BMJ Open

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Journal:	*BMJ Open*
Manuscript ID	bmjopen-2015-010910
Article Type:	Research
Date Submitted by the Author:	20-Dec-2015
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Primary Subject Heading:	Public health
Secondary Subject Heading:	Health policy, Epidemiology
Keywords:	return to work, workers compensation, injury, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, OCCUPATIONAL & INDUSTRIAL MEDICINE

Does workers' compensation system policy influence return to work following injury? A comparative effectiveness study.

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Abstract word count: 284

Word count: 3,045

Number of tables: 4

Number of figures: 1

Key words: Return-to-Work; Workers' Compensation; Health Policy; Work-Related Injury
(Up to five key words)

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ABSTRACT

Objectives: To determine whether workers' compensation system policy is an independent predictor of Return to Work (RTW) following work injury and if so, the magnitude of the effect.

Setting: Eight Australian state and territory workers' compensation systems, providing coverage for more than 90% of the Australian labour force**.**

Participants: 94,675 injured Australian workers with workers' compensation claims accepted in 2010 and with at least two weeks of compensated time off work.

Primary outcome measures: Duration of time lost from work in weeks derived from administrative databases of workers compensation systems. Proportion of injured workers receiving income replacement at 4, 13, 26, 52 and 104 weeks post-injury.

Results: Survival curves described substantial variation between states and territories with respect to the proportion of injured workers returning to work over the 2 year period post injury. Binary logistic regression analyses identified significant differences between states and territories at all time points post-injury, after controlling for demographic, work and injury factors. Compared to New South Wales: workers in Victoria and South Australia had significantly greater odds of being off work (receiving income benefits) at all time points; workers in Tasmania had greater odds of being back at work (off benefits) at all time points, while the RTW of workers in Western Australia, Queensland, and NT improved at later time points. The magnitude of jurisdiction effects are equivalent to or greater than that identified for injury type, age, gender, occupation and socio-economic status.

Conclusions: Workers' compensation system design has a significant and independent impact on RTW following work injury and illness. Further research is necessary to identify specific compensation system policies and practices that promote timely and appropriate RTW.

ARTICLE SUMMARY

The International Labour Organisation estimates that there are more than 313 million injuries resulting from work-related accidents annually. There is now evidence that return to work following injury can facilitate recovery and return to health. Many industrialised and developing nations operate workers compensation or social insurance systems with the primary objective of returning injured workers to the workplace in timely and cost effective manner. However there is relatively little evidence regarding the relative impact of compensation system design on RTW outcomes. Australia has a system of nine major workers compensation systems, each with different policy settings. This study sought to determine whether RTW outcomes varied between these jurisdictions, and whether these differences could be attributed to jurisdictional policy settings.

Strengths and limitations of the study

- Use of population-based data from eight of nine Australian workers' compensation jurisdictions, covering more than 90% of the Australian labour force.
- Ability to account for factors, other than jurisdiction of claim, that are known to impact on return to work outcomes including age, gender, occupation, injury type and socioeconomic status.
- Use of income replacement duration as a proxy for return to work outcomes produces some uncertainty in estimates.

Funding Statement

This study was supported by a grant from Safe Work Australia and WorkSafe Victoria.

Competing Interests

AC, TL, JT and BHM receive salary support via a grant from WorkSafe Victoria and the Transport Accident Commission. Both are state government regulatory agencies in the state of Victoria, Australia. There are no other competing interests.

INTRODUCTION

There are an estimated 4.8 million deaths from injury annually, accounting for over 10 percent of the total global burden of disease, with 973 million people sustaining injury that resulted in access to healthcare [1]. In the sphere of work injury, the International Labour Organisation [2] has estimated that there are 2.3 million fatalities and a further 313 million injuries arising from work-related accidents annually. These figures underestimate the true burden of work-related injury and illness as they exclude the substantial additional burden of occupational diseases and work-related mental health conditions.

Work injury results in changes to physical and mental health, quality of life, and a reduced ability to participate in society and the labour market [3-5]. Extended periods of workless-ness can have a negative impact on health [5]. Work injury may have flow on effects such as increasing the risk of marital separation [6] and has been associated with poorer health of family members [7].

Most industrialised and developing nations have public insurance systems that compensate injured workers for periods of time away from work, and seek to promote effective rehabilitation and return to work [8]. There is substantial international variation in the design and management of these systems [9]. Differences between jurisdictions include the proportion of the labour market covered, caps and time period limits on wage replacement, access to treatment and rehabilitation and time limits on benefit periods, among others [10].

This diversity in system design and policy presents an opportunity for comparative research to identify the most effective RTW policy settings. Globally, very little quality evidence regarding the relative impact of compensation system policy on RTW outcomes following work injury has been published [11].

In Australia, more than half a million workers were injured at work in the 2013/14 financial year [12], equating to 4.3% of the labour force. The societal cost of work injury has been estimated at $60.6 billion per annum, or 4.8% of GDP [13]. Commonwealth and state governments in Australia have established an array of workers' compensation systems with the objective of returning injured workers to the workforce while minimising the costs of rehabilitation to society [10]. These are predominantly geographically based in the six states and two territories. The systems vary substantially in their design, and with respect to return to work (RTW) policy and practice.

This study sought to determine whether the Australian state or territory in which an injured worker receives compensation affects RTW outcomes and if so, to determine the magnitude of this effect.

METHODS

Setting

In December 2010, the year of focus for this study, Australia had a labour force of 11.42 million workers. The vast majority of Australian workers are covered by compulsory workers' compensation insurance regulated by state and territory governments. In addition there are two commonwealth workers compensation systems [10]. All of these compensation schemes provide income replacement, healthcare and rehabilitation support to eligible injured workers. Amongst the Australian systems, there is a diversity of policy approaches. The schemes differ on multiple aspects including their coverage (e.g., industries and workers covered); entitlements (e.g., included injuries and illnesses); benefits (e.g., minimum and maximum levels and duration); rehabilitation (e.g., early RTW, access to support); health care (e.g., access to and coverage); administration (e.g., appeal procedures, oversight mechanisms); financing (e.g., who pays, experience rating); and job protection (e.g., duration of protection, employer obligation to accommodate injured worker) [10]. These are all factors that have been identified as important to fairness of coverage and outcomes for injured workers [14], and provide an opportunity to study the relative impact of different policy approaches on outcomes including RTW.

Data sources

Annually the Australian workers' compensation authorities contribute case-level claims data to the National Dataset of Compensation-based Statistics (NDS) compiled by Safe Work Australia [15]. A total of 345,220 cases of compensated work injury occurring in the 2010 calendar year were extracted from the NDS.

Participants were injured workers aged 15-80 years with an accepted workers' compensation claim. Cases were excluded from the dataset if the NDS indicated they had worked less than 1 hour or more than 100 hours per week prior to injury. To ensure comparable jurisdictional-level cohorts were established, cases with two weeks or less working time loss were removed to account for jurisdictional variation in compensation system criterion for claim acceptance (both Victoria and South Australia have employer excess periods of two weeks, during which employers typically cover income replacement payments). Duplicate cases were removed.

Following application of inclusion and exclusion criteria, a total of 94,675 cases remained for analyses.

Outcome

The primary outcome for analyses is the cumulative duration of income compensation, considered the best estimate of time away from work when using administrative data [16]. Weeks of compensated time loss were calculated by dividing the number of hours compensated by the number of pre-injury work hours per week. The dataset included claims information to June 2014 providing a maximum 4.5 year period of follow up. Conclusion of compensated time loss payments was considered to indicate RTW.

Analysis

Injured worker characteristics nationally and in each jurisdiction were summarised. Survival / recovery curves of the primary outcome were plotted to visualise the proportion of injured workers in each jurisdiction receiving income compensation throughout the follow-up period. For each case, cumulative time loss durations were converted to binary variables indicating whether the injured worker received ≥ 4, 13, 26, 52, and 104 weeks of compensation.

Predictors of outcomes were assessed using binary logistic regression models. Models included jurisdiction of claim and covariates to control for factors shown to influence RTW, including age, gender, injury type, occupation, industry, socioeconomic status, remoteness and full/part time work.

Injured workers were categorised as 'full-time' if pre-injury working hours were ≥ 35 hours per week. Socio-economic status and remoteness were determined by linking postcode data to the Index of Relative Socio-economic Advantage and Disadvantage in Socio-Economic Indexes for Areas (SEIFA) [17] and the Accessibility/Remoteness Index of Australia (ARIA) [18]. SEIFA rankings were converted to quintiles; the highest ranked-quintile was classified as 'advantaged' and the lowest quintile as 'disadvantaged'. The dataset included standardised industry [19], occupation [20], and injury categories [21]. Injury classifications were modified to consolidate back injuries into their own category to account for coding variations between jurisdictions; the modified coding has been reported previously [22]. Cases with incomplete records were excluded, resulting in 80,090 cases included in the regression analyses; in descending order, missing data were attributable to SEIFA (*n* = 14,266; 15.1%), ARIA linkage (*n* = 14,223; 15.0%) to postcode, employer industry (*n* = 817; 0.9%), and occupation (*n* = 167; 0.2%).

To investigate the relative magnitude of effect of predictor variables, Odds Ratios were standardised to reflect change in odds (regardless of direction) using the following algorithm:

- If OR > 1
  - OR – 1 = % change in odds
  - E.g., OR: 2.00 = 2 – 1 = 1 (100% change to odds)
- If OR < 1
  - (1 / OR) – 1 = % change in odds
  - E.g., OR: 0.50 = (1 / 0.5) – 1 = 2 – 1 = 1 (100% change to odds)

Data manipulations and descriptive analyses were conducted in MS Excel 2010 and regression models were run in SPSS v22 with p-values of ≤ 0.01 considered significant.

Ethics

This study received ethics approval from the Monash University Human Research Ethics Committee (MUHREC) on 8 October 2014.

RESULTS

Participant characteristics

Sample characteristics are presented in Table 1. Western Australia (33%) and the Northern Territory (31%) had a smaller proportion of injured female workers than the national average (38%). Back pains/strains were the most common injury in Western Australia (41%) and Tasmania (39%), while musculoskeletal injuries were more common overall (43%). Manufacturing was the most common employer industry in Victoria (19%), public administration and safety in the Northern Territory (12%), and construction in the Australian Capital Territory (17%). Healthcare and social assistance was the most common industry overall (16%). Socio-economically advantaged postcodes were over-represented in Western Australia (30%), whilst disadvantaged postcodes were overrepresented in South Australia (30%) and Tasmania (49%).

