Occupational Vehicular Accidents: A Workers' Compensation Analysis of

Oregon Truck Drivers 1990-1997

By:

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Abstract

This study used workers' compensation data from Oregon from 1990-1997 to examine vehicular accidents by truck drivers, and calculate rate estimates using baseline data derived from the U.S. Bureau of Census' Current Population Surveys. During this period, 1,168 valid injury claims due to vehicular accidents were filed representing an accident rate of 50.3 (95% C.I. = 45.1-55.5) per 10,000 truck drivers annually. There were 19 work-related vehicular accident fatalities recorded in the data over the 8 year period. Of all claimants, males constituted the majority (80.7%), most were 35 years of age or younger (51.4%) and had less than 1 year of job tenure (51.0%). Truck driver injury rates due to vehicular accidents were lowest during the 6:00 a.m. – 12.p.m. period. The average amount of compensable lost work days per injury claim was 57.8 days, of which male claimants lost an average of 60.5 days of work and females lost an average of 46.9 days of work. The amount of lost work days due vehicular accident increased with the claimant's age. A total of \$11,642,635 was paid in claims for vehicular accidents of truck drivers in Oregon over the time examined, averaging \$9,966 per claim. Sprains were the most frequently cited injury experienced from vehicular accidents.

Author Keywords: Vehicular accidents, driving, truck drivers, workers' compensation, public health, workplace safety.

Truck Driver Accidents

Introduction

Occupational vehicular accidents involving truck drivers represent a serious threat to both work safety and public health. It has been estimated that from between 1980-1992, accidents involving motor vehicles accounted for 23% of all industrial fatalities (Ore and Fosbroke, 1997). Many of the studies which have broadly examined occupational vehicular accidents have usually confined their analyses to fatality assessment (Karlson and Baker, 1978; Loomis, 1991; Jenkins et al. 1993). Other research which has attempted to examine the specific occupation of truck drivers, has proven to be of particular value because of the various factors affecting driving safety which can be assessed using a profession where driving constitutes a primary job activity. For example, researchers have used data from truck drivers to examine the effects of hours of work on fatigue (Arnold et al. 1997), as well differences due to varying ranges of operation between short and long-haul drivers (Hanowski, et al. 1998; Hanowski et al., 2003). However, the methods of these previous studies on truck drivers have been confined to surveys, focus groups, and on-board instrumentation, and not conducted on a large population of truck drivers as a whole.

This study extends the literature on occupational vehicular accidents by analyzing all workers' compensation injury claims due to vehicular accidents filed by truck drivers in Oregon during the years 1990 through 1997. The use of such data has several advantages. First, important demographic data which has been of significant interest to researchers of vehicular accidents, such as age (Jonah, 1986; Massie et al., 1994; Zhang et al., 1998; Claret et al., 2003) and gender (Massie et al., 1994; Li et al., 1998) can be analyzed. Second, additional information that has been of interest such as time of accident (Lenne et al., 1997), day of week of accident (Doherty et al., 1998) and event causing

accident are recorded and can be examined. Third, other relevant facts, such as nature of injury, part of body injured, disability time and medical costs associated with the accidents can be assessed. Additionally, this study combined the Oregon administrative claim information with Oregon truck driver employment data derived from the U.S. Department of Census' Current Population Surveys as a means of estimating truck driver injury rates and assessing the risks associated with potentially influential accident factors.

Truck Driver Accidents

Methods

This study used workers' compensation claim data that were provided by the Oregon Department of Consumer and Business Information and Management Division for the period 1990 – 1997. Records were kept for all claims that were disabling or potentially disabling (i.e. those that involved either potential or actual lost work time), although the records were available for some claims that did not actually result in disability. For this study only accepted vehicular accident claims from individuals working as a truck driver (1990 U.S. Census Occupation Code 804) were analyzed.

The data set included information on claimant occupation and industry, claimant demographics (e.g. age, gender), claimant work schedules, nature of reported injury, body part affected, compensated days of lost work by claimant and claimant cost. Claim costs were tracked through 1999 and the cost data reflect accumulated claim costs through this time. By the end of the observation period 95.0% of all accepted injury claims of truck drivers due to vehicular accidents were closed and for these claims the cost data was complete.

