

# BMJ Open Psychological distress following a motor vehicle crash: evidence from a statewide retrospective study examining settlement times and costs of compensation claims

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## ABSTRACT

**Objective** To determine whether psychological distress associated with musculoskeletal injuries sustained in a motor vehicle crash (MVC), regardless of time of onset, impacts compensation outcomes such as claim settlement times and costs. Second, to identify factors routinely collected by insurance companies that contribute to psychological distress during the compensation process.

**Design** Statewide retrospective study.

**Data source** Analysis of the New South Wales statewide (Australia) injury register for MVC survivors who lodged a compensation claim from 2011 to 2013.

**Participants** 6341 adults who sustained a musculoskeletal injury and who settled a claim for injury after an MVC. Participants included those diagnosed with psychological distress (n=607) versus those not (n=5734).

**Main outcome measures** Time to settlement and total costs of claims, as well as socio-demographic and injury characteristics that may contribute to elevated psychological distress, such as socio-economic disadvantage, and injury severity.

**Results** Psychological distress in those with a musculoskeletal injury was associated with significantly longer settlement times (an additional 17 weeks) and considerably higher costs (an additional \$A41 575.00 or 4.3 times more expensive). Multivariate logistic regression analysis identified risk factors for psychological distress including being female, social disadvantage, unemployment prior to the claim, not being at fault in the MVC, requiring ambulance transportation and rehabilitation as part of recovery.

**Conclusions** Results provide compelling evidence that psychological distress has an adverse impact on people with musculoskeletal injury as they progress through compensation. Findings suggest that additional resources should be directed toward claimants who are at risk (eg, the socially disadvantaged or those unemployed prior to the claim), the major aim being to reduce risk of psychological distress, such as post-traumatic stress disorder, and associated risk of increased settlement times and claim costs. Prospective studies are now required that investigate treatment strategies for those at risk of psychological distress associated with an MVC.

## Strengths and limitations of this study

- This is the first study to investigate the impact of psychological distress in all claimants experiencing a musculoskeletal injury and who lodge and settle their compensation claim for a motor vehicle crash (MVC) over a 2-year period in the state of New South Wales. It was revealed that the presence of psychological distress greatly increased settlement times and costs.
- The study identified risk factors associated with an increased likelihood of psychological distress after an MVC.
- The study has the potential to change medical practice and insurance policy for those at risk of psychological distress following an MVC.
- It was not possible to determine whether psychological distress was present prior to the MVC, as this information is not routinely collected by insurance companies.

## INTRODUCTION

Motor vehicle crashes (MVCs) remain a major source of physical injury and distress. For example, in the UK, there were 194 477 reported casualties in a traffic accident in 2014,<sup>1</sup> while in Australia in 2013, the rate of annual hospitalised injuries associated with an MVC was 151.7 per 100 000.<sup>2</sup> Psychological distress associated with an MVC has been shown to be substantial and prevalent.<sup>3–7</sup> A recent meta-analysis investigated the extent of psychological distress associated with an MVC.<sup>3</sup> Regardless of whether the psychological distress occurred prior to or after the MVC, the study revealed that traumatic brain injury, spinal cord injury and musculoskeletal injury (ie, whiplash) resulted in significantly elevated levels of distress<sup>3</sup> and psychological distress has been shown to remain elevated for at least 3 years post-MVC.<sup>3 8–10</sup> Recent prospective research found that one in two



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persons suffered elevated rates of psychological distress (eg, depression) soon after the MVC and many of these continue to experience elevated distress 12 months after the MVC.<sup>9</sup> Factors such as more severe physical injury, older age and past negative emotional reactions to distress were associated with elevated psychological distress 12 months post-MVC.<sup>9</sup> For the purpose of this study, psychological distress is defined as an unpleasant mental condition perceived as disturbing and which can impede daily functioning, with mental symptoms including agitation, fatigue, confusion, loss of motivation and depressed mood.

