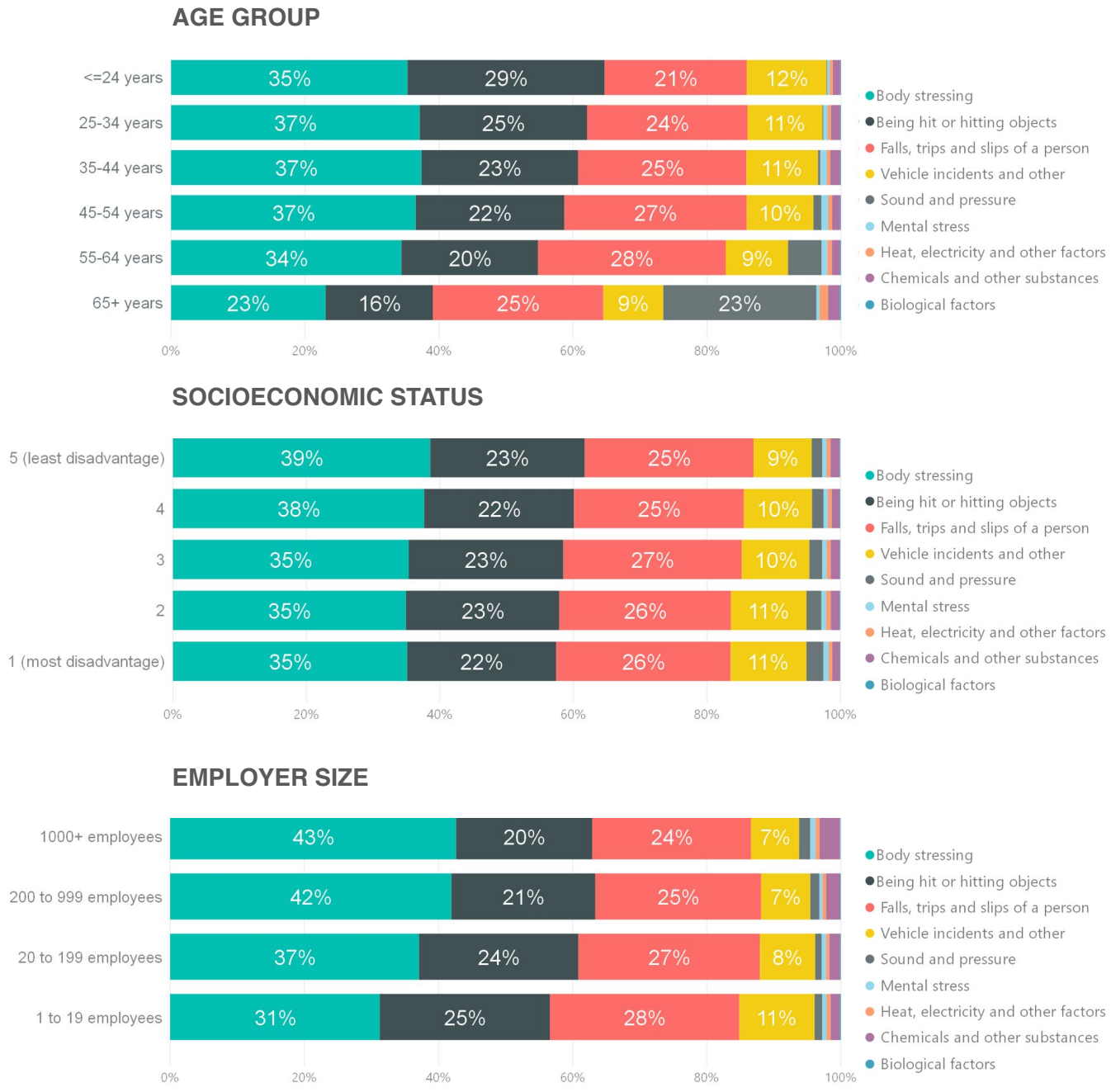


Figure 7 Mechanism of injury by age, socioeconomic status and employer size groups in truck drivers



INCIDENCE OF WORK-RELATED INJURY AND DISEASE

The total number of claims gradually decreased over the study period, and the overall incidence decreased from 77.7 to 56.2 per 1000 workers per year (Table 1; adjusted IRR= 0.77, 95% CI: 0.81 to 0.87; for 2013—2015 compared to 2004—2006). Much of this decline was observed in the most recent time period (2013—2014). This time period coincides with the introduction of tightened workers compensation legislation in New South Wales which led to an approximate 20% drop in the volume of claims from that state, and therefore does not necessarily indicate improvements in health and safety.