Table 1. Injured worker characteristics by state or territory of compensation claim, claims greater than two weeks compensated time loss

	2010/11 covered workers (thousands)*	Claimants (> 2 weeks' time loss)	Mean (SD) age in years	Female % (*n*)	Most common injury, % (*n*)	Most common industry, % (*n*)	Most common occupation, % (*n*)	Most advantaged quintile, % (*n*)	Most dis-advantaged quintile, % (*n*)
Entire dataset	9,833	94,675	42.1 (12.6)	37.5% (35,467)	MSK 42.9% (40,604)	HC/SA 15.6% (14,623)	Labourers 23.4% (22,095)	18.1% (14,589)	18.1% (14,542)
NSW	3,078	33,399	42.1 (12.6)	38.2% (12,767)	MSK 42.4% (14,165)	HC/SA 14.7% (4,896)	Labourers 20.2% (6,756)	21.2% (5,477)	19.9% (5,139)
VIC	2,577	18,965	43.2 (12.4)	36.8% (6,973)	MSK 42.4% (8,045)	Manufacturing 18.8% (3,573)	Labourers 23.8% (4,522)	18.4% (3,126)	15.7% (2,674)
QLD	1,900	21,722	41.3 (12.8)	37.6% (8,171)	MSK 53.9% (11,717)	HC/SA 15.8% (3,406)	Labourers 27.4% (5,910)	12.8% (2,787)	16.6% (3,605)
SA	719	6,402	42.8 (12.1)	41.6% (2,665)	MSK 48.2% (3,086)	HC/SA 24.0% (1,378)	Labourers 21.4% (1,371)	9.3% (455)	30.1% (1,466)
WA	1,098	9,195	41.7 (13.0)	33.1% (3,042)	Back pain/strains 40.9% (3,760)	HC/SA 15.8% (1,448)	Labourers 24.5% (2,257)	30.2% (2,186)	4.0% (290)
TAS	210	2,491	42.0 (12.3)	38.9% (969)	Back pains/strains 37.5% (935)	HC/SA 17.9% (445)	Labourers 31.8% (793)	3.3% (83)	49.0% (1,218)
NT	114	1,068	40.5 (13.3)	30.8% (329)	MSK 39.5% (422)	Public admin and safety 12.0% (123)	Labourers 23.2% (248)	18.5% (177)	15.4% (147)
ACT†	136	1,433	39.7 (12.6)	38.5% (551)	MSK 44.3% (635)	Construction 18.3% (262)	Tech/trade workers 20.4% (292)	86.4% (298)	0.9% (3)

SD: standard deviation; *n*: number; HC/SA: Healthcare and Social Assistance

*N workers covered by workers compensation in each jurisdiction. Data provided by Safe Work Australia [23]

†ACT is an amalgamation of claimants under private and government scheme management

Duration of compensated time loss

Table 2 and **Error! Reference source not found.** illustrate differences in compensated time loss durations between jurisdictions. Victorian and South Australian workers had longer average durations than workers from other jurisdictions. Injured workers from Queensland, Tasmania, and the Northern Territory had the shortest average durations. More than half of Victorian injured workers received time loss payments at 13 weeks (51%) compared to less than a third in Tasmania (31%). Differences in the proportion of injured workers receiving 52 or 104 weeks' compensation were even greater. Four times as many Victorian workers received compensation payments for 52 weeks than in Queensland (25% to 6%), and 16% in Victoria received 104 weeks of time loss payment compared to only 1% in Queensland.

Table 2. Duration of compensated time loss and proportion of injured workers reaching time loss milestones, by state or territory; claims greater than two weeks compensated time loss

	Mean compensated time loss in weeks (SD)	% off work at 4 weeks (*n*)	% off work at 13 weeks (*n*)	% off work at 26 weeks (*n*)	% off work at 52 weeks (*n*)	% off work at 104 weeks (*n*)
Total	30.5 (130.1)	77.8% (73,649)	40.6% (38,472)	25.5% (24,145)	15.5% (14,684)	8.4% (7,993)
NSW	33.9 (208.6)	74.7% (24,959)	39.2% (13,107)	25.4% (8,500)	16.3% (5,451)	9.5% (3,189)
VIC	43.8 (67.0)	85.2% (16,158)	50.7% (9,609)	35.7% (6,765)	24.9% (4,727)	16.0% (3,028)
QLD	15.4 (22.0)	76.1% (16,537)	33.6% (7,308)	16.1% (3,493)	5.6% (1,224)	1.0% (223)
SA	38.9 (60.2)	79.2% (5,068)	43.3% (2,773)	29.8% (1,910)	21.3% (1,366)	14.0% (894)
WA	24.5 (34.0)	78.2% (7,187)	42.5% (3,909)	26.9% (2,472)	15.0% (1,378)	4.4% (402)
TAS	20.4 (36.4)	73.2% (1,824)	31.3% (779)	17.2% (428)	10.1% (251)	4.9% (123)
NT	20.0 (29.6)	79.5% (849)	39.3% (420)	21.2% (226)	8.1% (86)	3.4% (36)
ACT	29.2 (65.9)	74.5% (1,067)	39.6% (567)	24.5% (351)	14.0% (201)	6.8% (98)

Recovery curves illustrate the substantial variation in time loss durations between jurisdictions. The curves for some jurisdictions (Tasmania, Queensland) are steep early while others, notably Victoria, are shallow early. The gradient of the curves in some jurisdictions (Northern Territory, Western Australia) are steeper over the longer durations relative to others. In Victoria at approximately 130 weeks duration there is a sharp downward trend,

consistent with the Victorian policy setting of ceasing income benefits at 130 weeks in all but the most seriously injured workers.

[Insert Figure 1 about here]

Regression analyses

Significant differences in outcomes were observed for factors including jurisdiction of claim, gender, age, injury type, occupation, industry, socio-economic status, remoteness. New South Wales was denoted as the comparator jurisdiction for regression analyses as it had the largest volume of cases. Adjusting for other factors, injured workers in Victoria, South Australia, and Australian Capital Territory were more likely to be off work (receiving income benefits) than New South Wales' workers at nearly every milestone. Workers in Tasmania were more likely than those in New South Wales to be back at work (off benefits) at all milestones. Workers in Queensland were more likely to be back at work than those in New South Wales at 13, 26, 52, and 104 weeks. Workers in Western Australia were less likely to be back at work than those in New South Wales at 4, 13, and 26 weeks but more likely to be back at work at 52 and 104 weeks. Workers in the Northern Territory were less likely than those in New South Wales to be at work at 4 weeks, but more likely at 52 and 104 weeks. Results are presented in the supplementary table.

Injured worker and employer characteristics had a significant impact on duration of compensated time loss. Female workers, older workers and workers from the most disadvantaged areas had longer time loss durations. Claims by workers from the most advantaged areas were generally of shorter duration. Workers from manual-labour industries, including agriculture, forestry, fishing, manufacturing, mining, and construction had longer durations when compared to the most common industry of healthcare and social assistance. Managers, professionals, technicians and trade workers, community and personal services workers and clerical/administrative workers were more likely to be at work (off benefits) at most milestones beyond 4 weeks.

Using musculoskeletal injury as the comparator, workers with mental health conditions were least likely to be off benefits (at work) at all time points. Workers with back pain/strains were initially less likely to reach the 4 week milestone, but more likely to reach all points between 26 and 104 weeks. Workers with fractures exhibited the opposite trend, being more likely to reach the 4 week milestone but less likely to reach all later milestones.

Standardised odds ratios

The ten variables with the greatest standardised odds ratios at each milestone are presented in Table 3. Jurisdiction becomes increasingly strong as both an absolute and relative factor in duration of compensated time loss. At four weeks there were three jurisdictions among the ten most important factors (Victoria, South Australia, and the Northern Territory) and their standardised ORs ranged between 33% and 67%. By 104 weeks, there were six jurisdictions among the top ten factors (South Australia, Western Australia, Tasmania, Queensland, Northern Territory and the Australian Capital Territory) with standardised ORs ranging between 66% and 975%.

Table 3. Ten factors with greatest impact on compensated time loss duration at each milestone

	Variables with largest impact as indicated by standardised Odds Ratio	Standardised Odds Ratio (99% CI)		Direction of effect on time loss duration
4 weeks	Mental health claim	87%	(66-110)	Longer
	Other trauma claim	71%	(61-81)	Shorter
	Victoria	**67%**	**(56-78)**	**Longer**
	Agriculture, forest, fishing industry	51%	(29-77)	Longer
	Construction industry	51%	(35-69)	Longer
	Fracture claim	46%	(35-59)	Longer
	Mining industry	43%	(20-71)	Longer
	South Australia	**38%**	**(24-54)**	**Longer**
	Aged 55+	38%	(28-48)	Longer
	Northern Territory	**33%**	**(6-67)**	**Longer**
13 weeks	Illness claim	131%	(111-153)	Shorter
	Other trauma claim	91%	(80-103)	Shorter
	Mental health claim	88%	(73-104)	Longer
	Tasmania	**56%**	**(38-66)**	**Shorter**
	Aged 55+	55%	(45-65)	Longer
	Construction industry	51%	(38-66)	Longer
	Aged 15-24	50%	(39-62)	Shorter
	Agriculture, forest, fishing industry	44%	(26-64)	Longer
	Mining industry	40%	**(21-62)**	Longer
	Aged 45-54	39%	(32-48)	Longer
26 weeks	Illness claim	157%	(129-188)	Shorter
	Mental health claim	93%	(77-110)	Longer
	Tasmania	**88%**	**(62-119)**	**Shorter**
	Other trauma claim	81%	(69-95)	Shorter
	Queensland	**78%**	**(67-89)**	**Shorter**
	Aged 55+	61%	(50-73)	Longer
	Aged 15-24	61%	(46-77)	Shorter
	Construction industry	58%	(42-76)	Longer
	Aged 45-54	50%	(40-60)	Longer
	ACT	**48%**	**(8-101)**	**Longer**
52 weeks	**Queensland**	**232%**	**(204-264)**	**Shorter**
	Illness claim	163%	(126-206)	Shorter
	Tasmania	**107%**	**(72-150)**	**Shorter**
	Northern Territory	**106%**	**(47-189)**	**Shorter**
	Aged 15-24	94%	(70-121)	Shorter
	Mental health claim	91%	(73-111)	Longer
	Very remote postcode	81%	(9-200)	Shorter
	ACT	**72%**	**(22-143)**	**Longer**
	Construction industry	70%	(49-93)	Longer
	Other trauma claim	62%	(48-77)	Shorter
104 weeks	**Queensland**	**975%**	**(801-1,199)**	**Shorter**
	Northern Territory	**183%**	**(72-365)**	**Shorter**
	Tasmania	**156%**	**(98-230)**	**Shorter**
	Illness claim	150%	(105-204)	Shorter
	Western Australia	**142%**	**(105-185)**	**Shorter**
	Aged 15-24	117%	(81-160)	Shorter
	ACT	**100%**	**(34-198)**	**Longer**
	Information media and telecommunications industry	86%	(27-174)	Longer
	Construction industry	85%	(56-118)	Longer
	South Australia	**66%**	**(47-87)**	**Longer**

