Title:

Estimating the Cost of Work Motor Vehicle Incidents in Australia

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To determine the costs of motor vehicle crashes companies have previously relied upon roughly estimated cost multipliers. Establishing the insurance cost of fleet crashes and obtaining more precise cost multipliers will assist fleet policy planning and provide a framework for cost-benefit analysis of safety measures. This project was designed specifically with this aim and was unique in that it co-ordinated a collaborative research process across insurance agencies that typically restrict access to their data. The data represented all vehicle incidents that occurred between 1999 and 2003 where a property damage claim was filed in relation to the researched fleet. During this period, 10,170 property damage claims were filed. Property damage claims were matched with workers compensation and third party claims. It was found that the average total insurance cost of the 43 matched incidents including property damage, workers compensation and third party costs was $28,122. Cost multiplier values that could be applied to property damage costs to estimate total insurance costs were calculated. The cost multiplier range was found to be between 4.1 and 14.5. Therefore, even at the minimal level an incident costs a further 300 percent in excess of property damage costs. The findings from this report provide current Australian benchmarking data that could be useful to government and industry.

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Jeremy Davey & Tamara Banks

Interest in fleet and work related road safety has grown in recent years. Previously to determine the costs of motor vehicle crashes companies have relied upon roughly estimated cost multipliers. To assist in policy planning and to provide a framework for cost-benefit analysis of safety measures a current need exists for establishing the cost of fleet crashes and obtaining more precise cost multipliers. Historically costs associated with work related vehicle crashes have more often than not been calculated in terms of vehicle damage or write off costs. Murray (2002) suggests that the direct cost of crashes in terms of repairs is only the tip of the iceberg.

Work-related road trauma has significant costs to the Australian society. It has been estimated that the average property damage cost to passenger and light commercial vehicles of minor crashes is approximately $2,000 (Wheatley, 1997). In addition to these asset costs, substantial costs are incurred as a result of human injury. For example during 1999-2000, the average workers compensation claim involving vehicle crashes was $21,887. It is important to note that this cost was considerably higher than the average workers compensation claim which was $12,055 (National Safety Council, 2002). It has also been observed that vehicle classes that are often associated with commercial vehicles or involved in work-related driving typically have a greater frequency of compulsory third party (CTP) claims than the class often associated with private vehicles. For example Class 3 vehicles (taxis) had a rate of claims 16 times higher than Class 1 vehicles (cars and station wagons) (Anderson, 2002). These findings from Australian research are consistent with American research which suggests that work related motor vehicle injuries represent substantial costs to society. It is reported that American work related injuries represent approximately 20 percent of total injuries and account for 38 percent of total injury medical care costs (Miller, Cohen & Rossman, 1993). Although motor vehicle injuries represent only three percent of all American work related injuries, due to their often serious nature, they account for one sixth of work related injury costs (Miller & Galbraith, 1995).

Although the Australian research discussed above has contributed to our understanding of the costs of work-related crashes, the information provided is limited by a narrow focus on isolated components of the crash cost. As different agencies are responsible for administrating different aspects of crash costs, restricted access has prevented data matching allowing only vague work incident cost estimates to be calculated. Comprehensive costs have been estimated in relation to the cost of road crashes in Australia. It has been estimated that the average cost per crash in 1996 was $24,000. The average cost of a crash increased depending upon the severity of injuries incurred. It was estimated that the average property damage only cost was $6,000 as compared to the average for a minor injury crash $14,000, serious injury crash $408,000 and fatal crash $1.7 million (Bureau of Transport Economics, 2000). This research offers a guide to the costs of incidents in Australia, however further research is needed to estimate Australian work-related costs.

This project provides current costs of a sample of Australian fleet crashes. In the past companies have relied upon a cost multiplier which has been at best a guess. For example, it has been suggested that the hidden costs of a crash may be between 8-36 times the property damage costs (Murray, Newnam, Watson, Davey, & Schonfeld, 2003). To determine the costs of motor vehicle crashes a comprehensive approach is needed where data is matched across workers compensation claims, CTP accident data and property damage claims. By adopting this approach, this project will establish a comprehensive insurance cost of crashes. These cost estimates could provide a framework for cost-benefit analyses of safety measures.