In general, the relative risk of workers' compensation claims increases with age. The highest rates were observed in the older truck driver group (79.5 per 1000 workers per year), with a 26% increased risk compared to the 35 to 44 years age group (adjusted IRR = 1.26, 95% CI: 1.10 to 1.44).

TABLE 2 NUMBER AND RATE OF ACCEPTED WORKERS' COMPENSATION CLAIMS IN TRUCK DRIVERS

	Rate per 1000	Adjusted	
		IRR*	95%CI#
Year of injury			
2004—2006	77.7	Ref	
2007—2009	76.1	1.05	0.95—1.17
2010—2012	72.2	1.02	0.92—1.13
2013—2014	56.2	0.77	0.81—0.87
Age group			
≤ 24 years	49.9	0.72	0.64—0.82
25—34 years	65.3	0.88	0.78—0.99
35—44 years	75.9	Ref	
45—54 years	70.1	0.93	0.82—1.05
55—64 years	72.5	0.97	0.86—1.10
65 + years	79.5	1.26	1.10—1.44

TABLE 2 NUMBER AND RATE OF ACCEPTED WORKERS' COMPENSATION CLAIMS IN TRUCK DRIVERS			
	Rate per 1000	Adjusted	
		IRR*	95%CI#
Jurisdiction			
New South Wales	80.2	Ref	
Victoria	56.0	0.65	0.57—0.75
Queensland	57.7	0.70	0.61—0.80
South Australia	91.4	1.08	0.94—1.24
West Australia	81.8	0.99	0.86—1.14
Tasmania	72.4	0.95	0.82—1.10
Northern Territory	74.4	0.97	0.83—1.14
Australian Capital Territory	80.4	1.11	0.95—1.31

**IRR refers to incidence rate ratio that is a relative difference measure used to compare the incidence rates of events occurring at any given point in time.*

 # 95% CI refers to the 95 percent confidence interval, which is a measure of the variance in the data. Confidence intervals that overlap the value 1 indicate a non-significant difference from the comparison group.

Table 3 provides the rates and relative risk of work-related injury and disease for the most common types of injury. The overall rate of fracture injury in truck drivers was 6.3 per 1000 workers. Older truck drivers had a slightly higher rate of fracture injury than drivers in the 35 to 44 year old age group (adjusted IRR = 1.03, 95% CI: 0.89-1.20), but this was not statistically significant. For MSK injury, the overall rate was 41.8 per 1000 workers. The rate was 18% lower for the oldest and the youngest age groups compared to the 35 to 44 age group (adjusted IRR = 0.82, 95% CI: 0.72-0.95; adjusted IRR = 0.68, 95% CI: 0.60-0.77). The overall rates of neurological and other diseases were 2.3 and 2.0 per 1000 workers respectively, and the rates increased steadily with age. For neurological injury, the rate reached 19.1 among older truck drivers, which was 15 times higher than the 35 to 44 year old age group (adjusted IRR = 15.2, 95% CI: 12.31-18.80).

Mental health conditions had the lowest overall rate compared to other types of injury. Furthermore, the rate of mental health conditions peaked in the 35 to 44 year age group. Relative to the comparator group, the risk of mental health conditions was 60% and 70% lower among the oldest and youngest age groups, respectively (adjusted IRR = 0.41, 95% CI: 0.26-0.65; adjusted IRR = 0.30, 95% CI: 0.21-0.43). Other traumatic injury had the second highest injury rate among all truck drivers (16.6 per 1000 workers). Compared with the 35 to 44 years age group, the rate was lower for other age groups except the older truck driver age group. Older truck drivers had a higher rate of other traumatic injury (16.1 per 1000 workers), but the difference in injury risk compared with the 35 to 44 year old age group was not statistically significant (adjusted IRR = 1.05, 95% CI: 0.91-1.21).