DISCUSSION

This study of over 90,000 injured Australian workers presents evidence that the state or territory in which a work-related compensation claim is made has a substantial and independent impact on RTW timeliness as measured by compensated time away from work. This effect persists even after accounting for demographic, socio-economic, employment and

injury-related factors known to affect duration of compensated time loss. The magnitude of jurisdiction-level impacts on RTW was comparable to or greater than that of other factors such as aging and the presence of particular injuries or conditions.

Descriptive analysis and data visualisation using recovery curves highlight the substantial variation in RTW outcomes between Australian states and territories. In Queensland as few as 1% of injured workers continue to receive income benefits at two years post injury while the equivalent figure in Victoria is 16%. This variation was evident despite excluding cases of 'minor' injury resulting in less than two weeks' income loss in order to minimise the impact of jurisdictional compensation system eligibility.

The findings suggest that the design and management of public insurance schemes for injury compensation have a substantial effect on RTW outcomes for injured workers receiving income replacement benefits. Unlike some factors affecting claim duration such as SES or injury type, policy and practice are highly modifiable. Prior research has demonstrated that modifications to compensation scheme management practices such as claims handling can have a positive impact on outcomes in Australian injury compensation settings [24]. Internationally, changes to the macro-level design of injury compensation systems have produced substantial improvements in health outcomes [25]. The present findings suggest that similar changes to scheme design and management have the potential to substantially improve outcomes for injured workers in Australian states and territories.

Some individual compensation system policy settings have also been the subject of study. For example, level of compensation benefits has been positively associated with claim incidence rates and time-loss duration [25 26]. Some studies have also examined the impact of waiting/excess periods on workers' compensation outcomes, with waiting periods having a negative association with time away from work [26]. One study examined the impact of workers' compensation policies on RTW outcomes using a comparative, cross-jurisdictional paradigm in six countries [11]. With these exceptions there is very little comparative evidence of the relative effectiveness of different approaches to public insurance for work-related injury.

Study strengths include the large dataset encompassing the eight major workers' compensation jurisdictions in Australia. The variables within the dataset permitted regression analyses that controlled for many covariates known to influence RTW outcomes, enabling the isolation of the impact of jurisdiction on outcome. Limitations include the use of

administrative payment data (compensated time loss) as the RTW outcome metric. Compensated time loss generally underestimates the amount of time an injured worker is away from work [27]. Further, income benefit cessation does not necessarily reflect RTW but in some workers may indicate retirement, return to education or other outcomes. The dataset reports only the primary injury and thus does not enable analyses of the impact of co-morbid conditions or other conditions developing secondary to the primary work-related condition. Research suggests that some injured workers develop mental health conditions during compensation processes [28] but it was not possible to examine this.

The report also demonstrates that it is feasible to conduct comparative policy studies in Australian workers' compensation systems using existing administrative datasets. The associations between regression covariates and time loss durations replicate findings of prior research, providing confidence in the study methodology. Such associations include longer time loss durations for female and older claimants [29], manual labour occupations [30], and mental health claims [31].

In Australia, the federal and state governments have chosen workers' compensation systems as the primary means via which they seek to encourage return to work of injured workers. Variations on this approach are in place in most other industrialised and many developing nations. Workers' compensation policy is composed of myriad and complex rules, each of which can work to improve or worsen RTW outcomes for injured workers. This study provides evidence that in Australia, state and territory policy and practice have a significant impact on RTW outcomes. While this study does not identify specific policies and practices that improve or limit RTW, the findings justify further research in this area.

AUTHORS CONTRIBUTIONS

AC conceived the study and drafted the manuscript. TL conducted analyses and contributed to manuscript preparation. BHM, CM and JT contributed to analyses and manuscript preparation. All authors approved the final manuscript.

ACKNOWLEDGMENTS

The authors would like to thank Dr Peter Smith for his contribution to design of the analytic methods. The authors would also like to acknowledge the contribution of state and territory workers compensation agencies, and SafeWork Australia, through data provision.

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DATA SHARING STATEMENT

Data presented in this study is drawn from the National Dataset of Compensation Based Statistics (NDS), held by SafeWork Australia. Data was provided to the authors under a data sharing agreement that prohibits distribution to other parties. Those seeking access to the data should contact SafeWork Australia.

TABLE LEGEND

Table 1. Injured worker characteristics by state or territory of compensation claim, claims greater than two weeks compensated time loss

Table 2. Duration of compensated time loss and proportion of injured workers reaching time loss milestones, by state or territory; claims greater than two weeks compensated time loss

Table 3. Ten factors with greatest impact on compensated time loss duration at each milestone

Supplementary Table. Logistic regression outputs showing Odds Ratios [99% CI] of amount of compensated time loss following work-related injury

FIGURE LEGEND

Figure 1. Recovery curves illustrating duration of compensated time loss by state or territory, claims greater than two weeks compensated time loss

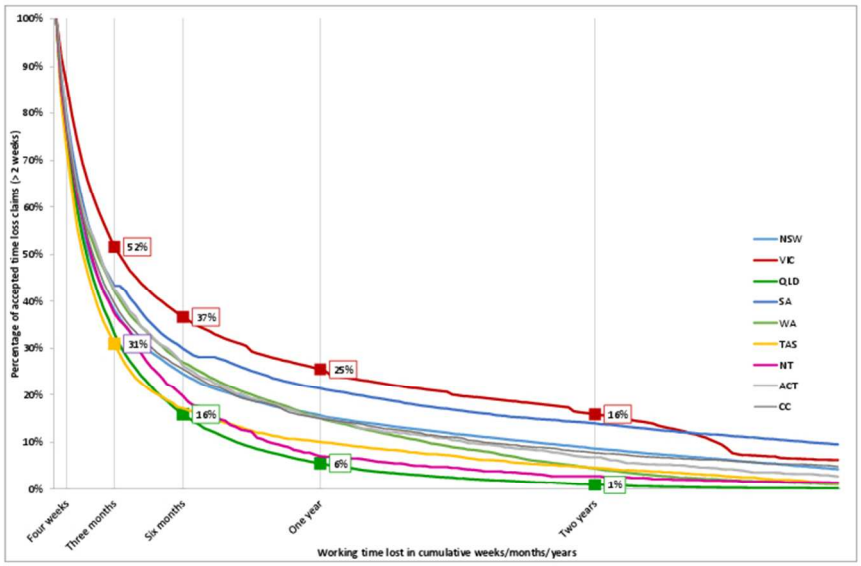

Figure 1. Recovery curves illustrating duration of compensated time loss by state or territory, claims greater than two weeks compensated time loss
303x234mm (72 x 72 DPI)

Supplementary Table. Logistic regression outputs showing Odds Ratios [99% CI] of amount of compensated time loss following work-related injury

Variables in equation	4 weeks	13 weeks	26 weeks	52 weeks	104 weeks
Jurisdiction (Reference: New South Wales)					
Victoria	1.67** (1.56-1.78)	1.34** (1.26-1.41)	1.30** (1.22-1.38)	1.28** (1.19-1.37)	1.33** (1.23-1.45)
Queensland	1.06* (1.00-1.13)	0.80** (0.76-0.84)	0.56** (0.53-0.60)	0.30** (0.28-0.33)	0.09** (0.08-0.11)
South Australia	1.38** (1.24-1.54)	1.25** (1.14-1.36)	1.32** (1.201.44)	1.46** (1.32-1.62)	1.66** (1.47-1.87)
Western Australia	1.30** (1.19-1.42)	1.22** (1.13-1.32)	1.12** (1.03-1.21)	0.90* (0.81-1.00)	0.41** (0.35-0.49)
Tasmania	0.86* (0.76-0.98)	0.64** (0.56-0.72)	0.53** (0.46-0.62)	0.48** (0.40-0.58)	0.39** (0.30-0.50)
Northern Territory	1.33** (1.05-1.66)	1.15 (1.15-1.39)	0.89 (0.71-1.12)	0.49** (0.40-0.58)	0.35** (0.22-0.58)
Australian Capital Territory	1.38 (0.96-1.97)	1.37* (1.03-1.84)	1.48** (1.08-2.01)	1.72** (1.22-2.43)	2.00** (1.34-2.98)
Gender (Reference: male)					
Female	1.26** (1.18-1.34)	1.29** (1.22-1.36)	1.29** (1.22-1.37)	1.27** (1.18-1.36)	1.22** (1.12-1.34)
Age (Reference: 26 to 35 years)					
15 to 24 years	0.79** (0.73-0.85)	0.67** (0.62-0.72)	0.62** (0.56-0.69)	0.52** (0.45-0.59)	0.46** (0.39-0.55)
35 to 44 years	1.21** (1.13-1.29)	1.28** (1.21-1.36)	1.40** (1.31-1.50)	1.44** (1.33-1.57)	1.45** (1.30-1.62)
45 to 54 years	1.30** (1.22-1.39)	1.39** (1.32-1.48)	1.50** (1.40-1.60)	1.53** (1.41-1.67)	1.54** (1.38-1.72)
55 years and over	1.38** (1.28-1.48)	1.55** (1.45-1.65)	1.61** (1.50-1.73)	1.60** (1.46-1.75)	1.57** (1.39-1.76)
Advantage/dis-advantage					
Most dis-advantaged quintile	1.07* (1.00-1.14)	1.11** (1.05-1.17)	1.15** (1.08-1.22)	1.19** (1.11-1.27)	1.20** (1.10-1.31)
Most advantaged quintile	0.94* (0.88-1.00)	0.87** (0.82-0.91)	0.84** (0.79-0.90)	0.79** (0.73-0.85)	0.79** (0.71-0.87)
Remoteness (Reference: Major city)					
Inner region	1.02 (0.96-1.08)	0.95* (0.90-1.00)	0.93** (0.88-0.98)	0.93 (0.87-1.00)	0.97 (0.88-1.06)
Outer region	0.99 (0.91-1.07)	0.92* (0.86-0.99)	0.92* (0.85-1.00)	0.91 (0.82-1.01)	0.96 (0.84-1.10)
Remote	0.96 (0.78-1.19)	0.82* (0.69-0.99)	0.85 (0.69-1.05)	0.84 (0.64-1.10)	0.71 (0.47-1.09)
Very remote	1.17 (0.85-1.63)	0.85 (0.65-1.11)	0.74 (0.53-1.03)	0.55* (0.33-0.92)	0.65 (0.30-1.38)