Research suggests the compensation process following an MVC increases distress; for example, health outcomes of people who lodge injury-related compensation claims are more likely to have higher levels of distress than those who do not claim.<sup>11–17</sup> Furthermore, preliminary research suggests that when a person has experienced a physical injury as well as psychological distress, the cost of their claim has been shown to double.<sup>18</sup> Other research has found poorer outcomes for claimants who were not at fault compared with those at fault.<sup>19</sup> The potential negative impact of psychological distress in the claims process is clearly undesirable in terms of complicating medical treatment for the injured person and challenging policy direction and effectiveness for insurers. A more desirable outcome is to minimise time spent in the compensation process because this would likely reduce the negative impact on the individual's health and contain claim costs for healthcare systems and insurers.<sup>20</sup>

Musculoskeletal injuries are common following an MVC and often lead to compensation claims,<sup>21–23</sup> and the risk of developing psychological distress with this physical injury is high.<sup>3,24</sup> Musculoskeletal injuries typically involve soft tissue injuries to the lower back, shoulders, hips and knees as well as whiplash injuries and account for more than 65 000 injuries in Australia each year following an MVC, at a cost in excess of \$A950 million.<sup>25</sup> Barriers to recovery from MVC-related musculoskeletal injuries include high initial pain intensity,<sup>26,27</sup> being female,<sup>20,28</sup> involvement in the compensation claims process<sup>14,20</sup> and elevated psychological distress.<sup>29,30</sup> Furthermore, recent research found significantly increased levels of psychological distress for MVC-related whiplash-associated disorder compared with controls.<sup>3,31</sup>

A review of research that focused on disability arising from an MVC concluded that there was a need to clarify rates of disability arising from an MVC, especially with regard to methodological issues and complicating factors like compensation.<sup>32</sup> This is also true for the impact of psychological distress following an MVC, including the influence of involvement in compensation claims.<sup>3,9</sup> Research in this area has been limited by uncertain diagnoses of psychological distress disorders and small sample sizes. In contrast, the research presented in this paper has addressed many of the limitations of prior research. For instance, it used a database of 6341 persons with musculoskeletal injury from the statewide injury register

of the New South Wales (NSW) State Insurance Regulatory Authority (SIRA), the authority that administers the NSW Compulsory Third Party (CTP) scheme. This statewide register also provides records with confirmed diagnoses of psychological distress, based on the International Statistical Classification of Disease and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM),<sup>33</sup> regardless of when the psychological distress was first diagnosed. The NSW CTP scheme is a fault-based scheme with limited access to entitlements for those at fault. Its purpose is to compensate those with injuries who were not at fault in the MVC with the claim requiring police and medical reports as evidence, in addition to a personal injury claim form.<sup>34</sup> An estimated 55% of all NSW MVC-related injuries result in the lodgement of a CTP claim.<sup>35</sup>

The objective of this research was to analyse the data of all NSW MVC survivors who sustained a musculoskeletal injury and who settled their claim over a 2-year period. Compensation outcomes of those without diagnosed psychological distress were then compared with those with diagnosed psychological distress. Specifically, the aim was to determine the impact of psychological distress, regardless of time of onset, on claim settlement times and total costs.<sup>34</sup> A further aim was to determine factors, routinely collected by NSW CTP insurance companies and collated by SIRA, that predict elevated risk of having psychological distress. Accordingly, findings should address two key research questions: (1) whether psychological distress is associated with longer claim time to completion and greater claim costs and (2) what injury or demographic characteristics are associated with psychological distress. The findings should be beneficial for informing general practitioners and insurer policymakers and thus improve healthcare practices for injury-related compensation claimants.

## METHOD

### Participants

Permission was sought and granted on 22 November 2016 from SIRA to access a total of 24 164 claims from the Personal Injury Register (PIR) of SIRA to determine their potential inclusion in the analysis. The PIR contains all MVC-related claims that occur in NSW. Inclusion criteria consisted of (i) the injured adult (18+) having a musculoskeletal injury and (ii) the claim had been lodged and also settled over a 27-month period (October 2011–December 2013). Claims that had been lodged but not settled and claims involving catastrophic injuries such as spinal cord injury and severe traumatic brain injury were excluded (catastrophic-injury-related claims are directed toward an alternative scheme in NSW). This resulted in 6341 participants who had experienced an MVC and sustained a musculoskeletal injury and who lodged and settled a claim in NSW, Australia, between October 2011 and December 2013 (27 months). The combined cohort data were received from SIRA in de-identified form, and

therefore, human research ethics approval was deemed not to be required.