TABLE 3 ADJUSTED IRRS FOR RISK OF INJURY BY AGE GROUPS IN TRUCK DRIVERS

	Rate per 1000	IRR*	95% CI#		Rate per 1000	IRR	95% CI
Fractures	**6.3**			**Mental health conditions**	**0.9**		
≤ 24 years	4.8	0.70	0.62—0.80	≤ 24 years	0.3	0.30	0.21—0.43
25—34 years	5.9	0.88	0.80—0.97	25—34 years	0.7	0.61	0.51—0.73
35—44 years	6.6	Ref		35—44 years	1.1	Ref	
45—54 years	6.5	1.0	0.91—1.08	45—54 years	1.0	0.88	0.76—1.01
55—64 years	6.3	0.97	0.89—1.07	55—64 years	1.0	0.88	0.75—1.03
65 + years	6.5	1.03	0.89—1.20	65 + years	0.5	0.41	0.26—0.65
Musculoskeletal	**41.8**			**Other traumatic**	**16.6**		
≤ 24 years	29.4	0.68	0.60—0.77	≤ 24 years	14.0	0.76	0.68—0.86
25—34 years	40.0	0.90	0.80—1.01	25—34 years	16.3	0.88	0.79—0.98
35—44 years	46.5	Ref		35—44 years	18.3	Ref	
45—54 years	42.4	0.93	0.83—1.04	45—54 years	15.8	0.87	0.79—0.97
55—64 years	40.9	0.91	0.81—1.02	55—64 years	16.4	0.94	0.84—1.05
6 5+ years	32.4	0.82	0.72—0.95	65 + years	16.1	1.05	0.91—1.21

TABLE 3 ADJUSTED IRRS FOR RISK OF INJURY BY AGE GROUPS IN TRUCK DRIVERS

	Rate per 1000	IRR*	95% CI#		Rate per 1000	IRR	95% CI
Neurological	**2.3**			**Other diseases**	**2.0**		
≤ 24 years	0.6	0.51	0.37—0.71	≤ 24 years	0.7	0.53	0.41—0.70
25—34 years	0.8	0.73	0.58—0.92	25—34 years	1.2	0.67	0.58—0.77
35—44 years	1.2	Ref		35—44 years	1.9	Ref	
45—54 years	1.8	1.44	1.18—1.77	45—54 years	2.2	1.15	1.03—1.29
55—64 years	4.6	3.30	2.72—4.01	55—64 years	2.9	1.59	1.42—1.79
65 + years	19.1	15.2	12.31—18.80	65+ years	4.3	2.78	2.31—3.34

**IRR refers to incidence rate ratio that is a relative difference measure used to compare the incidence rates of events occurring at any given point in time.*

 # 95% CI refers to the 95 percent confidence interval, which is a measure of the variance in the data. Confidence intervals that overlap the value 1 indicate a non-significant difference from the comparison group.

DURATION OF TIME LOSS

Figure 8 shows the median duration of compensated time loss in weeks by age group for claims lodged between 2004 and 2012. The median duration increased steadily with age. Compared with the 34 to 44 year old age group (3.2 weeks, IQR: 1.0—11.6), older truck drivers had a significantly longer median duration of time loss at 6.6 weeks (IQR = 2.0—19.9, Coef: 3.40, 95%CI: 2.86 to 3.94). The youngest age group had the shortest median time loss at 2.0 weeks (IQR: 0.8—6.2).

Figure 8 Median duration of time loss in weeks due to work-related injury and disease in truck drivers by age group

Figure 9 presents time loss data by injury type and mechanism of injury. Mental health conditions resulted in the longest median time loss (10.3 weeks, IQR: 3.2—29.0), followed by fractures (8.6 weeks, IQR: 4.6—17.8) and neurological injury (7.1 weeks, IQR: 2.6—20.0). Claims due to other traumatic injuries had the shortest median time loss (3.5 weeks, IQR: 1.8—9.0). Furthermore, claims due to mental stress had a median time loss of 10 weeks (IQR: 2.2—38.2), which is 72% longer than claims due to 'Vehicle incidents and other ' mechanism. Claims due to 'Falls, trips and slips of a person' and 'Body stressing' had median time loss of 4.2 weeks (IQR:1.2—13.8 weeks) and 3.4 weeks (IQR: 1.0—12.8). In addition, the claims with the shortest median time loss were those where the mechanism was 'sound and pressure'.

Figure 9 Median duration of time loss in weeks due to work-related injury and disease in truck drivers by type and mechanism of injury