METHOD

This project was designed specifically to meet this need and was unique in that it co-ordinated a collaborative research process across government agencies that typically have restricted access to their data. De-identified data sets containing vehicle/property damage claims, workers compensation claims and CTP claims were matched. As Gross costs were not available, Net costs across each of the insurance domains were used for calculations.

In this paper incidents refer to any event that involved damage to a fleet vehicle or another vehicle, damage to any property or injury to any person. Using this definition, non-road crash related incidents including theft and storm damage were included. The word incident is used rather than accident to indicate that each event results from a cause or combination of causes such as fatigue or error of judgement rather than being purely a chance occurrence. The term fleet vehicle refers to any vehicles owned by the researched fleet and included vehicles used for work purposes and also salary sacrificed vehicles leased by employees.

The data represented all motor vehicle crashes that occurred in a large Australian fleet (over 5,000 vehicles) from July 1999 through to July 2003 where a property damage claim was filed in relation to the researched fleet. The researched fleet comprised an assortment of models used for a range of purposes in both urban and rural environments. The product mix of the fleet was 62% passenger vehicles used primarily for administrative purposes, 37% light commercial vehicles used primarily to enable trade employees to deliver goods and perform services at work sites and 1% heavy vehicles used to perform specific duties in specific environments. During this period, 10,170 vehicle/property damage claims were filed. Data was matched across the three databases using common data fields including the incident date, time and location.

The recorded total property damage costs included either estimates for the researched fleet's vehicle and the third party's vehicle in incidents where the researched fleet's driver was 'at fault', or the final costs for these if the vehicle/property have been repaired. The total property damage cost is net of the excess if payable and also includes proceeds of salvage and where applicable, any recoveries from third parties 'at fault'. It is important to note that this value may be affected by knock for knock arrangements between insurers, where each insurer bears its own costs. This can mean that a no fault claim in relation to the researched fleet could still show costs where a full recovery from the third party 'at fault' would be expected. Similarly, as a result of this arrangement, an 'at fault' claim may only include its own damage. These arrangements are rare nowadays and will have little impact on the calculation of the total net incident cost across all crashes as the industry considers that these arrangements should even out between each insurer over time.

The total workers compensation payments comprised costs where applicable in regards to: compensation payments (death, lump sums for pain and suffering and/or permanent injury, weekly payments for partial or total incapacity), services/goods payments (ambulance services, accommodation expenses, attendance by a nurse, medical treatment, hospital treatment, rehabilitation services, physiotherapy services, chiropractic services, damaged artificial limbs, clothing) and non-compensation payments (transport and maintenance, damages and common law, investigation expenses, interpreter services, legal cost, funeral expenses). It is important to note that while all workers involved in an incident may have been entitled to claim workers compensation payments, only workers compensation data pertaining to employees for the researched fleet was available. Therefore this study was not able to capture any workers compensation costs potentially incurred by other employers.

The CTP data was supplied at an accident level. Total CTP costs comprised economic loss, general damages, investigation, legal, treatment rehabilitation and associated costs in

relation to personal injuries incurred in an incident. The reviewed CTP scheme appears to be similar to the accident compensation scheme administered by the Accident Compensation Corporation in New Zealand which provides personal injury cover for all New Zealand residents, citizens and temporary visitors to New Zealand. The reviewed CTP scheme provides motor vehicle owners with insurance that covers their unlimited liability for personal injury resulting from the use of the insured motor vehicle anywhere in Australia. For the injured third party it provides a right to seek monetary compensation from the person 'at fault' for personal injury and other related losses. The scheme is based on attributing fault and therefore requires the injured party to establish negligence against an owner or driver of a motor vehicle. As proof of liability is required, situations can arise where a driver who is wholly at fault in an accident cannot obtain compensation because there is no negligent party against whom a claim can be made.