### Measurements

Musculoskeletal injury severity was assessed using the New Injury Severity Score, which computes the simple sum of squares of the three most severe injuries identified by the Abbreviated Injury Scale.<sup>36</sup> The Index of Relative Socioeconomic Disadvantage was calculated from the Socio Economic Index for Areas (SEIFA), which ranks areas in Australia according to relative socio-economic advantage and disadvantage.<sup>37</sup> Rehabilitation indicator refers to whether the claimant required rehabilitation as part of their recovery plan. Presence of psychological distress, such as post-traumatic stress disorder (PTSD) or major depressive disorders, was determined using the ICD-10-AM Classification of Mental and Behavioural Disorders: Clinical Descriptions and Diagnostic Guidelines<sup>38</sup> at some time within the claims process (the database is progressively updated over the duration of the claim). Psychological distress was determined from sources such as reports and independent assessments from general practitioners, psychiatrists and psychologists. It is recognised that psychological distress could be present prior to the claimant's MVC and that this has the potential to influence psychological distress post-MVC.<sup>3</sup> However, timing of onset of psychological distress was not the aim of this research given that such information is not routinely collected by NSW insurance companies and is therefore not collated by the NSW regulatory authority. Of the 6341, those with musculoskeletal injury without psychological distress numbered 5374 (90.4%) and those with both musculoskeletal injury and psychological distress numbered 607 (9.6%).

### Statistical analysis

A retrospective design was employed to analyse the PIR datasets of all NSW MVC survivors at the time of their claim lodgement (both minor claims, that is, 'Accident Notifications Forms' and full claims) over 27 months, and who met the inclusion criteria. Reporting was guided by the relevant checklist (see STROBE Statement in supplementary file 1). Descriptive statistics were used to summarise demographic and claim/accident characteristics of the participants by psychological distress status. The differences in the demographics and claim characteristics between those that claimed compensation and those that did not were compared using analysis of variance (ANOVA) tests for continuous variables and  $\chi^2$  tests for categorical variables. In order to determine predictive factors, logistic regression was employed. Only statistically significant socio-demographic and injury variables from [table 1](#) were included in the logistic regression analysis from which unadjusted ORs were determined. Following this, all the variables were again used in backward elimination ( $p < 0.05$ ) logistic regression, and adjusted ORs were calculated.

Logistic regression can provide information on factors that are associated with having psychological distress, and advantages of employing this statistical methodology include its ability for isolating predictors and for producing ORs.<sup>39</sup> In order to determine predictive factors, logistic regression was employed. Potential predictor variables from the socio-demographic and injury variables from [table 1](#) were considered and significant variables were retained for the logistic regression analysis. Univariate analysis on the significant variables was conducted from which the unadjusted ORs were determined. Following this, variables for the final model were selected using a backward elimination technique based on changes in likelihood ratios. Significant variables ( $p < 0.05$ ) from the logistic regression were used in the final model and adjusted ORs were calculated. While [table 1](#) showed that there was a significantly higher probability ( $p < 0.01$ ) for those who had psychological distress also having legal representation (61.0%) compared with musculoskeletal-injury-only claimants (18.9%), this injury characteristic was excluded from the logistic regression as legal representation can be instigated not only at the time of the claim lodgement, but at any time throughout the claims process, thus making it difficult to establish its predictive association with psychological distress. Again, it should be noted that psychological distress can develop before the injury, as well as at any time throughout the claims process.

All variables selected for the logistic regression have been investigated in prior studies for their relevance to injury outcomes following MVC.<sup>11 40</sup> To determine the predictive capacity of the logistic regression model, receiver operating characteristics (ROC) estimates were calculated. The ROC plots the true-positive rate (sensitivity) against the false-positive rate (1-specificity) in detecting factors that influence greater time to claim settlement and elevated costs for MVC claimants with musculoskeletal injuries with and without psychological distress.