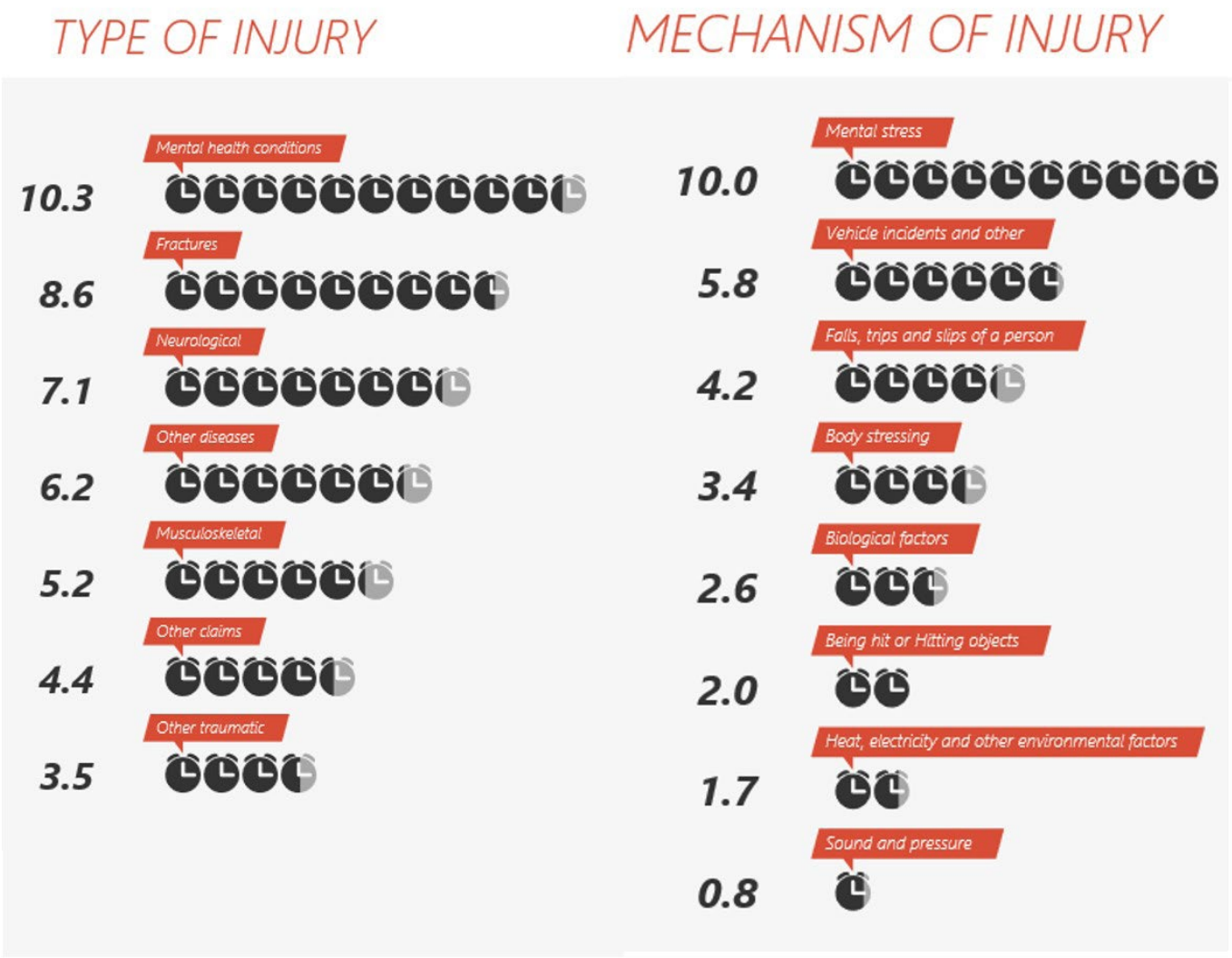
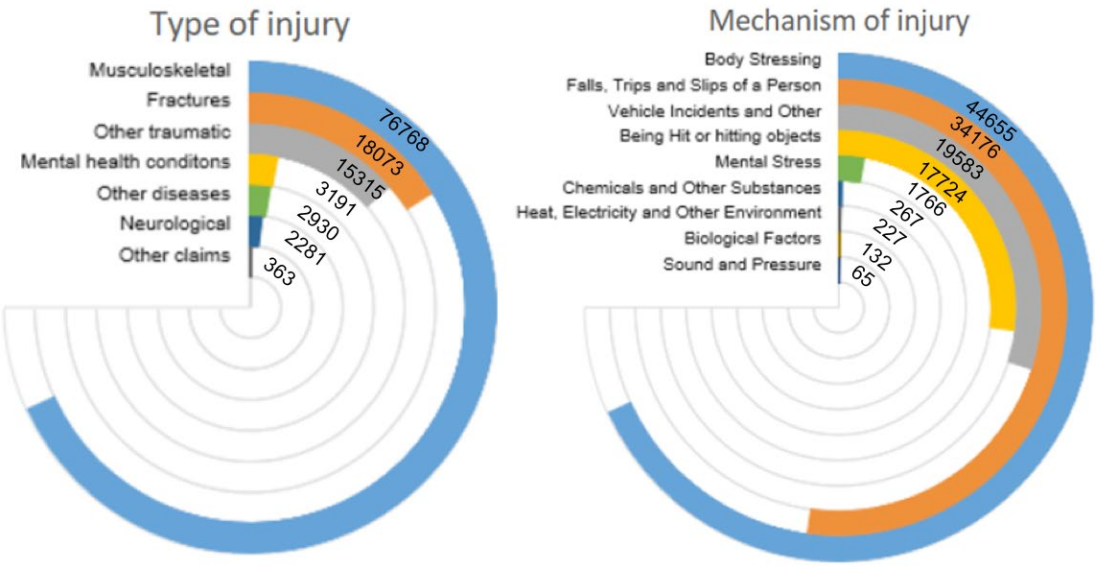