*: $p \leq .01$; **: $p \leq .001$

	4 weeks	13 weeks	26 weeks	52 weeks	104 weeks
Part time/Full time (Reference: Part time)					
Full time	1.05 (0.99-1.11)	1.01 (0.96-1.06)	0.98 (0.93-1.04)	1.02 (0.95-1.09)	1.06 (0.96-1.16)
Industry (Reference: Health care and social assistance)					
Agriculture, forestry, and fishing	1.51** (1.29-1.77)	1.44** (1.26-1.64)	1.36** (1.17-1.58)	1.35** (1.12-1.63)	1.59** (1.25-2.01)
Mining	1.43** (1.20-1.71)	1.40** (1.21-1.62)	1.38** (1.17-1.64)	1.45** (1.18-1.78)	1.43** (1.08-1.90)
Manufacturing	1.13* (1.02-1.25)	1.13** (1.03-1.23)	1.18** (1.07-1.30)	1.27** (1.13-1.43)	1.37** (1.176-1.59)
Electricity, gas, water, and waste services	1.04 (0.82-1.31)	1.03 (0.83-1.27)	0.96 (0.75-1.24)	0.91 (0.66-1.25)	0.96 (0.63-1.46)
Construction	1.51** (1.35-1.69)	1.51** (1.38-1.66)	1.58** (1.42-1.76)	1.70** (1.49-1.93)	1.85** (1.56-2.18)
Wholesale trade	1.15* (1.01-1.31)	1.28** (1.15-1.43)	1.40** (1.23-1.58)	1.53** (1.32-1.77)	1.65** (1.38-1.98)
Retail trade	1.15* (1.02-1.30)	1.15** (1.04-1.28)	1.19** (1.06-1.34)	1.28** (1.11-1.47)	1.44** (1.20-1.74)
Accommodation and food services	1.21** (1.07-1.36)	1.21** (1.09-1.34)	1.24** (1.10-1.40)	1.31** (1.13-1.52)	1.48** (1.22-1.79)
Transport, postal, and warehousing	1.10 (0.98-1.24)	1.08 (0.97-1.19)	1.09 (0.97-1.23)	1.14 (0.99-1.32)	1.16 (0.97-1.40)
Information media and telecommunications	0.98 (0.73-1.30)	1.15 (0.89 -1.49)	1.35* (1.02 -1.79)	1.44* (1.04-2.00)	1.86** (1.27-2.74)
Financial and insurance services	1.16 (0.91-1.48)	1.16 (0.95-1.42)	1.01 (0.81-1.27)	1.03 (0.78-1.35)	0.97 (0.67-1.41)
Rental, hiring, and real estate services	1.20 (0.96-1.51)	1.18 (0.97-1.43)	1.14 (0.92-1.42)	1.34* (1.04-1.73)	1.31* (0.94-1.84)
Professional, scientific, and tech services	1.13 (0.96-1.34)	1.16* (1.01-1.34)	1.21* (1.03-1.42)	1.19 (0.98-1.45)	1.19 (0.92-1.55)
Administrative and support services	1.21** (1.07-1.37)	1.33** (1.19-1.48)	1.37** (1.21-1.54)	1.40** (1.21-1.63)	1.47** (1.21-1.78)
Public administration and safety	0.97 (0.86-1.10)	1.01 (0.91-1.12)	1.00 (0.89-1.12)	0.99 (0.86-1.15)	0.94 (0.77-1.15)
Education and training	0.88* (0.78-0.99)	0.92 (0.83-1.02)	0.90 (0.80-1.02)	0.95 (0.81-1.10)	1.08 (0.88-1.33)
Arts and recreation services	1.29** (1.06-1.58)	1.11 (0.94-1.31)	1.00 (0.82-1.22)	1.07 (0.83-1.36)	1.12 (0.81-1.54)
Other services	1.23** (1.06-1.43)	1.24** (1.10-1.41)	1.28** (1.11-1.47)	1.36** (1.15-1.62)	1.45** (1.16-1.81)

*: $p \leq .01$; **: $p \leq .001$

	4 weeks	13 weeks	26 weeks	52 weeks	104 weeks
Occupation (Reference: labourers)					
Managers	1.00 (0.89-1.12)	0.89* (0.81-0.98)	0.86** (0.77-0.96)	0.87* (0.76-0.99)	0.87 (0.73-1.03)
Professionals	0.99 (0.90-1.09)	0.91* (0.84-0.99)	0.86** (0.78-0.94)	0.81** (0.72-0.91)	0.82** (0.70-0.95)
Technicians and trades workers	0.92** (0.86-0.98)	0.90** (0.84-0.95)	0.90** (0.84-0.96)	0.87** (0.80-0.95)	0.91 (0.81-1.01)
Community and personal service workers	0.96 (0.88-1.05)	0.89** (0.82-0.96)	0.87** (0.80-0.95)	0.87** (0.78-0.96)	0.90 (0.78-1.03)
Clerical and administrative workers	0.98 (0.87-1.11)	0.86** (0.78-0.95)	0.86** (0.77-0.96)	0.87* (0.76-0.99)	0.87 (0.73-1.03)
Sales workers	0.98 (0.87-1.11)	0.92 (0.83-1.02)	0.91 (0.81-1.02)	0.91 (0.79-1.05)	0.85 (0.71-1.02)
Machinery operators and drivers	1.04 (0.96-1.13)	1.01 (0.95-1.08)	1.00 (0.93-1.08)	0.94 (0.86-1.04)	0.96 (0.85-1.07)
Injury/illness (Reference: musculoskeletal injuries					
Fractures	1.46** (1.35-1.59)	0.86** (0.80-0.91)	0.77** (0.71-0.83)	0.76** (0.69-0.83)	0.71** (0.63-0.80)
Other trauma	0.59** (0.55-0.62)	0.52** (0.49-0.56)	0.55** (0.51-0.59)	0.62** (0.57-0.68)	0.62** (0.55-0.69)
Back pains/strains	0.89** (0.84-0.95)	0.99 (0.93-1.05)	1.07* (1.01-1.14)	1.13** (1.05-1.22)	1.14** (1.04-1.25)
Mental health disorders	1.87** (1.66-2.10)	1.88** (1.73-2.04)	1.93** (1.77-2.10)	1.91** (1.73-2.11)	1.46** (1.29-1.66)
Other diseases	0.85** (0.77-0.93)	0.43** (0.40-0.47)	0.39** (0.35-0.44)	0.38** (0.33-0.44)	0.40** (0.33-0.49)

*: $p \leq .01$; **: $p \leq .001$

BMJ Open

Does time off work after injury vary by jurisdiction? A comparative study of eight Australian workers' compensation systems.

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2015-010910.R1
Article Type:	Research
Date Submitted by the Author:	29-Feb-2016
Complete List of Authors:	Collie, Alex; Monash University, Institute for Safety Compensation and Recovery Research Lane, Tyler; Monash University, Institute for Safety Compensation and Recovery Research Hassani-Mahmooei, Behrooz; Monash University, Institute for Safety Compensation and Recovery Research Thompson, Jason; Monash University, Institute for Safety Compensation and Recovery Research McLeod, Christopher; University of British Columbia, School of Population and Public Health
Primary Subject Heading:	Public health
Secondary Subject Heading:	Health policy, Epidemiology
Keywords:	return to work, workers compensation, injury, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, OCCUPATIONAL & INDUSTRIAL MEDICINE

Does time off work after injury vary by jurisdiction? A comparative study of eight Australian workers' compensation systems.

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Abstract word count: 284
Word count: 3,045
Number of tables: 3
Number of figures: 1
Key words: Return-to-Work; Workers' Compensation; Health Policy; Work-Related Injury
(Up to five key words)

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ABSTRACT

Objectives: To determine whether the jurisdiction in which a work-related injury compensation claim is made is an independent predictor of duration of time off work following work injury and if so, the magnitude of the effect.

Setting: Eight Australian state and territory workers' compensation systems, providing coverage for more than 90% of the Australian labour force. Administrative claims data from these systems was provided by government regulatory authorities for the study.

Participants: 95,976 Australian workers with workers' compensation claims accepted in 2010 and with at least two weeks of compensated time off work.

Primary Outcome Measure: Duration of time lost from work in weeks, censored at 104 weeks.

Results

After controlling for demographic, worker, injury and employer factors in a cox regression model, significant differences in duration of time loss between state and territory of claim were observed. Compared to New South Wales: workers in Victoria and South Australia had significantly longer durations of time off work and were more likely to be receiving income benefits at 104 weeks post injury, while workers in Tasmania and Queensland had significantly shorter durations of time of work. The magnitude of jurisdiction effects on duration of time loss were equivalent to or greater than that identified for other factors such as injury type, age, gender, occupation and socio-economic status.

Conclusions

The state or territory in which a worker is injured and makes a workers' compensation claim has a significant and independent impact on duration of time loss following work injury and illness. Further research is necessary to identify specific compensation system policies and practices that promote timely and appropriate return to work and seek to reduce duration of time off work.