### RESULTS

Socio-demographic and injury characteristics are shown in [table 1](#). All factors shown in [table 1](#) were either preinjury factors or assessed at the time of lodging the claim, except for legal representation, which can potentially occur at any time during the claims process. Mean days from MVC to lodgement of a minor 'no fault' claim (Accident Notification Form) was 23 days (SD=22.8) and to full claim lodgement was 110 days (SD=84.0).

[Table 2](#) shows a breakdown of musculoskeletal injury types for the sample separated by musculoskeletal injury only compared with musculoskeletal injury+psychological distress. While it is accepted that an MVC survivor is vulnerable to sustaining several different categories of injuries (eg, whiplash and lumbar and other soft tissue injuries), [Table 2](#) shows that the most common musculoskeletal injury was soft tissue, followed by whiplash injuries.

**Table 1** Socio-demographic and injury characteristics of NSW MVC claimants 2011–2013

Variable	Musculoskeletal injury (n=5734)	Musculoskeletal injury+psych distress (n=607)	p
Age (years), mean (SD)	42.8 (16.3)	44.4 (15.9)	0.02
New Injury Severity Score, n (%)			0.02
Minor–moderate 1–8	5259 (91.9)	539 (88.8)	
Serious 9–15	348 (6.1)	54 (8.9)	
Severe–critical 16–75	114 (2.0)	14 (2.3)	
Index of Relative Socioeconomic Disadvantage, mean (SD)	1017.0 (86.4)	986.5 (89.2)	<0.01
Index of Relative Socioeconomic Disadvantage, n (%)			<0.01
Most disadvantaged	983 (17.4)	182 (30.3)	
Disadvantaged	803 (14.2)	72 (12.5)	
Average	1007 (17.8)	113 (18.8)	
Advantaged	853 (15.1)	95 (15.8)	
Most advantaged	1996 (35.4)	136 (22.6)	
Male, n (%)	2417 (42.2)	212 (34.9)	<0.01
Employment status, n (%) (yes)	4197 (73.2)	364 (60.0)	<0.01
Occupation skill level, n (%)			<0.01
Managers and administrators	567 (9.9)	34 (5.6)	
Professionals	1026 (17.9)	34 (5.6)	
Para-professionals	213 (3.7)	74 (12.2)	
Tradespersons	257 (4.5)	17 (12.2)	
Clerks	600 (10.5)	26 (4.3)	
Sales persons and personal service workers	680 (11.9)	63 (10.4)	
Plant and machine operators and drivers	225 (3.9)	64 (10.5)	
Labourers and related workers	537 (9.4)	22 (3.6)	
At fault* (no), n (%)	4866 (87.9)	568 (96.1)	<0.01
Prior claim (yes), n (%)	620 (10.8)	86 (14.2)	0.012
Economic loss claim (no), n (%)	3101 (54.1)	329 (54.2)	0.96
Weekly earnings, mean (SD)	1212.4 (2832.6)	1001.4 (659.4)	0.23
Legal representation (yes), n (%)	1085 (18.9)	370 (61.0)	<0.01
Accident notification (days), mean (SD)	22.6 (22.9)	23.9 (21.4)	0.32
Notification of claim (days), mean (SD)	112.7 (86.7)	97.5 (69.1)	<0.01
Rehabilitation indicator, n (%)			<0.01
Required	398 (6.9)	127 (20.9)	
Possibly required	2920 (50.9)	287 (47.3)	
Not required	1844 (32.2)	171 (28.2)	
Role			<0.01
Driver	3764 (65.6)	386 (63.6)	
Passenger	1120 (19.5)	156 (25.7)	
Rider	404 (7.0)	23 (3.8)	
Pillion	22 (0.4)	2 (0.3)	
Pedestrian	237 (4.1)	30 (4.9)	
Cyclist	159 (2.8)	7 (1.2)	
Other	28 (0.5)	3 (0.5)	
Ambulance (yes)	2179 (38.0)	300 (49.4)	<0.01

Continued



**Table 1** Continued

Variable	Musculoskeletal injury (n=5734)	Musculoskeletal injury+psych distress (n=607)	p
Hospital (yes)	1405 (24.5)	173 (28.5)	<0.01

For some variables there were missing values; total number will therefore not always equal 6341.