Figure 10 further illustrates the annual average cumulative time loss in weeks in truck drivers by type and mechanism of injury. Among claims lodged between 2004 and 2012 a total of 1,071,230 weeks were compensated for time loss due to work-related injury or illness in truck drivers. When averaged using a 48 working week year, this is equivalent to 22,317 working years total or 119,025 working weeks lost per financial year. Musculoskeletal injury comprised 76,768 weeks (64.5%) of the total annual average cumulative time loss, whilst fractures and other traumatic injury accounted for 15.2% and 12.9% of the total time loss respectively. Furthermore, claims due to vehicle incidents comprised 19,583 (16.5%) weeks of time loss. Claims due to body stressing accounted for 37.5% (401,902 weeks) of time loss.

Figure 10 Annual average cumulative time loss in weeks in truck drivers by type and mechanism of injury



FATAL INJURY

There were 545 compensated work-related fatal injury claims in truck drivers in the 12-year time series, representing 15.1% of all compensated fatal claims across all occupations in Australia during the study period.

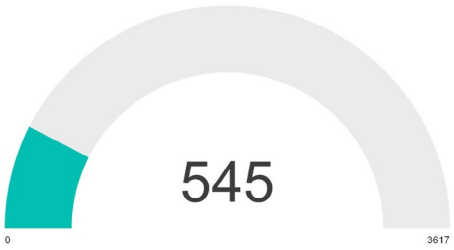


Figure 11 shows the type and mechanism of compensated work-related fatal injury in truck drivers and in all other workers. Fatalities were most often coded as other traumatic injury in truck drivers (75%), followed by other diseases (9%) and other claims (6%). All other workers had a lower proportion of other traumatic fatal injury but a higher proportion of fatal injury caused by other diseases. Furthermore, the most common mechanism of fatalities in truck drivers were vehicle incidents (77%), followed by being hit or hitting objects (12%). Fatal injuries due to chemicals and other substances only accounted for 1% of all fatal injuries in truck drivers, but were the third most common fatal injury among all other workers.

Figure 11 Proportion of fatality claims (a) and mechanism (b) of injury in truck drivers and all other workers

Figure 11 (a) Type of fatal injury

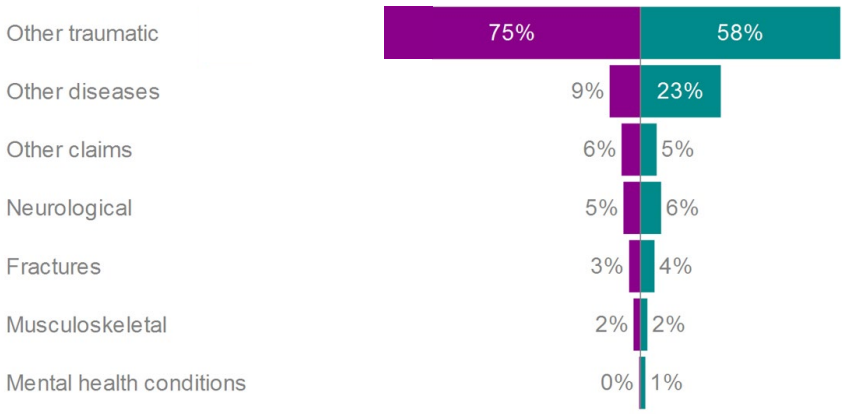
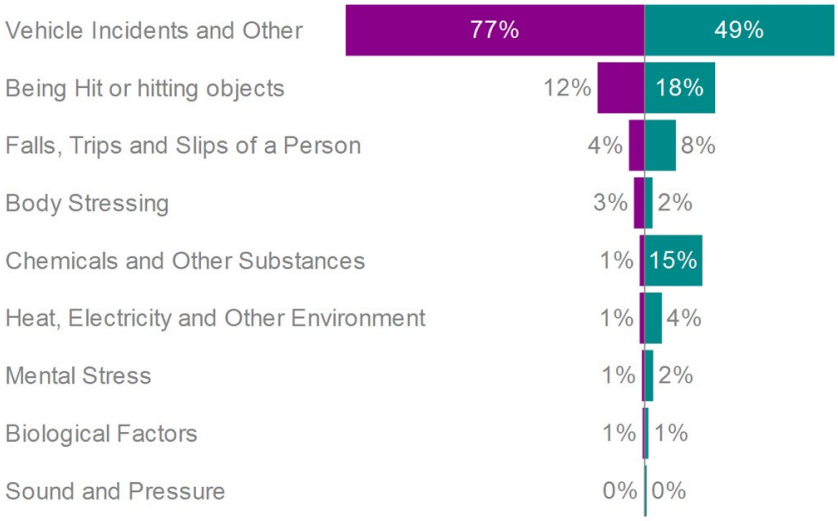