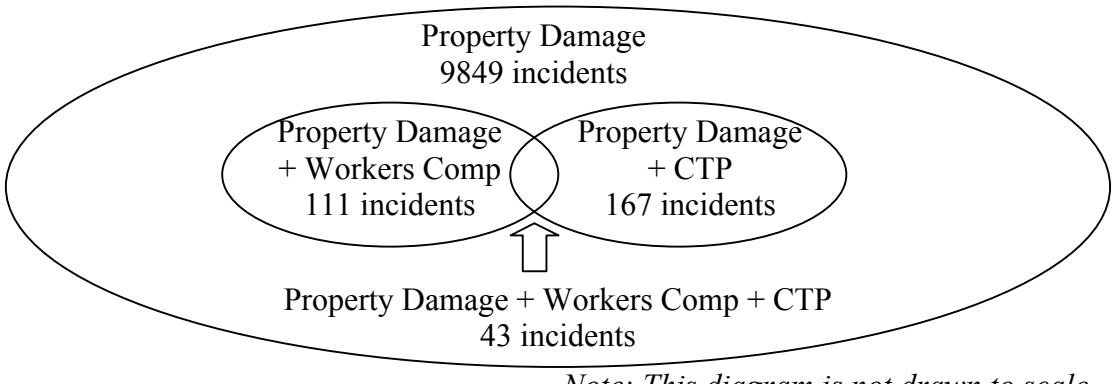
To account for the likelihood of counting the same costs twice, total work cover payments within CTP costs were identified and compared with workers compensation total payments for each incident. Two incidents had a CTP total work cover payment that was within $100 of the respective workers compensation total payment. After discussions with insurance experts, it was thought that for these incidents where the two values were within a $100 range of each other, the values may possibly represent the same payment. It is recognised that this will not always be the case as some of the work cover payments in the CTP data will relate to other parties in the accident who are not employees of the researched fleet. However a conservative approach was adopted in this study and therefore to adjust for this potential duplicate recording, the lower work cover payment cost was not included in the calculations of the total cost for these two incidents.

RESULTS AND DISCUSSION

Property Damage verses Property Damage plus Injury Frequency

Of the 10,170 property damage claims that were filed, 321 property damage incidents were able to be matched with at least one other data set (workers compensation or CTP). This equates to approximately three percent of all property damage incidents. The matched data is represented by the smaller circles in Figure 1. Workers compensation claim data was able to be matched with 154 of the property damage incidents and CTP data was able to be matched with 210 of the property damage incidents. Forty-three incidents were able to be matched across all three data sets. In Figure 1 these incidents are reflected by the overlap area between the two smaller circles.

Figure 1: Venn diagram of the complete data set representing how the data is matched.



Note: This diagram is not drawn to scale.

Viewed within the context of data from the State in which the researched fleet predominantly operates vehicles, this ratio of property damage claims versus property damage plus injury data is surprising. The most recent annual data available for the State pertains to the year ending 31st December 2002. During this period 22,081 incidents were reported in the State. This comprised 8,447 property damage only incidents and 13,634 incidents with injuries. This distribution has remained relatively stable over the past five years with the highest ratio for property damage only incidents (44 percent) occurring in 1999 (reference with held to protect the identity of the researched fleet). Alternatively the researched fleet's incidents resulted in 9,849 property damage only crashes and 321 crashes with injuries (observed through CTP and/or workers compensation data).

When comparing the ratios in this study to the State statistics it is critical to note that different qualifying levels were set for recording property damage data by the researched fleet and the State. State statistics were derived from archived records of reported crashes where the incident was reported to Police and the damage was greater than $2,500 to vehicle/property or at least one vehicle was towed away. This qualifying level may result in many incidents with minor property damage going unreported. Alternatively, the property damage statistics in this report were derived from records archived by the researched fleet pertaining to all property damage claims filed with vehicle/property damages of $500 or higher. The different definitions of property damage limit comparisons. To remedy this, an analysis of the researched fleet's incidents with property damage costs of $2,500 or greater was conducted. Table 1 presents the percentages for incidents with property damage costs of $2,500 or greater, involving the researched fleet's vehicles from 1999 through to 2003 and for all incidents occurring in the State from 1999 through to 2002. As can be seen in the table, the percentage of crashes resulting in injury claims involving the researched fleet's vehicles is very low as compared to all State crashes.