\*At-fault claims are minor claims that are capped at payment of \$A5000.00.

**Claim settlement times, costs and legal representation**

ANOVA results confirmed a significant difference between musculoskeletal injury and musculoskeletal injury+psychological distress claim settlement times ( $F=392.82$ ,  $df=1$ , 6339,  $p<0.001$ ). Mean days to claim settlement from accident date was significantly longer for musculoskeletal injury+psychological distress compared with musculoskeletal injury only (353.81 days;  $SD=164.83$ ; 95% CI 340.67 to 366.95 versus 231.65 days;  $SD=142.08$ ; 95% CI 227.97 to 235.32, respectively). This difference was significantly longer for musculoskeletal injury+psychological distress claimants (mean difference 122.16 days or 17.45 weeks).

ANOVA results also confirmed a significant difference in claim costs between musculoskeletal injury and musculoskeletal injury+psychological distress claimants ( $F=444.03$ ,  $df=1$ , 6339,  $p<0.001$ ). Mean claim costs for musculoskeletal injury only claimants was \$A12 421.13;  $SD=370710.78$ ; 95% CI 11 461.39 to 13 380.87. Mean claim costs for musculoskeletal injury+psychological distress claimants was \$A53 996.52;  $SD=966930.42$ ; 95% CI 46 288.92 to 61 704.11. This is an overall mean increase of \$A41 575.39 or 4.3 times more expensive per

case. To understand better the effect of injury severity on claim costs, a further ANOVA was conducted with serious and above musculoskeletal injury removed. This did not change the findings. Mean cost for musculoskeletal injury was \$A10 034.54 ( $SD=283780.90$ ; 95% CI 9267.37 to 10 801.71). Mean cost of musculoskeletal injury+psychological distress was \$A43 262.87 ( $SD=619270.97$ ; 95% CI 38 023.02 to 48 502.71), and this was significantly greater for the musculoskeletal injury+psychological distress group ( $F=516.71$ ,  $df=1$ , 6607,  $p=0.000$ ). Musculoskeletal injury+psychological distress claimants were also significantly more likely ( $p<0.01$ ) to involve legal representation (61.0% compared with 18.9%).

**Impact of socio-demographic and injury characteristics on probability of psychological distress**

Table 1 presents the factors at the time of the MVC and claim lodgement that either increase or decrease the probabilities of musculoskeletal injury claimants being diagnosed with psychological distress. Age, economic loss (defined as yes/no) associated with the injury and claim, weekly earnings and hospitalisation did not

**Table 2** Breakdown of musculoskeletal injury types by musculoskeletal injury versus musculoskeletal injury with psychological distress from 2011 to 2013

Musculoskeletal Injury Type	Musculoskeletal Injury Only (%) n=5,734 (90.43%)	Musculoskeletal Injury + Psychological Distress (%) n=607 (9.57%)	Total
Soft Tissue	4630 (89.78)	527 (10.21)	5157
Whiplash	3750 (89.43)	443 (10.56)	4193
Skin	2133 (86.81)	324 (13.18)	2457
Lumbar	1256 (84.69)	227 (15.30)	1483
Chest	985 (86.10)	159 (13.89)	1144
Seatbelt	672 (84.31)	125 (15.68)	797
Thoracic	634 (86.84)	96 (13.15)	730
Upper Limb Joint	441(87.67)	62 (12.32)	503
Upper Limb Fracture	432 (93.50)	30 (6.49)	462
Lower Limb Fracture	413 (93.43)	29 (6.56)	442
Lower Limb Joint	229 (87.40)	33 (12.59)	262
Face	82 (85.41)	14 (14.58)	96
Abdomen	49 (90.74)	5 (9.25)	54
Spinal Contusion	2 (100.00)	0 (0.00)	2
Finger Amputation	2 (100.00)	0 (0.00)	2