ARTICLE SUMMARY

Strengths and limitations of the study

- Use of population-based data from eight of nine Australian workers' compensation jurisdictions, covering more than 90% of the Australian labour force.
- Ability to account for factors, other than jurisdiction of claim, that are known to impact on return to work outcomes including age, gender, occupation, injury type and socioeconomic status.
- Use of income replacement duration as a proxy for return to work outcomes produces some uncertainty in estimates.

‘

INTRODUCTION

There are an estimated 4.8 million deaths from injury annually, accounting for over 10 percent of the total global burden of disease, with 973 million people sustaining injury that resulted in access to healthcare [1]. In the sphere of work injury, the International Labour Organisation [2] has estimated that there are 2.3 million fatalities and a further 313 million injuries arising from work-related accidents annually. These figures underestimate the true burden of work-related injury and illness as they exclude the substantial additional burden of occupational diseases and work-related mental health conditions.

Work injury results in changes to physical and mental health, quality of life, and a reduced ability to participate in society and the labour market [3-5]. Extended periods of workless-ness can have a negative impact on health [5]. Work injury may have flow on effects such as increasing the risk of marital separation [6] and has been associated with poorer health of family members [7].

Most industrialised and developing nations have public insurance systems that compensate injured workers for periods of time away from work, and seek to promote effective rehabilitation and return to work [8]. There is substantial international variation in the design and management of these systems [9]. Differences between jurisdictions include the proportion of the labour market covered, caps and time period limits on wage replacement, access to treatment and rehabilitation and time limits on benefit periods, among others [10]. This diversity in system design and policy presents an opportunity for comparative research to identify the most effective policy settings for minimising duration of work disability.

Prior research has established the association between return to work outcome and a range of biological/physical, psychological, social and demographic factors. These include worker characteristics including age [11] and gender [12], injury characteristics including type of injury [13], workplace level factors [14] and psychological factors including self-efficacy [15] and pain catastrophizing [16]. Globally, very little quality evidence regarding the relative impact of compensation system policy on duration of work disability has been published [17]. One study examining return to work outcomes in cohorts of workers with lower back pain from six countries identified that access to long-term disability benefits and the degree of impairment required to access such benefits were independently associated with the sustainability of return to work [17]. Another study across forty-nine states of the USA identified that waiting periods for wage replacement and policies around access to medical treatment were

independently associated with duration of disability in workers with lower back pain [18]. A systematic review identified that many studies of health and recovery outcomes in those with compensable injury fail to report even basic characteristics of the compensation system [9].

In Australia, more than half a million workers were injured at work in the 2013/14 financial year [19], equating to 4.3% of the labour force. The societal cost of work injury has been estimated at $60.6 billion per annum, or 4.8% of GDP [20]. Commonwealth and state governments in Australia have established an array of workers' compensation systems with the objective of returning injured workers to the workforce while minimising the costs of rehabilitation to society [10]. These are predominantly geographically based in the six states and two territories, In addition there are two commonwealth workers compensation systems [10]. All of these compensation schemes provide income replacement, healthcare and rehabilitation support to eligible injured workers. Amongst the Australian systems, there is a diversity of policy approaches. The schemes differ on multiple aspects including their coverage (e.g., industries and workers covered); entitlements (e.g., included injuries and illnesses); benefits (e.g., minimum and maximum levels and duration); rehabilitation (e.g., early RTW, access to support); health care (e.g., access to and coverage); administration (e.g., appeal procedures, oversight mechanisms); financing (e.g., who pays, experience rating); and job protection (e.g., duration of protection, employer obligation to accommodate injured worker) [10]. These are all factors that have been identified as important to fairness of coverage and outcomes for injured workers [21], and provide an opportunity to study the relative impact of different policy approaches on outcomes including RTW.

This study is the first in a planned series of analyses of a newly established national research dataset of workers' compensation outcomes. The objective of this study is to determine whether the Australian state or territory in which an injured worker receives compensation is an independent predictor of the duration of time off work and if so, to determine the magnitude of this effect. Should a significant and independent effect of jurisdiction be observed, subsequent analyses will examine the contribution of specific policy settings to duration of work disability.

METHODS

Setting

In December 2010, the year of focus for this study, Australia had a labour force of 11.42 million workers. The vast majority of Australian workers are covered by compulsory workers'

compensation insurance regulated by state, territory and commonwealth government authorities. Eight of the ten major Australian compensation systems are included in this study, including the states of New South Wales, Victoria, Queensland, Western Australia, South Australia, Tasmania and the Northern Territory. In addition the Comcare scheme covering commonwealth government employees, government employees of the Australian Capital Territory (ACT) and more than 30 large national firms was included. Claims arising from private sector organisations in the ACT and from the military are covered by compensation systems for which data was not available.

The systems share many common features. They provide coverage for employees of working age within the relevant jurisdiction. Many common work-related physical conditions are eligible for compensation, including acute traumatic injuries and chronic or gradual onset conditions (e.g., chronic low back pain). Some diseases are also compensable and each jurisdiction maintaining a list of eligible occupational diseases. Most jurisdictions also accept 'psychological injury' or mental health claims, where there is a demonstrable link betweene the mental health condition and the workplace. Benefits provided by the compensation systems typically include healthcare expenses and income replacement payments to injured workers for the period of time they are off work. The Australian systems often also pay costs associated with occupational or vocational rehabilitation and re-training. Some injured workers with a permanent injury or disability may also be eligible to receive lump sum payments. Healthcare and other medical expenses are typically provided on the basis that they are 'reasonable and necessary' as determined by the claims management organisation. Income replacement payments are usually capped at a percentage of the workers pre-injury earnings.

The process of making a workers' compensation claim is largely consistent between jurisdictions. Workers who have incurred an injury at work and are intending to make a workers' compensation claim must provide their employer, and in some cases their insurer, with information about their injury. This information, captured on a 'claim form', must be accompanied by a medical certificate from a General Practitioner or other qualified medical practitioner. The employer must then notify the claims management organisation of the claim within a specified time, and the claims management organisation usually has a period of time to determine whether the claim is eligible for workers compensation benefits under the legislation, and to accept or deny the claim.

Despite their similarities, there are also many areas in which Australian workers' compensation jurisdiction vary in policy and practice. A detailed description of these is out of scope for this study, however it is useful to identify some of the major structural and functional differences as context to the study. There are differences relating to the waiting period for access to compensation. Victoria and South Australia each have a ten day waiting period during which the employer is required to provide income replacement. The other states and territories have waiting period of zero or one day. The relationship of claims management or insurance function to the regulation function also differs. Comcare is both the government regulator and claims manager. Queensland has a single major insurer for the majority of claims that is separate from the system regulator. South Australia has two private sector insurers that manage claims on behalf of the state regulator. Victoria has five private sector insurers managing claims that are separate to the regulator. There are differences relating to the rate and duration of income replacement. Most jurisdictions have provide 100% of pre-injury average weekly earnings (PIAWE) during the first three to six months of time loss, while Queensland covers 85% for the first six months, and New South Wales and Victoria cover 95% for three months before dropping to 80%. The Victorian scheme caps the duration of income replacement at 130 weeks, whereas there are longer period in the other states. Under the Comcare scheme income benefits may be payable until the worker reaches the national retirement age of 65. These types of policy settings change routinely, within jurisdictions. In 2012 there were some major structural reforms to the New South Wales workers compensation system that restricted access to compensation and to benefits. In 2015 the South Australian government introduced new workers compensation legislation that radically changed the design of that state's workers compensation system. A detailed description of the policy settings and changes within jurisdictions is published annually by Safe Work Australia [10].

Data sources

Annually the Australian workers' compensation authorities contribute case-level claims data to the National Dataset of Compensation-based Statistics (NDS), compiled by Safe Work Australia[22]. A total of 305,774 cases of compensated work injury occurring in the 2010 calendar year were extracted from the NDS.

Cases were excluded if the worker was aged less than 15 years or greater than 80 years (N=20 excluded); if the NDS indicated they had worked less than 1 or more than 100 hours per week prior to injury (N=63,225). Cases arising from the ACT private systems were

removed due to that jurisdiction not reporting post-code data necessary for calculation of some predictors (N=4,669). To ensure comparable jurisdictional-level cohorts were established, cases with two weeks or less time loss were removed to account for jurisdictional variation in compensation system criterion for claim acceptance (both Victoria and South Australia have employer excess periods of two weeks, during which employers typically cover income replacement payments – N=141,615). Finally a number of duplicate cases were also removed (N=39). Following application of inclusion and exclusion criteria, a total of 95,976 cases remained for analyses.

Outcome variables

The primary outcome was duration of time lost, measured as the cumulative number of weeks compensation paid. Cumulative duration is considered an appropriate estimate of time off work when using administrative data[23]. Duration was calculated by dividing the number of hours compensated by the number of pre-injury work hours per week to produce the number of compensated weeks. The dataset included claims information to June 2014, providing a maximum 4.5 year period of follow up. For each case in the data set duration was censored at a maximum of 104 weeks time loss, consistent with our prior analyses on similar datasets [12 24].

Independent variables

Factors have previously been associated with duration of work disability including age, gender, occupation, industry, socioeconomic status, remoteness, and injury type, were derived from the NDS dataset for inclusion in the analyses. Age refers to worker age at the time of injury/disease onset. Occupation was classified into nine occupation group codes using the Australian and New Zealand Standard Classification of Occupations (ANZSCO) [25]. Industry was classified according to the Australian and New Zealand Standard Industrial Classification (ANZSIC) [26].

Nature of injury was classified using a modification of the Type of Occurrence Classification System (TOOCS) version 3 [27]. Quality assurance analyses of the dataset identified inconsistencies between jurisdictions in application of TOOCS coding, creating discrepancies in some categories, particularly musculoskeletal injuries and trauma. These could not be fully attributed to regional variations in injury type and likely reflected variations in coding practices that could not be controlled statistically. To account for this issue a modified injury coding system was developed that collapsed chronic and traumatic musculoskeletal injuries

into a single category. Categories related to fractures, mental health conditions and diseases were retained.