Data from the U.S. Bureau of the Census' Current Population Survey (CPS) was used to estimate Oregon employment levels for different demographic categories and time periods. The CPS is a monthly survey of approximately 50,000 households that is used by the United States government to assess, among other things, monthly unemployment rates. The CPS is a rotating survey with households first surveyed for four months, not surveyed for the next eight months, and then surveyed for an additional four months before permanently leaving the survey. Most of our employment estimates are based on the monthly outgoing rotation group (CPS-MORG) files for 1990 through

1997. These files contain data for all individuals participating in their fourth or eighth monthly survey. For individuals in CPS-MORG, additional questions pertaining an individual's employment are asked. We further restricted this sample to those individuals who reported residing in Oregon and employed as a truck driver at the time of the interview.

The injury rate due to a vehicular accident for a particular category of truck driver was calculated by dividing the reported number of injuries from vehicular accident by the number of employed trucker drivers in this particular category. Data for the numerator was obtained from the Oregon workers' compensation administrative data while the denominator is estimated using CPS sample data for Oregon truckers. The vehicular accident injury rates were converted to injuries per 10,000 trucker drivers by multiplying the rate by 10,000. Since estimates were employed in calculating injury rates, 95% confidence interval estimates are presented.

In some cases injury rates are reported in relation to a baseline employment category. The relative rates are computed by forming the ratio of the injury rate of the particular employment category and the injury rate of the baseline employment category. A ratio greater than one indicates that the particular employment category has a higher injury rate than the baseline category. Since both the numerator and denominator of this ratio are based on estimates 95% confidence intervals were calculated using the delta method. In no case, for the relative rate estimates reported below, was the lower confidence interval bound found to be less than one. All calculations reported in this paper were made using Stata (release 7) software (Stata Corp., College Station TX).

To estimate the fraction of Oregon truck drivers that work at particular times of day and days of week, data from the May 1991 and May 1997 CPS Work Schedule Supplement Surveys (CPS-WSS). These surveys contain supplemental questions pertaining to an individuals work schedule in addition to the usual monthly survey questions. Only individuals in these work schedule supplements who reported working as a truck drivers were included in the analysis. Since only 32 of the 2084 of these truck drivers reported residing in Oregon, in order to increase the precision of our estimates, we used the entire sample of truck drivers when estimating shift work, time of day, and day of week employment fractions. Such estimates are valid when the characteristics of Oregon trucker drivers and US truck drivers do not differ. We found no statistically significant differences in the age, gender and industry of employment distributions between Oregon truck drivers and truck drivers residing in other states.

Results

Between 1990-1997, there were 1,210 claims filed by truck drivers in Oregon in which some form of vehicular accident was cited as cause of injury. Of these claims, 1,168 (96.5%) were accepted as valid and compensable through the workers' compensation process. The average annual accepted number of claim was 146, which ranged from a low of 122 claims in 1992 to a high of 157 in 1994. Applying the CPS to obtain baselines for the number of truck drivers in Oregon by year, it was estimated that the average rate of vehicular accidents experienced by these workers was 50.3 per 10,000 annually (95% CI = 45.1 - 55.5). The number of accidents by year for Oregon truck drivers, as well as estimates of the yearly accident rates and corresponding confidence intervals are provided in Table 1.

Of the accepted claims, 943 (80.7%) were filed by men, and 225 (19.3%) were filed by women. Using data from the CPS-MORG, the estimated percentage of Oregon truck drivers that were female over the same time period was 5.1%. The majority of claimants were under 35 years of age with 228 (19.5%) 25 years and under and 372 (31.9%) between 26 and 35. For the remaining claimants, 304 (26.0%) were aged between 36 and 45 years, 174 (14.9%) were between 46 and 55 years, 90 (7.7%) were older than 55 years. The CPS-MORG data estimates that, over the same time period, 8.5% of Oregon truck drivers were less than 25 years of age, 28.5 % were between ages 26 and 35, 28.5 % were between ages 26 and 35, 32.8% were between ages 36 and 45, 19.1% were between ages 46 and 55, and 8.9% were older than 55. Of all truck drivers involved in accidents resulting in injury, the majority 596 (51.0%) had 1 year or less of job tenure. Of the remaining claimants, 322 (27.6%) had over 1 year to 5 years of tenure, 83 (7.1%) had over 5 years to ten years of tenure, 28 (2.4%) had over 10 years to 15 years tenure, 22 (1.9%) had over 15 to 20 years of tenure, 15 (1.3%) had over 20 years of tenure, and for 102 (8.7%) of the claims no information on tenure was recorded. The CPS-MORG contains no data on job tenure so comparisons with all Oregon truck drivers over the same time period was not possible.