Figure 11 (b) Mechanism of fatal injury



The approximate rate of work-related fatal claims per 100,000 workers in truck drivers and all other workers is shown in Table 4. This table also shows the comparison to the rate of fatal claims by type and mechanism of injury. Between 2004 and 2015, truck drivers recorded an incidence of compensated work-related fatality claims of 34.3 per 100,000 workers. This rate is almost 13 times higher than that observed for all other workers (2.7 per 100,000 workers).

In particular, the incidence rate of 'other traumatic' fatal claims in truck drivers was about 15 times higher (23.7 per 100,000 workers) than all other workers (1.6 per 100,000 workers). In addition, the incidence rate of compensated fatality due to 'vehicle incidents and other' in truck drivers was nearly 20 times higher than that in all other workers. Truck drivers were also found to be have a greater incidence rate of compensated fatality due to 'being hit or hitting objects' and 'falls, trips and slips of a person.

TABLE 4 THE APPROXIMATE RATE OF WORK-RELATED FATAL CLAIMS PER 100,000 WORKERS IN TRUCK DRIVERS AND ALL OTHER WORKERS

	Truck drivers	All other workers
Over all rates	34.3	2.7
Type of fatal injury		
Other traumatic	23.7	1.6
Other diseases	2.9	0.6
Other claims	1.8	0.1
Neurological	1.6	0.2
Fractures	1.1	0.1
Musculoskeletal	0.6	0.1
Mental health conditions	0.1	0.0
Mechanism of fatal injury		
Vehicle Incidents and Other	24.3	1.3
Being Hit or hitting objects	3.8	0.5
Falls, Trips and Slips of a Person	1.3	0.2
Body Stressing	0.9	0.1
Heat, Electricity and Other Environment	0.4	0.1
Chemicals and Other Substances	0.4	0.4
Mental Stress	0.2	0.1
Biological Factors	0.2	0.0
Sound and Pressure	0.1	0.0

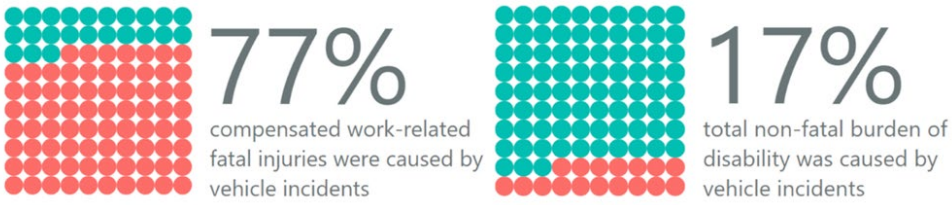
VEHICLE INCIDENTS

Road traffic injury (crashes) are represented in the claims data as vehicle incidents. There has been significant focus on road safety among truck drivers over recent decades, with a number of substantial Australian research projects studying the major causes of heavy vehicle crashes [11, 19]. These have led to the implementation of multiple mitigation strategies including fatigue monitoring, shift scheduling and other interventions.

This study provides further support for this approach, with truck drivers clearly at elevated risk of death on the job, and with the largest proportion of compensated work-related fatal injury occurring as a result of vehicle incidents (77%).