Postcode was linked to the Accessibility/Remoteness Index of Australia (ARIA)[28 29], an indicator for remoteness, and the Index of Relative Socio-Economic Disadvantage (ISRD)[30], an indicator of socio-economic status (SES). ARIA classifies postcodes into five categories: major cities, inner regional, outer regional, remote, and very remote. ISRD classifies postcodes into ranked deciles. The highest and lowest two quintiles were grouped into categories of the least and most advantaged quintiles, which were compared to the middle three quintiles. Workers were classified as part-time if their recorded pre-injury number of working hours was less than 35 per week. Workers with 35 or more hours work per week pre-injury were classified as full-time.

Jurisdiction was the final predictor and was categorised as the compensation system in which the claim was accepted. As described above, these are typically organised geographically according to state or territory of injury, with the exception of the Comcare scheme which has national coverage of employees of the federal government and approximately 35 large national corporations.

Analysis

Injured worker characteristics and median duration of time loss in weeks were summarised nationally and for each jurisdiction. Predictor variables were tested for association with the outcome variable (duration of time loss) in univariate cox regression. Nonparametric tests (Kruskal-Wallis for categorical [dichotomous], Mann-Whitney for categorical [>2 categories], and Spearman rank [ordered categorical]) were used to assess associations.

Predictors that were significantly associated with duration of time loss were included in a stepwise Cox Regression model. All predictor variables, with the exception of jurisdiction, were entered into the model in the first step. Jurisdiction was added in the second step to determine whether it added any explanatory power to the model, and how it affected associations with other predictor variables. Cases exceeding 104 weeks of time loss were right-censored. Outputs are reported as adjusted Hazard Ratio (HR) with 99% Confidence Interval (CI).

Duration of time loss was plotted in a survival curve to illustrate the proportion of injured workers receiving compensation over time and differences by jurisdiction. The survival curve is derived from the Cox Regression and controls for covariates. Data manipulations and

descriptive analyses were conducted in SPSS v22, with p-values of ≤ 0.01 considered significant.

Ethics

This study received ethics approval from the Monash University Human Research Ethics Committee (MUHREC) on 8 October 2014.

RESULTS

Participant characteristics

Participant characteristics are presented in Table 1. Western Australia (33.1%) and the Northern Territory (30.8%) had a smaller proportion of injured female workers than the national average (37.6%), while Comcare was much higher at 44.6%. Non-fracture physical health injuries were similarly common at around ¾ of claimants in each, though the distribution of mental health injury claims varied substantially; Comcare (14.6%), Tasmania (11.5%) and Victoria (10.2%) had the highest proportion of claims for mental health conditions, while Western Australia had the lowest (3.3%). Manufacturing was the most common employer industry in Victoria (18.8%), public administration and safety in the Northern Territory (12.0%), and construction in the clerical and administrative workers in Comcare (50.9%). Healthcare and social assistance was the most common industry overall (15.3%). Socio-economically advantaged postcodes were over-represented in Comcare (38.8%) and Western Australia (30.2%), whilst disadvantaged postcodes were overrepresented in South Australia (30.1%) and Tasmania (49.0%).

Table 1. Injured worker characteristics by state or territory of compensation claim

	2010/11 covered workers (thousands)*	Workers (> 2 weeks' time loss)	Mean (SD) age in years	Female % (*n*)	Mental health condition, % (*n*)	Most common industry, % (*n*)	Most common occupation, % (*n*)	Most advantaged quintile, % (*n*)	Most dis-advantaged quintile, % (*n*)
Entire dataset	10,096	95,976	42.2 (12.6)	37.6% (36,134)	7.7% (7,349)	HC/SA 15.3% (14,491)	Labourers 22.9% (21,973)	18.5% (15,347)	17.9% (14,799)
New South Wales	3,078	33,399	42.1 (12.6)	38.2% (12,767)	8.1% (2,709)	HC/SA 14.7% (4,896)	Labourers 20.2% (6,756)	21.2% (5,477)	19.9% (5,139)
Victoria	2,577	18,965	43.2 (12.4)	36.8% (6,973)	10.2% (1,930)	Manufacturing 18.8% (3,573)	Labourers 23.8% (4,522)	18.4% (3,126)	15.7% (2,674)
Queensland	1,900	21,722	41.3 (12.8)	37.6% (8,171)	4.8% (1,032)	HC/SA 15.8% (3,406)	Labourers 27.4% (5,910)	12.8% (2,787)	16.6% (3,605)
South Australia	719	6,402	42.8 (12.1)	41.6% (2,665)	9.6% (616)	HC/SA 24.0% (1,378)	Labourers 21.4% (1,371)	9.3% (455)	30.1% (1,466)
Western Australia	1,098	9,195	41.7 (13.0)	33.1% (3,042)	3.3% (308)	HC/SA 15.8% (1,448)	Labourers 24.5% (2,257)	30.2% (2,186)	4.0% (290)
Tasmania	210	2,491	42.0 (12.3)	38.9% (969)	11.5% (286)	HC/SA 17.9% (445)	Labourers 31.8% (793)	3.3% (83)	49.0% (1,218)
Northern Territory	114	1,068	40.5 (13.3)	30.8% (329)	6.4% (68)	Public admin and safety 12.0% (128)	Labourers 23.2% (248)	18.5% (177)	15.4% (147)
Comcare	400	2,734	46.0 (10.1)	44.6% (1,218)	14.6% (400)	HC/SA 15.3% (1,557)	Clerical and administrative 50.9% (1,392)	38.8% (1,056)	9.5% (260)

SD: standard deviation; *n*: number; HC/SA: Healthcare and Social Assistance.
**N* workers covered by workers compensation in each jurisdiction. Data provided by Safe Work Australia[31].

Duration of compensated time loss

Table 2 presents summary statistics on duration of time loss between jurisdictions. Median time loss across the entire sample was 9.2 weeks (IQR: 4.2 to 26.6). Victoria (13.2 weeks) and South Australia (10.0 weeks) had the longest median durations, while Tasmania (7.1 weeks) and Queensland (7.8 weeks) had the shortest. Differences were also reflected in the proportion of claims that received at least two years' compensated time loss: 14.0% of cases in South Australia and 16.0% in Victoria received at least 104 weeks compensated time loss, compared to 1.0% of accepted claims in Queensland.

Table 2. Duration of compensated time loss by jurisdiction.

Jurisdiction	N (col %) workers included	Weeks time loss		N (row %) off work at 104 weeks
		Median	IQR	
Total	95,976 (100%)	9.2	(4.2 - 26.6)	8127 (8.5%)
New South Wales	33,399 (34.8%)	8.5	(3.9 - 26.6)	3189 (9.5%)
Victoria	18,965 (19.8%)	13.2	(5.6 - 51.6)	3028 (16.0%)
Queensland	21,722 (22.6%)	7.8	(4.0 - 17.6)	223 (1.0%)
South Australia	6,402 (6.7%)	10.0	(4.6 - 39.3)	894 (14.0%)
Western Australia	9,915 (10.3%)	9.8	(4.2 - 29.0)	402 (4.4%)
Tasmania	2,491 (2.6%)	7.1	(3.8 - 16.3)	123 (4.9%)
Northern Territory	1,068 (1.1%)	9.0	(4.4 - 22.2)	36 (3.4%)
Comcare	2,734 (2.8%)	8.9	(4.1 – 26.4)	232 (8.5%)

IQR = interquartile range.

Cox regression analysis

In univariate analyses all independent variables were significantly associated with the outcome variable at the $p<0.01$ level, and as such were entered into the multivariate model. Cox regression models included 82,475 cases, 6,667 (8.1%) of which were censored for having time loss durations that exceeded 104 weeks; 13,501 (14.1%) cases were excluded as they did not report post-code data necessary for calculation of remoteness and socio-economic state predictors. Results of the final Cox proportional hazards model are reported in Table 3.

Table 3. Factors associated with duration of time loss (weeks). Model 1 includes all predictors excluding jurisdiction while model 2 includes jurisdiction.