Percentages in columns are row percentages showing the percentage of the total for each musculoskeletal injury type in the musculoskeletal distress only versus musculoskeletal+psychological distress categories.

significantly increase the probability of psychological distress. Socio-economic disadvantage increased the probability of experiencing psychological distress (mean musculoskeletal injury 1017.9, SD=86.4; mean musculoskeletal injury+psychological distress 986.5, SD=89.2,  $p<0.01$ ). For example, over 40% of those with psychological distress were socially disadvantaged compared with 31% of those without psychological distress. There was a significant difference ( $p<0.01$ ) between male and female claimants in terms of probability of also having psychological distress; that is, 65.1% were female who had a musculoskeletal injury+psychological distress compared with 57.8% with only musculoskeletal injury. Claimants who were unemployed were more likely to have psychological distress ( $p<0.01$ ) compared with those employed. A total of 4197 (73.2%) of those working at the time of lodging their claim did not have psychological distress compared with 364 (60.0%) of those with musculoskeletal injury+psychological distress. A total of 620 (10.8%) of those with a history of a prior claim did not have psychological distress, whereas 86 (14.2%) did have psychological distress, suggesting that those with a claim history are more likely to have psychological distress in addition to their musculoskeletal injury ( $p=0.01$ ). Those with a musculoskeletal injury+psychological distress were more likely to have a serious injury severity score ( $p=0.02$ ). Those with a musculoskeletal injury+psychological distress were also more likely to be not at fault (96.1% compared with 87.9% for musculoskeletal injury only). It is noted here, however, that data taken from an 'at fault' scheme necessarily mean that there are limited at-fault claimants, reducing confidence in its association with psychological distress. No significant difference was found between the two groups in terms of number of days taken for notifying the insurer of the MVC (either via a minor claim, ie, Accident Notification Form, or a full claim). However, in terms of days taken to notify the insurer of the claim lodgement, those who had psychological distress were more likely to notify lodgement of their claim sooner ( $p<0.01$ ). It was also more likely that the claimant will require rehabilitation if they have psychological distress ( $p<0.01$ ). A larger portion of passengers had psychological distress, whereas motorbike riders and cyclists were less likely to have psychological distress ( $p<0.01$ ). If an ambulance was required at the time of the MVC, the claimant was significantly more likely to have psychological distress in addition to their musculoskeletal injury ( $p<0.01$ ), and similarly, if the claimant attended hospital, they were more likely to have psychological distress ( $p<0.01$ ) than if hospitalisation was not required.

#### Logistic regression analysis of significant socio-demographic and injury characteristics

All socio-demographic and injury characteristics that were found to significantly differentiate between the two groups were entered into a logistic regression to determine their unadjusted and adjusted predictive power of psychological distress. Table 3 shows that six variables were

associated with the presence of psychological distress. Being unemployed, being female, being socio-economically disadvantaged, not being at fault, requiring an ambulance at the time of their MVC and needing rehabilitation were all found to be significant contributors to an increased risk of having psychological distress. The area under the ROC curve for this group of six variables was 70%. Adding non-significant variables to the logistic regression did not significantly add to this percentage, providing validity for the predictive capacity of the model.

#### Sensitivity analysis

Sensitivity analysis was conducted with a subset of those that had PTSD only. In this subset, those with other types of psychological distress were excluded from the analysis. For those with PTSD diagnosis only ( $n=83$ ), SEIFA, fault and rehabilitation indicators were significant predictors. Although employment and sex were no longer significant in this model, the effect sizes for all predictors were greater in this PTSD-only subset, indicating that no significance is likely a result of reduced power in the sample. The overall performance of the model was greater in the PTSD-only subset with a concordance index of 0.764 compared with 0.695 in the original model.