However this study also shows that injury resulting from vehicle incidents account for only 16.5% of the total burden of non-fatal disability in truck drivers. The remaining 83.5% of disability due to injury and disease equates to an average of 74,530 working weeks lost every year. More common mechanisms of working time loss include body stressing (typically resulting in musculoskeletal conditions) and falls, slips and trips (usually resulting in traumatic injury).

Combined, these data support the continued focus on road safety research to reduce the number of fatal work-related injuries in truck drivers, but also support greater preventative effort to reduce the burden of non-fatal injury and disease, as well as a focus on rehabilitation and effective treatment of drivers with work-related health conditions.



Summary and Conclusions

This is the second report of the *Driving Health* study. The first report presented an overview of work-related injury and disease in the transport industry over a twelve year time frame. This second reports focusses specifically on work-related injury and disease in truck drivers, the most common male occupation in Australia.

The report identifies that work-related injury and disease among truck drivers is not uniformly distributed across society. Injured and ill drivers are more likely to reside in some specific geographic areas and to be from specific socioeconomic groups. Older drivers are at higher risk of injury and disease than younger drivers, take a longer period of time off work, and are more likely to have neurologic conditions.

Mapping of the geographic distribution of workers' compensation claims demonstrated very high rates of work-related injury and disease in truck drivers who live in a small number of areas on the outskirts of major cities and on the border between Victoria and New South Wales. Injured and ill drivers were much less likely to live in inner city areas. This sort of spatial analyses can inform the prevention and rehabilitation programs by identifying regions with greater burden of ill health, that are more likely to benefit from interventions to reduce the occurrence and consequences of work-related injury and disease. Although this analysis does not address what sort of interventions should be delivered, it does provide insight into where they might best be delivered.

Our first report noted the associated between older age and higher risk of injury and disease in transport workers generally. This report extends these findings to focus more specifically on truck drivers. Reports suggest one in five working truck drivers is at or near retirement age [6, 9, 20], and that nearly half of the workforce is now aged between 45 and 64 years old compared to 33% in 1995 [21]. Although drivers of 65 years were identified as contributing the smallest proportion of total claims, they had the greatest risk of work-related injury and disease when compared to the truck drivers in the 35 to 44 year age group. This heightened risk was statistically significant for all conditions except for 'other traumatic injury'. Drivers over 45 years of age also had significantly higher risk of other conditions than the 35 to 44 year age group. This category includes a range of other diseases and illnesses including circulatory and respiratory diseases and cancer.

This study also found that older truck drivers had a significantly larger proportion of neurological injury compared to younger age groups and that the percentage of these claims increased with age. It is known that truck drivers are exposed to traffic noise (e.g., engine and road noise) for long durations. Poor road surfaces, conditions of the vehicle and less mature occupational health and safety systems have also been reported as risk factors associated with noise-induced hearing loss [22], and noise-induced hearing loss is common amongst truck drivers [23, 24], particularly older truck drivers [24, 25]. To improve the health and wellbeing of the trucking workforce, work modifications designed to alter the work environment and working conditions are necessary. Example modifications include selecting vehicles with superior noise controlling measures, introducing journey planning practices that encourage driving on quality road surfaces and screening of hearing within professional development programs. Noise related risk controls should also be reviewed within workplace health and safety laws and regulations.

These findings are consistent with the OECD report on Aging and Transport [26] which states that the most critical safety issue for older drivers is their frailty and associated injury susceptibility. However our findings extend this report to suggest that the greatest risk in older drivers relates to neurological conditions such as noise induced hearing loss, and also that they face increased risk of other conditions including cancer, respiratory and circulatory conditions. Further detailed analysis of specific occupational disease patterns in older drivers is warranted.

Analysis also identified substantial differences in the duration of time loss due to work-related injury and disease in truck drivers across age, type and mechanism of injury groups. Specifically, older truck drivers had significantly greater periods of time off work compared to younger drivers. In addition, although mental health conditions were found to be less common in truck drivers, claims due to mental stress had the longest duration of time off work. Truck drivers are exposed to a variety of occupational stressors such as constant time pressures, social isolation, disrespectful treatment from others, driving hazards and violence or fear of violence [27, 28]. However, due to the special characteristic of this occupation (male-dominated, often living in regional or rural areas) [29, 30], the reported stigma associated with claiming workers' compensation benefits for mental ill health [31], and the difficulty of demonstrating a link between the circumstances of work and a mental health conditions (which is a precondition for an accepted workers' compensation claim) [32], work-related mental ill health is likely to be significantly under-represented in our database. Considering previous reports of the high risk of suicide in truck drivers [10], psychological well-being promotion for truckers should be an area of focus.