The time in which accidents occurred was recorded in the Oregon data, and analyzed in this study. For 76 (6.5%) claims, however, time of accident data was missing. Among claims with valid time of injury data, 474 (43.4%) injuries due to vehicular accidents occurred during the morning hours (6 a.m. -12 p.m.), 419 (38.4%) during the afternoon (12 p.m. -6 p.m.), 100 (9.2%) during the evening (6 p.m. -12 p.m.) and 99 (9.1%) at night (12 a.m. -6 a.m.). Estimates from the CPS-WSS show that 49.8% of total truck driver work hours occur in the morning, 35.3% in the afternoon, 6.8% in the evening and 8.1% at night. The Oregon data also contained information on how many hours were worked by the employee at the time the accident occurred, with most accidents occurring during the third hour worked. Even using the CPS WSS to adjust for the daily number of hours worked by truck divers in Oregon, the third hour of work still demonstrated the highest rate of accidents. A breakdown of accidents by hours worked is provided in Figure 1.

It was also found that the fewest number of injuries due to vehicular accidents occurred on the weekends with 65 (5.6%) reported on Saturdays and 25 (2.1%) on Sundays. In contrast, the average number of injuries due to vehicular accidents occurring on a given weekday was about 216 (18.5%) per day. However, adjusting for the fact that less truck drivers work on weekends using data from the

CPS-WSS, the estimated odds ratio of a Saturday and Sunday injuries compared to Tuesday was 1.024 (95% CI 1.018-1.030) and 0.987 (95% CI 1.022-1.026), respectively.

The injuries suffered by Oregon truck drivers from vehicular accidents were examined by severity as measured by the number of lost work days compensable by temporary total disability (TTD) benefits. On average, truck drivers lost 57.8 days of work for injuries due to vehicular accidents, with male claimants losing and average of 60.5 days and female claimants losing an average of 46.9 days. The amount of days of lost work increased with age. Those under 25 years of age lost an average of 41.9 days. The amount of lost days increased to an average of 87.0 for those over the age of 65. The upward trend of lost days with age is illustrated in Figure 2.

Claims in which the nature of injury was reported to be a fracture had greatest amount of lost work days among all nature of injury categories with 124.7 days, while claims which reported the nature of injury as a bruise had the shortest with 32.4 days. Injuries in which the affected part of body was the pelvic area were had the most lost work days among all categories of body part injured with 173.0 days, while those reporting abdomen injuries had the least lost work days with 5.3 days; however, it should be noted that the number of claims citing each of these body parts were 5 and 3 respectively. For those categories of body part injured with 100 or more reported claims, back injuries lost an average of 58.5 days of work, neck injuries lost an average of 43.9 days of work, and injuries affecting multiple body parts lost an average of 68.3 days of work.

Claim costs, which can also be viewed as a measure of accident severity, were analyzed from the workers' compensation data. The total workers' compensation costs associated with all claims of

occupational vehicle accidents over the 1990-1997 period was \$11,642,635, with the average total cost of a claim being \$9,966. Of this amount, an average of \$3,041 was for TTD indemnification payments, \$4,677 for medical expenses, \$1,962 for permanent partial disability (PPD) payments, and \$285.18 for vocational rehabilitation costs. The cost of claims for males was greater than for those by females, with males averaging \$10,821 per claim and females averaging \$6,383 per claim. Claim costs were also found to depend on the time of the accident. Total claim costs averaged \$12,578 for injuries due to a nighttime truck accident averaged, \$10,970 for injuries due to a morning accident averaged, \$8,898 for injuries due to afternoon accidents and \$4,244 for injuries due to evening accidents. Injuries from accidents occurring on Fridays were associated with the highest average total claim costs (\$14,105) followed by Tuesday(\$11,554), Wednesday (\$11,034), Saturday (\$8,791), Monday(\$7,567), Sunday (\$6,804), and Thursday(\$5,852).