#### DISCUSSION

In NSW, Australia, an MVC fault-based system is legislated that provides compensation for people injured in MVCs that were the fault of another vehicle owner or driver. The driver at fault is the person who was driving the vehicle considered most at fault in the accident.<sup>35</sup> Analysis of the PIR data of all NSW compensation claimants over 27 months between 2011 and 2013 who met the inclusion criteria revealed that almost 10% of claimants will be diagnosed with elevated psychological distress such as depression or PTSD or a distressing condition involving significantly elevated anxiety and depressive mood. For comparison, the Australian prevalence of elevated psychological distress such as PTSD is estimated at  $0.9\pm 0.1\%$  and depression is estimated at  $3.5\pm 0.2\%$ .<sup>41</sup> The prevalence of musculoskeletal injury with a comorbid depression has been estimated at  $29.51\pm 3.21\%$ .<sup>42</sup> Furthermore, prior research has consistently found levels of psychologically distressing symptomatology to range between 20% and 40% for people sustaining injury in an MVC, irrespective of whether they have made a compensation claim.<sup>3</sup> The current findings reported in this paper suggest a much lower percentage of psychological symptomatology. Nevertheless, the psychological data presented in this paper are reporting disorders rather than symptomatology. Distress associated with the claims process has been documented,<sup>3</sup> and the significant escalations in time to claim settlement and cost increases revealed in this study warrant action for their amelioration. Prevalence differences found in prior studies may well be a factor of employing prospective research designs and research-based diagnostic assessments. However, the

**Table 3** Logistic regression results showing predictors for claimants who experience psychological distress

Variable	Unadjusted OR (95% CI)	p	Adjusted OR (95% CI)	p
Age	1.01 (1.00 to 1.01)	0.02		
New Injury Severity Score		0.03		
Minor–moderate 1–8	1.00			
Serious 9–15	1.51 (1.12 to 2.04)	0.007		
Severe–critical 16–75	1.20 (0.68 to 2.10)	0.53		
Index of Relative Socioeconomic Disadvantage		<0.001		<0.001
Most disadvantaged	1.65 (1.28 to 2.12)	<0.001	1.55 (1.18 to 20.6)	0.002
Disadvantaged	0.83 (0.61 to 1.13)	0.24	0.87 (0.62 to 1.23)	0.43
Average	1.00		1.00	
Advantaged	0.99 (0.74 to 1.32)	0.96	1.07 (0.77 to 1.48)	0.70
Most advantaged	0.61 (0.47 to 0.79)	<0.001	0.60 (0.45 to 0.81)	0.001
Male	0.73 (0.62 to 0.87)	<0.001	0.72 (0.59 to 0.88)	0.001
Employment status (yes)	0.55 (0.46 to 0.65)	<0.001	0.71 (0.58 to 0.87)	0.001
At fault (yes)	0.29 (0.19 to 0.45)	<0.001	0.25 (0.15 to 0.40)	<0.001
Prior claim (yes)	1.36 (1.07 to 1.73)	0.013		
Rehabilitation indicator		<0.001		<0.001
Required	1.00		1.00	
Possibly required	0.31 (0.24 to 0.39)	<0.001	0.37 (0.29 to 0.48)	<0.001
Not required	0.29 (0.23 to 0.38)	<0.001	0.36 (0.27 to 0.48)	<0.001
Other	0.12 (0.08 to 0.19)	<0.001	0.17 (0.08 to 0.38)	<0.001
Role		<0.001		
Driver	1.00			
Passenger	1.36 (1.12 to 1.66)	0.002		
Rider	0.56 (0.36 to 0.86)	0.008		
Pillion	0.89 (0.21 to 3.78)	0.87		
Pedestrian	1.23 (0.83 to 1.83)	0.30		
Cyclist	0.43 (0.32 to 3.45)	0.03		
Other	1.05 (0.32 to 3.45)	0.94		
Transportation by ambulance (yes)	1.47 (1.22 to 1.77)	<0.001	1.44 (1.19 to 1.76)	<0.001
Hospital (yes)	1.14 (0.94 to 1.38)	0.19		
	ROC=	0.70		

p Values are shown.

current findings have considerable consequences given that they are based on outcomes from every MVC casualty in NSW over a 27-month period with a defined injury (musculoskeletal) and who settled their claim. Furthermore, the diagnosis of psychological distress was based on international mental health criteria (ICD-10-AM) and sourced from treating clinicians and independent medical/psychological assessments.