Table 1: Property Damage Claims verses Property Damage plus Casualty Claims for the researched fleet's vehicles as compared to all State incidents.

Incidents involving the researched fleet's vehicles from 1999 through to 2003		Incidents occurring in the State from 1999 through to 2002	
Property Damage Claims only	Property damage plus injury claims	Property Damage Claims only	Property damage plus injury claims
1 250 incidents (89%)	159 incidents (11%)	33 417 incidents (39.9%)	83 571 incidents (59.1%)

Considering the percentage of crashes resulting in injuries was very low in comparison to state statistics a precautionary check was conducted. The crash severity was gauged by reviewing the property damage costs. As 663 of the researched fleet's property damage claims exceeded $5,000 and within this sample, 325 claims exceeded $10,000, it is suggested that the number of people who experienced an injury or loss as a result of being involved in one of the crashes recorded by the researched fleet could exceed 321.

Property Damage verses Property Damage plus Injury Costs

Four measures were used in this study to determine crash costs. These comprised average Net Property Damage Costs, average CTP Net Total Accident Costs and average Workers Compensation Total Payments. The final measure, average Total Insurance Cost, was computed via the following formula: Total Insurance Cost = Net Property Damage Costs + CTP Net Total Accident Costs + Workers Compensation Total Payments. Considering the small percentage of incidents with reported property damage plus injury costs, averages were calculated separately for all property damage incidents and property damage plus injury

incidents. A frequency analysis was performed on each of the cost measures. Descriptive statistics including the minimum, maximum and average cost, standard deviations and the number of incidents are presented below in Tables 2 and 3.

Table 2: Means and Ranges for each of the Cost Dimensions for all Incidents

	Property Damage	CTP	Workers Comp.	Total Insurance
Min Cost	-$3,343	$0	$0	-$3,343
Max Cost	$92,643	$1,039,814	$47,764	$1,059,157
Mean Cost	$1,579	$628	$45	$2,281
SD	3,802	13,223	1,065	14,502
N	10,170	10,170	10,170	10,170

Table 3: Means and Ranges for each of the Cost Dimensions for Property Damage plus Injury Incidents

	Property Damage	CTP	Workers Comp.	Total Insurance
Min. Cost	-$2,518	$0	$0	-$1,745
Max. Cost	$92,643	$1,039,814	$47,764	$1,059,157
Mean Cost	$6,841	$30,404	$2,924	$28,122
SD	10,799	87,258	8,180	73,039
N	321	210	154	321

Looking at Table 2 it can be observed that the Property Damage cost averaged across all reported incidents was $1,579. Considering the low frequency of matched CTP and workers compensation data, the estimated Total Insurance cost averaged across all reported incidents was only marginally higher ($2,281) than the Property Damage cost. However, it is important to note that the Property Damage costs were derived from the original data set from which all other data sets were matched. Consequently all Property Damage costs were included, however due to a perceived lack of matches it is suspected that some data in relation to injury costs may have been excluded from this study. Consequently it is believed that the figure in Table 2 represents a substantial underestimate of the average Total Insurance costs. It is believed that the average Total Insurance figure presented in Table 3 represents a more accurate estimate as it was calculated based only on incidents where property damage data could be matched with CTP and/or workers compensation data. The average property damage estimate ($6,841) and Total Insurance estimate ($28,122) provided in Table 3 also appear to be more congruent with previous estimates of Australian incident costs including average property damage only ($6,000) and total cost ($24,000) (Bureau of Transport Economics, 2000).

While it could be argued that Table 3 potentially reflects a slight overestimate in costs due to limiting the sample of incidents to property damage plus injury incidents only, it is important to note that approximately 75 percent of incidents within this sample reported Total Insurance Costs below the mean cost of $28,122. More specifically approximately 20 percent of the 321 cases reported property damage costs of $0. Furthermore 10 percent of the 210 CTP cases reported costs of $0 and 10 percent of the 154 Workers Compensation cases reported costs of $0. Based on these figures, it can be concluded that the majority of work-related incidents have low incident costs, however a small percentage of incidents have large costs which appear to dramatically inflate average incident costs.