Of all injury types reported from vehicular accidents, sprains were the most common and constituted 628 (53.8%) of all claims. Multiple trauma was the next most frequently cited injury type comprising 144 (12.3%) of the claims, followed by bruises with 94(8.1%) claims, fractures with 91 (7.8%) claims, non-classified traumatic injuries with 56 (4.8%), cuts and lacerations with 27 (2.3%) claims, sprain and bruises with 24 (2.1%) claims, and dislocations with 19 (1.6%) claims. In the case of 85 (9.2%) claims, the type of injury was unknown or unspecified. The claim rates by injury type per 10,000 workers is provided in Table 2, while the average number of lost work days and total claim costs by injury type is shown in Table 3.

The accidents experienced by truck drivers were further analyzed by the event which lead to the injury. The most frequently cited cause of accident was "moving and standing vehicle" with 257 (22.0%) claims, followed by "jackknifed or overturned" with 173 (14.8%) claims, and moving in intersection with 159 (13.6%) claims. Unspecified or non-classified "highway accidents" and "transportation accidents" accounted for 99 (8.5%) claims, and the equivalent number of claims were made for accidents in which "moving in the same direction" was reported. For 78 (6.7%) of the claims "ran off the highway with no collision" was listed as cause of accident, for 67 (5.7%) claims "collision between vehicles" was noted, while "moving in opposite directions" was attributed to 65 (5.6%) claims. Of the remaining claims, 64 (5.5%) were for "non-collision accidents," 47 (4.0%) were for "sudden stops and starts," 29 (2.5%) were for "overturned," 13 (1.1%) were for "struck stationary object," 5 (0.4%) were for "loss of control," 4 (0.3%) were for "re-entrant collision" and "struck by shifting load," 2 (0.2%) for "non-highway accident," and 1 (0.1%) was for "fell and struck by vehicle."

Over the 1990-1997 period 19 (1.6%) of the reported truck driver accidents resulted in fatalities with only one fatality being female. For 17 of the fatalities, 12 occurred during the morning hours (6 a.m. – 12 p.m.). The time of accident was not listed for two fatalities. Most fatalities were associated with accidents that didn't involve another vehicle, with 5 fatalities occurring because the truck overturned or jackknifed, 5 occurring because the truck ran off the road, and 1 occurring because the truck struck a stationary object.

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Discussion:

Overall, there were 1,168 accepted claims filed by truck drivers in Oregon for the 8-year period examined, averaging 146 claims annually, and representing an estimated rate of 50.3 accidents per 10,000 truck drivers per year. In general, the rate was relatively stable over time, especially when comparing the ranges of the 95% confidence intervals. The majority of claimants were male, and the total cost of all medical and indemnity expenses was \$11,642,635, in which the average claim amount was about \$9,966. On average, workers received 57.8 days of TTD indemnity payments due to lost work per accident, and there were 19 fatalities recorded for truck drivers in work-related accidents.

One finding of this study was that truckers' injuries due to vehicular accidents occurred disproportionately among young workers, which is consistent with prior studies that reported higher accident risks associated with young drivers (Massie et al. 1994, Li et al., 1998). Female trucker drivers were also disproportionately injured from vehicular accidents although some of this is accounted for by the fact that, on average, female truck drivers are younger. It is also important to note that the amount of lost work days and total claim costs associated with injuries due to vehicular accidents were markedly higher for male truck drivers than female truck drivers. Thus, while female truck drivers appear more likely to be injured by a vehicular accident than males, when injured the severity is greater for males than females. This latter result is inconsistent with previous evidence that females are more likely to experience more severe injuries from accidents than males (Abdel-Aty and Abdelwahab, 2001; Evans and Gerrish, 2001). This disagreement with past research may be partially explainable because of possible differences in truck types driven by the two genders in the course of their occupational duties as well as accident type experienced by these drivers, all of which have been

found to affect the difference in severity of accidents between males and females (Ulfarsson and Mannering, 2003). Unfortunately, the data did not contain information by which to control for these factors. It was also found that younger workers involved in accidents took less time to recover from their injuries and return to work than older workers, which is consistent with other studies that have found higher mortality rates among older drivers involved in accidents attributable to age-related increases in fragility (Li, Braver, Chen, 2003).

Injury rates due to vehicular accidents were lowest during the morning hours, and the least severe injuries (as measured by claim costs) occurred during the evening. The number of accidents were substantially less frequent on the weekends, however adjusting for the number of truck drivers working on the weekends produced odds ratios which showed only a minor difference in risk for those working on Saturday and Sunday relative to a given weekday (Tuesday). Although injury rates for truck drivers due to vehicular accidents did not vary substantially by day of week, injuries occurring on Friday were the most severe.