Our analysis identified 545 cases of compensated work-related fatal injuries in truck drivers over the twelve year time frame of the study. This equates to approximately 45 fatalities every year. Of these, 77% occurred following vehicle incidents. These results are consistent with a previous report by Safe Work Australia showing that there were around 50 work-related fatalities in truck drivers per year and that three-quarters of the worker fatalities in truck-related incidents occurred on a public road with these typically involving a vehicle crash [33]. In addition, our regression analysis determined that truck drivers are at a 13 fold higher risk of work-related fatal injury than all other workers, and a 20 fold higher risk of fatality resulting from a vehicle incident than other workers.

Heavy vehicle safety has been a long-standing concern of transport safety regulators, policy, road transport authorities, truck drivers and transport sector worker representative groups such as trade unions. The involvement of a heavy vehicle is associated with more severe injury both for truck drivers and other commuters [34], and nearly 60 percent of people killed in heavy vehicle truck crashes are occupants of light vehicles, and a further 20 percent are vulnerable road users including motorcyclists, pedal cyclists or pedestrians. Our findings provide further support for a continued focus on prevention of heavy vehicle crashes and truck driver safety to reduce the burden of fatal injury.

However our analysis also provides significant insight into the burden of disability among truck drivers. We estimated that less than 17% of the total number of working weeks lost among truck drivers in this study were due to vehicle incidents / crashes. The most common mechanism of injury and disease was bodily stressing, often resulting in musculoskeletal conditions, followed by slips, trips and falls. Vehicle incidents were the fourth most common mechanism. More than 120 thousand truck drivers had an accepted workers' compensation claim for a non-fatal work-related injury or disease during the twelve year period of this study. Combined these results suggest that there is significant potential to improve health and wellbeing of truck drivers through a focus on prevention and rehabilitation of musculoskeletal and other conditions.

A recent systematic review of studies of truck and bus driver health proposed a causal pathway between driver health, driving performance and safety. Specifically this study suggested that poor health can contribute to reduced safety and lower levels of driving performance. This suggests an opportunity to improve safety through focusing on health promotion and rehabilitation, as well as more conventional mechanisms. [35]

While not detracting from the importance of crash prevention to reduce the number of fatalities, these findings present a new substantial opportunity to improve the health and wellbeing of truck drivers in Australia that has not been previously characterized at a national level.

STRENGTHS AND LIMITATIONS

The strength of study was use of a database with population coverage of compensable work-related injury and disease at a national level as well as population level denominator data. Use of standardized coding system also allows comparisons within and across occupational, industry categories and across injury types. However, this study has several limitations that should be acknowledged. First, some claims' postcodes in the NDS are not included in the postal areas classification thereby could not be included in the geospatial visualization. In addition, postal areas can cross state or territory borders, and multiple statistical local areas. Therefore, the estimate state-standardised claim rates may not prefectly represent the geographic differences in the risk of work-related injury and disease for truck drivers, especially for postcodes that are allocated to multiple statistical local areas. Second, by providing detailed analyses of specific injuries by age group, caution should be taken when interpreting some of the results because of the relatively small group sizes (e.g., there were 19 claims due to mental health conditions in truck drivers > 65 years of age). Third, some workers with work-related conditions may choose not to make workers' compensation claims, or may not be eligible. Thus, the NDS is unlikely to represent all cases of work-related injury and illness in truck drivers. Finally, the database contains limited information on workplace factors contributing to injury and illness and other factors beyond demographic information. This means it is not possible to explore all of the possible workplace predictors of injury and disease.

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Appendix I

TABLE 5 INJURY TYPE CATEGORIES AND CORRESPONDING TOOCS GROUP

Type of condition	TOOCS Major Group
Fractures	B: Fractures
Musculoskeletal	F: Traumatic Joint/Ligament and Muscle/Tendon Injury
	H: Musculoskeletal and Connective Tissue Diseases
Neurological	A: Intracranial Injuries
	E: Injury to Nerves and Spinal Cord
	L: Nervous System and Sense Organ Diseases
Mental Health Conditions	I: Mental Diseases
Other Traumatic	C: Wounds, Lacerations, Amputations and Internal Organ Damage
	D: Burn
	G: Other Injuries
Other Diseases	J: Digestive System Diseases
	K: Skin and Sub-cutaneous Tissue Diseases
	M: Respiratory System Diseases
	N: Circulatory System Diseases
	O: Infectious and Parasitic Diseases
	P: Neoplasms (Cancer)
	Q: Other Diseases
Other Claims	R: Other Claims