It is recognised that the use of Net costs in these calculations may provide an under estimate of the actual cost incurred. For example, the inclusion of recoverable costs in the cost calculations may account for the cluster of incidents reporting very low costs including $0. In

some instances the recoverable costs may have exceeded the actual costs resulting in a profit which has been represented in this study by a negative cost.

Cost Multiplier Calculations

Crash costs and cost multiplier values were obtained using three different calculations. The first calculation was conducted to determine a lower range. The second calculation was conducted to determine an upper range and the third calculation was conducted to determine what could potentially be considered the most probable cost.

Lower Range Cost Multiplier Calculations

To estimate the lower range cost of a motor vehicle incident the crash costs for Property Damage, CTP, Workers Compensation and Total Insurance Incident costs were calculated. The costs were averaged across the complete data set which included 10,170 crash incidents. This resulted in very low cost averages for CTP and Workers Compensation due to the fact that data from only 210 accidents and 154 incidents respectively contributed to the total insurance costs for these measures that were then averaged over the entire 10,170 incidents. These calculations yielded the following results: Average Net Property Damage Cost - $1,579, Average CTP Net Total Accident Cost - $628, Average Workers Compensation Total Payment - $45, Average Total Insurance Cost - $2,281

These results suggest that property damage costs typically account for 70 percent of the total insurance incident costs. Based on these averages a cost multiplier value was calculated that could be applied to property damage costs to estimate total insurance costs. To provide a very conservative estimate of the cost multiplier, the average total insurance cost of a motor vehicle incident across all 10,170 incidents with reported property damage ($2,281) was divided by the average Net Property Damage Cost across all 10,170 incidents ($1,579). This resulted in a cost multiplier value of 1.4.

It is believed that the above results represent a substantial underestimate of the actual costs due to a perceived lack of matches between the insurance data sets. As previously discussed, past research has suggested that the hidden costs may be somewhere between 8-36 times the property damage costs. Additionally an organisation with one of the Nation's largest fleets (name withheld), on occasions utilises a benchmark cost multiplier of four. These comparisons with previous research and organisational benchmarks may further support the belief that this calculation is a substantial underestimate.

Upper Range Cost Multiplier Calculations

In light of this limitation a second analysis was conducted to estimate the upper range cost of a motor vehicle incident. In this analysis, the cost measures were reviewed independently and only incidents that had data available for the measure being reviewed were analysed. This resulted in higher cost averages for CTP and Workers Compensation due to the fact that the cost was averaged by the number of accidents/incidents that contributed to the total insurance cost for that measure. To calculate the average Total Insurance Cost, all costs associated with incidents that could be matched across data sets were analysed. Three hundred and twenty-one incidents could be matched on more than one cost measure. The upper range cost multiplier calculations yielded the following results: Average Net Property Damage Cost - $1,579 (10,170 incidents), Average CTP Net Total Accident Cost - $30,404 (210 accidents), Average Workers Compensation Total Payment - $2,924 (154 incidents), Average Total Insurance Cost - $22,872 (321 incidents).

These results suggest an alternate costing pattern. When calculating the averages across all incidents with available data for the respective measure, property damage costs typically accounted for only five percent of the total insurance incident costs. Based on these

averages a cost multiplier value was calculated that could be applied to property damage costs to estimate total insurance costs. The average total insurance cost of a motor vehicle incident across the 321 incidents with matched data ($22,872) was divided by the Net Property Damage Cost across 10,170 incidents ($1,579). This resulted in a cost multiplier value of 14.5.

Probable Cost Multiplier Calculations

The previous calculations provide a lower and upper range of the total insurance cost multiplier. To gain what could be considered the most probable estimate, a further analysis was conducted. Similar to the upper range calculation, this analysis only included incidents that had data available for the measure being reviewed. However in contrast to the upper range calculation, in this analysis the average Net Property Damage cost was calculated based only on incidents where property damage data could be matched with CTP and/or Workers Compensation data. This resulted in the Net Property Damage Cost being averaged across 321 incidents rather than 10,170 incidents. The following results were obtained: Average Net Property Damage Cost - $6,841 (321 incidents), Average CTP Net Total Accident Cost - $30,404 - (210 accidents), Average Workers Compensation Total Payment $2,924 - (154 incidents), Average Total Insurance Cost - $28,122 (321 incidents).