It was also found that sprains were the most frequently experienced injury type experienced by truck drivers from occupational vehicular accidents, followed by multiple trauma, bruises, and fractures. Fractures were the most severe of all non-fatal injuries, requiring almost 8 weeks of indemnity per claim. Although infrequent, injuries to the pelvic region required the longest indemnity time for all body parts affected averaging over 24 weeks per claim. Fatalities constituted 1.6% of all accident claims, and most were not the result of collision with another vehicle.

One limitation of this study is that workers' compensation data do not indicate whether the truck drivers involved in the accidents were at fault in the accident, or detail extra-mitigating circumstances affecting the accidents (e.g., drug or alcohol use), and therefore while it is possible that the disproportionate injury rates due vehicular accidents observed among young truck drivers may be due to lack of experience, other confounding factors that cannot be discerned from the data may be responsible for this observed relationship. Another limitation is that workers' compensation data does contain information on costs associated with vehicular damage, property damage, or injuries associated with non-employed passengers or other persons or vehicles involved in the accidents. To this extent, the amounts reported in this study are only those which apply to the disability, medical, rehabilitation costs associated with the injuries sustained by the truck drivers involved in the recorded accidents, and hence represents an underestimate of the complete costs associated with the incidents. Last, because some truck driver accidents may not have resulted in an injury or a loss of work time, it is likely that minor accidents went unreported in the workers' compensation data, and hence the total number of claims reported in this study is likely lower than the actual incidence of accidents experienced by truck drivers for the time examined.

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Table 1: Claim Rates by Year

Year	Number of Claims	Estimated <u>Claim Rate per 10,000</u>	<u>95% CI</u>	
1990	146	82.5	48.0 - 117.0	
1991	141	40.1	31.5 - 48.7	
1992	122	41.5	30.1 - 52.9	
1993	153	54.0	40.5 - 67.5	
1994	157	54.7	38.8 - 70.6	
1995	141	61.1	36.2 - 86.0	
1996	156	56.9	37.1 - 76.7	
1997	142	36.4	28.4 - 44.4	

Table 2:

Claim Rates by Nature of Injury

Injury Type	Number of Claims	Estimated Rate per 10,000	<u>95% C.I.</u>	
Sprains	628	27.1	24.4 - 29.8	
Multiple Trauma	144	6.2	5.6 - 6.8	
Bruise	94	4.1	3.7 – 4.5	
Fractures	91	3.9	3.1 - 4.7	
Unknown	85	3.7	3.3 – 4.1	
Traumatic Injuries NI	EC 56	2.4	2.1 - 2.7	
Cuts & Lacerations	27	1.2	1.1 – 1.3	
Sprain & Bruise	24	1.0	0.9 – 1.1	
Dislocations	19	0.8	0.7 - 0.9	

Table 3:

Cost and Disability Duration by Nature of Injury

Nature of Injury	No. Claims	TTD Days	TTD	Medical	<u>PPD</u>	Voc. Rehab	Total Cost
Sprains	628	43.8	\$2,041.90	\$2,898.29	\$1,206.37	\$99.28	\$6,245.85
Multiple Trauma	144	95.1	\$5,531.50	\$6,845.45	\$2,530.30	\$405.30	\$15,321.50
Bruises	94	32.4	\$1,357.97	\$1,723.43	\$695.50	\$227.30	\$4,004.19
Fractures	91	124.7	\$6,988.30	\$14,290.33	\$6,322.79	\$1,636.11	\$29,237.53
Other/Unknown	85	53.5	\$3,176.86	\$5,983.59	\$2,920.54	\$140.81	\$12,221.71
Traumatic Inj. Uns	. 56	59.7	\$3,194.00	\$5,728.28	\$2,787.79	\$15.14	\$11,728.25
Cuts & Laceration	s 27	43.7	\$2,804.56	\$4,649.30	\$2,166.11	\$0.00	\$9,619.96
Sprains & Bruises	24	52.7	\$2,985.92	\$4,892.67	\$796.58	\$0.00	\$8,675.17
Dislocations	19	93.8	\$5,976.58	\$6,361.53	\$2,498.21	\$1,533.95	\$16,370.26

Figure 1

Truck Driver Injuries per Number of Hours Worked



Number of Hours Worked

Figure 2

TTD Indemnity Duration by Claimant Age



Claimant Age (Years)