	Model 1			Model 2		
Variables in equation	Hazard Ratio	(99% CI)	*p*-Value	Hazard Ratio	(99% CI)	*p*-Value
Jurisdiction (Reference: New South Wales)						
Victoria				0.84	(0.82 - 0.86)	< .001
Queensland				1.34	(1.30 - 1.37)	< .001
South Australia				0.78	(0.74 - 0.81)	< .001
Western Australia				1.01	(0.98 - 1.05)	.430
Tasmania				1.32	(1.25 - 1.40)	< .001
Northern Territory				1.09	(1.00 - 1.20)	.012
Commonwealth Comcare				0.98	(0.92 – 1.04)	.375
Gender (Reference: male)						
Female	0.86	(0.84 - 0.88)	< .001	0.86	(0.84 - 0.89)	< .001
Age (Reference: 25 to 34 years)						
15 to 24 years	1.29	(1.25 - 1.34)	< .001	1.29	(1.25 - 1.34)	< .001
35 to 44 years	0.84	(0.82 - 0.87)	< .001	0.85	(0.82 - 0.87)	< .001
45 to 54 years	0.81	(0.78 - 0.83)	< .001	0.81	(0.79 - 0.84)	< .001
55 years and over	0.78	(0.75 - 0.80)	< .001	0.79	(0.77 - 0.82)	< .001
Advantage/dis-advantage						
Most dis-advantaged quintile	0.93	(0.91 - 0.95)	< .001	0.94	(0.92 - 0.96)	< .001
Most advantaged quintile	1.07	(1.04 - 1.10)	< .001	1.09	(1.67 - 1.11)	< .001
Remoteness (Reference: Major city)						
Inner region	1.06	(1.03 - 1.08)	< .001	1.02	(1.00 - 1.05)	.028
Outer region	1.12	(1.08 - 1.15)	< .001	1.04	(1.00 - 1.07)	.010
Remote	1.13	(1.04 - 1.23)	< .001	1.09	(1.00 - 1.19)	.007
Very remote	1.22	(1.08 - 1.38)	< .001	1.10	(0.97 - 1.24)	.063
Part time/Full time (Reference: Part time)						
Full time	0.96	(0.94 - 0.99)	< .001	0.99	(0.96 - 1.01)	.156
Employer industry (Reference: Health care and social assistance)						
Agriculture, forestry, and fishing	0.83	(0.78 - 0.88)	< .001	0.82	(0.77 - 0.87)	< .001
Mining	0.83	(0.77 - 0.89)	< .001	0.81	(0.75 - 0.88)	< .001
Manufacturing	0.91	(0.87 - 0.94)	< .001	0.91	(0.87 - 0.95)	< .001
Electricity, gas, water, and waste services	1.01	(0.92 - 1.12)	.739	0.98	(0.88 - 1.08)	.541
Construction	0.77	(0.74 - 0.81)	< .001	0.77	(0.73 - 0.81)	< .001
Wholesale trade	0.82	(0.77 - 0.86)	< .001	0.83	(0.79 - 0.88)	< .001
Retail trade	0.92	(0.87 - 0.96)	< .001	0.88	(0.84 - 0.93)	< .001
Accommodation and food services	0.93	(0.89 - 0.98)	< .001	0.89	(0.85 - 0.94)	< .001
Transport, postal, and warehousing	0.94	(0.90 – 0.99)	.002	0.93	(0.88 - 0.98)	< .001
Information media and telecommunications	0.86	(0.76 - 0.98)	.002	0.86	(0.76 - 0.98)	.002
Financial and insurance services	1.00	(0.90 - 1.10)	.915	0.97	(0.88 - 1.07)	.378
Rental, hiring, and real estate services	0.90	(0.82 - 0.98)	.002	0.90	(0.82 - 0.99)	.004
Professional, scientific, and tech services	0.92	(0.85 - 0.98)	.001	0.90	(0.84 - 0.97)	< .001
Administrative and support services	0.88	(0.83 - 0.92)	< .001	0.85	(0.80 - 0.89)	< .001
Public administration and safety	1.03	(0.98 - 1.08)	.145	0.99	(0.94 - 1.04)	.614
Education and training	1.08	(1.03 - 1.14)	< .001	1.03	(0.98 - 1.08)	.151
Arts and recreation services	0.91	(0.84 – 0.99)	.003	0.93	(0.86 - 1.01)	.021
Other services	0.87	(0.82 - 0.92)	< .001	0.86	(0.81 - 0.92)	< .001
Occupation (Reference: labourers)						
Managers	1.05	(1.00 - 1.11)	.005	1.08	(1.03 - 1.14)	< .001
Professionals	1.05	(1.01 - 1.09)	.003	1.07	(1.02 - 1.11)	< .001
Technicians and trades workers	1.07	(1.03 - 1.10)	< .001	1.08	(1.05 - 1.11)	< .001
Community and personal service workers	1.04	(1.00 - 1.08)	.011	1.04	(1.00 - 1.08)	.005
Clerical and administrative workers	1.06	(1.02 - 1.11)	< .001	1.07	(1.03 - 1.12)	< .001
Sales workers	1.06	(1.00 - 1.11)	.006	1.07	(1.01 - 1.12)	.001
Machinery operators and drivers	1.00	(0.96 - 1.03)	.672	1.00	(0.97 - 1.04)	.772
Injury/illness (Reference: physical injuries, excluding fractures)						
Fractures	1.01	(0.98 - 1.04)	.612	0.99	(0.97 - 1.02)	.572
Mental health conditions	0.66	(0.64 - 0.69)	< .001	0.68	(0.65 - 0.71)	< .001
Other diseases	1.40	(1.34 - 1.45)	< .001	1.39	(1.34 - 1.44)	< .001

All predictor variables demonstrated significant associations with duration of time loss, in both the initial model (excluding jurisdiction) and the final model. In the final model, female workers (HR: 0.86; CI [99%]: 0.84-0.89) had significantly longer duration than male worekrs. Injured workers from the most disadvantaged areas (HR: 0.94; CI [99%]: 0.92-0.96) had significantly longer durations than those from the most advantaged areas. The age of the worker displayed a graded relationship with duration of time loss; compared to the reference group aged 25 to 34 years, the youngest group (15-24 years) had significantly shorter durations (HR: 1.29; CI [99%]: 1.24-1.34) while older groups had longer durations (HR: 0.79 to 0.85; all statistically significant). Remoteness was significantly associated with shorter durations, though the magnitude and significance diminished upon the inclusion of jurisdictional variables in the final model. A similar change was observed among part-time workers, who had significantly longer durations in the first model, but in whom this association disappeared on inclusion of the jurisdictional variable in the final model.

Workers from manual-labour industries, including agriculture, forestry, fishing, manufacturing (HR: 0.82; CI [99%]: 0.77-0.87), mining (HR: 0.81; CI [99%]: 0.75-0.88), and construction (HR: 0.77; CI [99%]: 0.73-0.81) had longer durations when compared to the most common industry of healthcare and social assistance. Managers (HR: 1.08; CI [99%]: 1.03-1.14), professionals (HR: 1.07; CI [99%]: 1.02-1.11), technicians and trade workers (HR: 1.08; CI [99%]: 1.05-1.11), community and personal services workers (HR: 1.04; CI [99%]: 1.00-1.08), clerical/administrative workers (HR: 1.07; CI [99%]: 1.01-1.12), and sales workers (HR: 1.07; CI [99%]: 1.01-1.12) experienced shorter durations of time loss than the comparison group of labourers.

Using physical injury (excluding fractures) as the comparator, workers with mental health conditions had significantly longer durations of time loss (HR: 0.68; CI [99%]: 0.65-0.71), while workers with diseases had significantly shorter durations (HR: 1.39; CI [99%]: 1.34-1.44).

Adjusting for covariates and using New South Wales as the reference category, workers in Victoria (HR: 0.84; CI [99%]: 0.82-0.86) and South Australia (HR: 0.78; CI [99%]: 0.74-0.81) had significantly longer durations. Injured workers in Queensland (HR: 1.34; CI [99%]: 1.30-1.37) and Tasmania (HR: 1.32; CI [99%]: 1.25-1.40) had significantly shorter durations than workers in New South Wales.

Adjusted survival estimates (Figure 1) illustrate the variation in time loss durations between jurisdictions, after accounting for other factors that are associated with duration. Workers in South Australia had the highest probability of receiving time loss benefits (being off work) throughout the 104 week follow up period, followed by workers from Victoria. Workers in Tasmania and Queensland had the lowest probability. The remaining four jurisdictions of Comcare, New South Wales, Western Australia and the Northern Territory are tightly clustered between these two extremes. The differences between jurisdictions are marked. The cumulative probability of survival at 20 weeks in Victoria and South Australia jurisdictions is approximately 0.4, whereas in Tasmania and Queensland the probability at this time point is approximately half that at 0.2. These differences persist throughout the 104 week follow up period.

[Insert Figure 1 about here]

DISCUSSION

This study of over 90,000 injured Australian workers presents evidence that the state or territory in which a work-related compensation claim is made has a substantial and independent impact on duration of work disability as measured by the compensated time away from work. This effect persists even after accounting for demographic, socio-economic, employment and injury-related factors known to affect duration of time loss. The magnitude of jurisdiction-level impacts was comparable to or greater than that of other factors such as aging and the presence of particular injuries or conditions.

Descriptive analysis and data visualisation using survival curves illustrate the substantial variation in duration between Australian states and territories. In Queensland as few as 1% of injured workers continue to receive income benefits after 104 weeks post injury while the equivalent figure in Victoria is 16%. This variation was evident despite excluding cases of 'minor' injury resulting in less than two weeks' time loss from all jurisdictions.

Engagement in injury compensation systems has been associated with slower recovery and return to work [32], including in Australian injury compensation jurisdictions [33]. Despite this evidence, many studies of people with compensable injury fail to report even the most basic aspects of the compensation system in the jurisdiction from which the study population was derived [9]. There is an emerging literature on the impact of individual compensation system policy settings on injury outcomes. For example, level of compensation benefits has been positively associated with claim incidence rates and time-loss duration[34 35]. Some studies

have also examined the impact of waiting/excess periods on workers' compensation outcomes, with waiting periods having a negative association with time away from work[34]. One study examined the impact of workers' compensation policies on RTW outcomes using a comparative, cross-jurisdictional paradigm in six countries[17]. More recently, a USA study identified that waiting periods for wage replacement, limiting initial choice of treating provider and limitations on switching treating medical provider were independently associated with duration of disability in workers with lower back pain [18]. With these exceptions there is very little comparative evidence of the relative effectiveness of different approaches to public insurance for work-related injury.

The current study adds to this evidence base. The findings suggest that, even after accounting for worker, workplace and system characteristics that affect duration of work disability, jurisdictional level factors are significantly associated with duration. Combined with this previous literature, this finding suggests that the design and management of public insurance schemes for injury compensation is having a substantial effect on duration of work disability for injured workers receiving income replacement benefits. Unlike some factors affecting claim duration such as SES or injury type, policy and practice are highly modifiable. Prior research has demonstrated that modifications to compensation scheme management practices such as claims handling can have a positive impact on outcomes in Australian injury compensation settings[36]. Internationally, changes to the macro-level design of injury compensation systems have produced substantial improvements in health outcomes[35]. The present findings suggest that similar changes to scheme design and management have the potential to improve outcomes for injured workers in Australian states and territories.

While this study was not designed to identify the impact of specific policy settings, there are some significant differences between jurisdictions that may be contributing to the observed effect, and that will be the subject of future analyses. One major difference is the claim waiting period. In two states (Victoria and South Australia) the employer is responsible for the first ten days of income replacement post injury, whereas this period is zero or one day in the other states and territories. Combined with policies that that provide an additional period of time for claim reporting to a workers compensation insurer (e.g., a further 10 days in Victoria), this policy may interfere with the ability for early intervention post injury. Some states that have shorter durations in this study have developed work practices that encourage early reporting. For example in Queensland there is a financial incentive for General Practitioners to report work-related injury claims to the state's workers compensation insurer.

The Australian workers compensation systems provide access to medical care largely using a 'worker choice' approach, where the injured worker is able to access the provider of their choice through either the public or private healthcare system. This is quite different to the approach reported by Shraim et al [18] who identified that policies that limit initial choice of provider and restrict movement between providers had a substantial impact on duration of work disability. This same effect is unlikely to be observed in the Australian setting.