Using these averages a cost multiplier value was calculated that could be applied to property damage costs to estimate total insurance costs. The average total insurance cost of a motor vehicle incident across the 321 incidents with matched data ($28,122) was divided by the Net Property Damage Cost across these same 321 incidents ($6,841). This resulted in a cost multiplier value of 4.1. This value is consistent with the benchmark multiplier used by another large fleet organisation.

Based on these calculations, two conclusions can be drawn. Firstly, CTP costs typically accounted for a substantial proportion of total insurance incident costs. Secondly, for incidents where a CTP claim was filed, CTP costs were more than four times greater than property damage costs. When reviewing these results, it is important to note that this sample is not entirely representative of the complete data set. Although the range of costs across all measures in this sample did represent the ranges in the complete data set, the average property damage costs were higher for incidents in the sample as compared to the complete data set. These findings make intuitive sense in that although personal injury/loss was reported for several incidents with property damage costs of $0, reports of personal injury/loss were more often associated with incidents that had higher property damage costs.

CONCLUSIONS

As research in the area of fleet safety is in its infancy, strategic and targeted exploration of fleet related issues is currently needed to assist organisations in managing their fleets in an informed manner. This study estimated the cost of motor vehicle incidents and determined cost multiplier values based on key domains where costs are incurred. Findings from this study suggest that the actual insurance costs may be approximately $28,122 (averaged across the 321 property damage incidents that could be matched with at least one other data set). Cost multiplier values were calculated that could be applied to property damage costs to estimate total insurance costs. The cost multiplier range was found to be between 4.1 and 14.5 (depending on calculation method). Applying these multipliers it could be estimated that for every $1 property damage cost incurred a further cost of between $3.10 and $13.50 is incurred for injuries. Therefore for incidents where a personal injury has occurred, even at the minimal level a crash is still costing a further 300 percent on top of

property damage costs. Upper level estimates suggest that the average hidden costs may be approximately of 1,500% of the property damage costs.

It should be recognised that while a majority of crashes had relatively low crash costs, a minority of incidents had extremely high costs which elevated the average crash costs. This pattern was consistent across all cost measures. The cluster of incidents reporting low costs is not surprising considering the costs reviewed in this study were Net rather than Gross. The use of only Net costs in this study is of concern for two reasons. Firstly, when estimating the cost of incidents, the use of Net costs may mask actual costs incurred. Gross costs are needed to allow policy analyses to be based on total costs irrespective of who suffers or benefits from an incident. Secondly, as Net costs are the only measure of incident severity in this study, any conclusions regarding risk exposure may be limited. An additional limitation of this study is the reliance on insurance data to determine costs. Insurance data may be misleading if the insured value of a vehicle does not reflect the actual replacement cost. Also individuals perceptions regarding the cost benefit ratio in relation to filing an insurance claim for minor repairs potentially at the expense of their no claims bonus or having to pay the excess may influence the likelihood of a claim being filed. Failing to include these potential low cost incidents in average cost calculations could lead to an overestimate of the average incident cost.

In future research, Gross costs should be explored and additional costs such as backfill costs associated with replacing personnel due to injury, loss of productivity due to personal injury, loss of productivity due to down time of physical plant and administration internal costs associated with management of incident and claims would ideally be investigated also. Future research should also calculate estimates for other types of commercial fleets. As the researched fleet comprised primarily passenger vehicles and light commercial vehicles, the findings of this study should not be generalised to heavy commercial vehicle fleets. It is anticipated that the injury risk and the level of vehicle damage relating to heavy commercial vehicles could differ substantially from the vehicles researched in this study.

This study makes a substantial contribution to the Australian literature in the area of road safety research. The incident costs identified in this study provide current Australian benchmarking data. Considering the high costs of motor vehicle incidents to society, a need exists to enhance current database access and further develop links between related databases such as hospital and law enforcement. These advances would aim to refine cost estimates of motor vehicle incidents that have the potential to inform road safety programmes and practises.

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