The findings also confirmed that the presence of psychological distress is associated with substantially increased claim settlement times, a mean increase of the total cost of the claim by over \$A40 000. Legal representation was also significantly more likely in those with psychological distress. These findings provide compelling

evidence, confirming that the presence of psychological distress during the claims process (regardless of whether it was pre-morbid or not) results in potentially adverse outcomes for the well-being of affected individuals and for insurance and regulatory organisations with increased settlement times and costs.

The identification of the factors that are likely to elevate risk of psychological distress during the claims process for injury compensation following an MVC provides healthcare professionals and insurance companies/regulatory bodies some scope for ameliorating the risk of escalating claim settlement times and costs. The current study provided evidence for six independent predictors of psychological distress during the claim process. It is

not surprising that unemployment, social disadvantage and a history of prior claims are risk factors for increased psychological distress given that they are somewhat related factors and that prior research has indicated their contribution to poorer mental health status.<sup>43 44</sup> It is acknowledged that prior mental health problems can predispose people to elevated psychological distress after their MVC;<sup>3 9</sup> however, there is no avenue available for assessing the impact of this influence given that such a predisposing factor is not routinely collected by insurance companies. Nevertheless, strategies and resources will need to consider this risk factor. Similarly, it is not surprising that being female is a risk factor for distress during the claims process given that higher prevalence rates of psychological distress for females are consistently reported across general populations.<sup>44</sup> This would suggest that resources directed at females to prevent escalation of distress in the claims process appear warranted. Transportation by an ambulance at the time of their accident is perhaps related to severity of the injury, and future research will be needed to clarify this risk factor. Requiring rehabilitation was also found to be a significant predictor of psychological distress, perhaps suggesting that some claimants who become psychologically distressed may be receiving rehabilitation regardless of their physical injury severity. This suggests that early intervention for psychological distress may well reduce the need for extended rehabilitation. Similarly, resources directed at those who are not at fault of the MVC may help reduce the risk of psychological distress negatively impacting on the claim's expected settlement times and cost trajectories. For example, related to at-fault status, previous research has found a relationship between perceived injustice and the high prevalence of occupational disability in whiplash injuries.<sup>45</sup> Changing to a no-fault scheme may reduce the association between fault status and increased claim settlement times and costs.

Limitations of this study need to be discussed. It was not possible to determine preinjury presence of psychological distress. It is expected that the presence of preinjury psychological distress would have a considerable impact on the presence of psychological distress during the claims process. However, arguably, proxy measures of preinjury psychological distress existed in the study, namely, social disadvantage and unemployment, both highly related to the presence of psychological disorder.<sup>43</sup> These two measures were found to predict psychological distress during the claim process. Nevertheless, research with access to preinjury health data shows that diagnosed psychological/psychiatric illness prior to injury is a significant risk factor for psychological distress following an MVC incident.<sup>46</sup> Due to the data being collected in a fault-based CTP scheme, very few claimants were at fault, and this may have been a factor in its predictor status of psychological distress. Clearly, the predictive capacity of fault status requires further research. The inclusion of only settled claims has the potential to exclude more claims in which psychological distress played a role given

their propensity to be more lengthy for the claimant. It was also not possible to know with a high level of accuracy what psychological condition was experienced.

This retrospective cohort study has positive implications at several systemic levels. First, the results reported in this paper can assist general practitioners to provide improved healthcare support to their clients, knowing that those presenting with psychological distress in addition to their musculoskeletal injury may require additional support such as referral to a clinical psychologist or psychiatrist early in the claims process to reduce the risk of the claim becoming more complex and subsequently more lengthy and expensive. Second, assuming that the goal of insurance companies is to support a claimant through the process of compensation with effective injury management and timely return to work, the results presented suggest that there are known targets for change (psychological distress) and that specific predictors available in insurers' personal injury databases can effectively identify who is likely to benefit from specific distress management strategies. This suggests that changes to healthcare protocols and practices are warranted. For example, in accordance with previous research, directing additional resources such as screening and treating psychological conditions of claimants who are at higher risk<sup>9</sup> regardless of whether their psychological condition predated their MVC provides opportunity for reducing time and costs involved with compensation claims.

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