Study strengths include the large dataset encompassing the eight major workers' compensation jurisdictions in Australia. The variables within the dataset permitted regression analyses that controlled for many covariates known to influence RTW outcomes, enabling the isolation of the impact of jurisdiction on outcome. Limitations include the use of administrative payment data (compensated time loss) as the primary outcome metric. Compensated time loss generally underestimates the amount of time an injured worker is away from work[37]. Further, income benefit cessation does not necessarily reflect return to work but in some workers may indicate retirement, return to education or other outcomes. The dataset reports only the primary injury and thus does not enable analyses of the impact of co-morbid conditions or other conditions developing secondary to the primary work-related condition. Research suggests that some injured workers develop mental health conditions during compensation processes[38] but it was not possible to examine this. Globally there is a diversity of approaches to compensation for time off work after work-related conditions and these findings may not be generalizable to other systems or settings.

The report also demonstrates that it is feasible to conduct comparative studies in Australian workers' compensation systems using existing administrative datasets. The associations between regression covariates and time loss durations replicate findings of prior research, providing confidence in the study methodology. Such associations include longer time loss durations for female and older claimants[11], manual labour occupations[39], and mental health claims[13].

In Australia, the commonwealth, state and territory governments have chosen workers' compensation systems as the primary means via which they seek to encourage return to work of injured workers. Variations on this approach are in place in most other industrialised and many developing nations. Workers' compensation policy is composed of myriad and complex rules, each of which may improve or worsen return to work outcomes for injured workers. This study provides evidence that in Australia, the jurisdiction in which a workers

compensation claim is made has a significant impact on duration of time off work, independent of other factors. While this study does not identify specific policies and practices that improve or limit return to work, the findings justify further research in this area.

AUTHOR CONTRIBUTIONS

AC conceived the study and drafted the manuscript. TL conducted analyses and contributed to manuscript preparation. BHM, CM and JT contributed to analyses and manuscript preparation. All authors approved the final manuscript.

ACKNOWLEDGMENTS

The study was funded by Safe Work Australia and Worksafe Victoria. The authors would also like to acknowledge the contribution of state and territory workers compensation agencies for data provision, and Shannon Gray for assistance with preparation of the manuscript for publication.

Funding Statement

This study was supported by a grant from Safe Work Australia and Worksafe Victoria.

Competing Interests

AC, TL, JT and BHM receive salary support via a grant from Worksafe Victoria and the Transport Accident Commission. Both are state government regulatory agencies in the state of Victoria, Australia. There are no other competing interests.

Data Sharing

No additional data available.

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TABLE LEGEND

Table 1. Injured worker characteristics by state or territory of compensation claim.

Table 2. Duration of compensated time loss by jurisdiction.

Table 3. Factors associated with duration of time loss (weeks).

FIGURE LEGEND

Figure 1. Adjusted survival plots for duration of time loss (weeks) by jurisdiction.

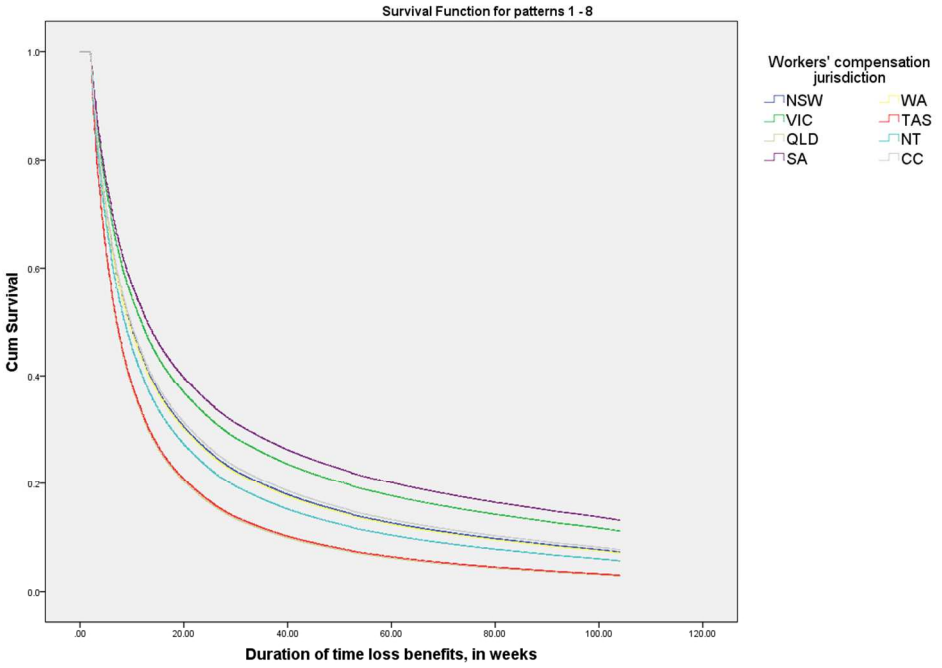

Figure 1. Adjusted survival plots for duration of time loss (weeks) by jurisdiction
104x72mm (300 x 300 DPI)

STROBE 2007 (v4) checklist of items to be included in reports of observational studies in epidemiology*

Checklist for cohort, case-control, and cross-sectional studies (combined)

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	Title page
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5-6
Objectives	3	State specific objectives, including any pre-specified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	6-10
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6-7
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	8-9
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	n/a
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	9-10
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	9-10
Bias	9	Describe any efforts to address potential sources of bias	8-9
Study size	10	Explain how the study size was arrived at	8-9
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	9-10
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	10-11
		(*b*) Describe any methods used to examine subgroups and interactions	n/a
		(*c*) Explain how missing data were addressed	13
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed	10-11,13

		Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy	
		(*e*) Describe any sensitivity analyses	n/a
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	13
		(b) Give reasons for non-participation at each stage	13
		(c) Consider use of a flow diagram	n/a
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Table 1, page 12
		(b) Indicate number of participants with missing data for each variable of interest	13
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	9
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	Table 2, page 13
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	n/a
		Cross-sectional study—Report numbers of outcome events or summary measures	n/a
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Table 2, page 13 (unadjusted) Table 3, page 14 (adjusted)
		(*b*) Report category boundaries when continuous variables were categorized	9-10, table 1, table 2
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	n/a
Discussion			
Key results	18	Summarise key results with reference to study objectives	16-17
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	18-19
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	19
Generalisability	21	Discuss the generalisability (external validity) of the study results	18-19
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	acknowledgments

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Does time off work after injury vary by jurisdiction? A comparative study of eight Australian workers' compensation systems.

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2015-010910.R2
Article Type:	Research
Date Submitted by the Author:	04-Apr-2016
Complete List of Authors:	Collie, Alex; Monash University, Institute for Safety Compensation and Recovery Research Lane, Tyler; Monash University, Institute for Safety Compensation and Recovery Research Hassani-Mahmooei, Behrooz; Monash University, Institute for Safety Compensation and Recovery Research Thompson, Jason; Monash University, Institute for Safety Compensation and Recovery Research McLeod, Christopher; University of British Columbia, School of Population and Public Health
Primary Subject Heading:	Public health
Secondary Subject Heading:	Health policy, Epidemiology
Keywords:	return to work, workers compensation, injury, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, OCCUPATIONAL & INDUSTRIAL MEDICINE

Does time off work after injury vary by jurisdiction? A comparative study of eight Australian workers' compensation systems.

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Abstract word count: 242
Word count: 4,588
Number of tables: 3
Number of figures: 1
Number of supplementary tables: 1
Key words: Return-to-Work; Workers' Compensation; Health Policy; Work-Related Injury
(Up to five key words)

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ABSTRACT

Objectives: To determine whether the jurisdiction in which a work-related injury compensation claim is made is an independent predictor of duration of time off work following work injury and if so, the magnitude of the effect.

Setting: Eight Australian state and territory workers' compensation systems, providing coverage for more than 90% of the Australian labour force. Administrative claims data from these systems was provided by government regulatory authorities for the study.

Participants: 95,976 Australian workers with workers' compensation claims accepted in 2010 and with at least two weeks of compensated time off work.

Primary Outcome Measure: Duration of time lost from work in weeks, censored at 104 weeks.

Results: After controlling for demographic, worker, injury and employer factors in a Cox regression model, significant differences in duration of time loss between state and territory of claim were observed. Compared to New South Wales: workers in Victoria, South Australia, and Comcare had significantly longer durations of time off work and were more likely to be receiving income benefits at 104 weeks post-injury, while workers in Tasmania and Queensland had significantly shorter durations of time off work.

Conclusions: The jurisdiction in which an injured worker makes a compensation claim has a significant and independent impact on duration of time loss. Further research is necessary to identify specific compensation system policies and practices that promote timely and appropriate return to work and reduce duration of time off work.

ARTICLE SUMMARY

Strengths and limitations of the study

- Use of population-based data from eight of ten Australian workers' compensation jurisdictions, covering more than 90% of the Australian labour force.
- Ability to account for factors, other than jurisdiction of claim, that are known to impact on return to work outcomes including age, gender, occupation, injury type and socioeconomic status.
- Use of income replacement duration as a proxy for return to work outcomes produces some uncertainty in estimates.
-

INTRODUCTION

There are an estimated 4.8 million deaths from injury annually, accounting for over 10 percent of the total global burden of disease, with 973 million people sustaining injury that resulted in access to healthcare[1]. In the sphere of work injury, the International Labour Organisation [2] has estimated that there are 2.3 million fatalities and a further 313 million injuries arising from work-related accidents annually. These figures underestimate the true burden of work-related injury and illness as they exclude the substantial additional burden of occupational diseases and work-related mental health conditions.

Work injury results in changes to physical and mental health, quality of life, and a reduced ability to participate in society and the labour market[3-5]. Extended periods of workless-ness can have a negative impact on health[5]. Work injury may have flow on effects such as increasing the risk of marital separation[6] and has been associated with poorer health of family members[7].

Most industrialised and developing nations have public insurance systems that compensate injured workers for periods of time away from work and seek to promote effective rehabilitation and Return to Work (RTW)[8]. There is substantial international variation in the design and management of these systems[9]. Differences between jurisdictions include the proportion of the labour market covered, caps and time period limits on wage replacement, access to treatment and rehabilitation and time limits on benefit periods, among others[10]. This diversity in system design and policy presents an opportunity for comparative research to identify the most effective policy settings for minimising duration of work disability.

Prior research has established the association between RTW outcome and a range of biological/physical, psychological, social and demographic factors. These include worker characteristics including age[11] and gender[12], injury characteristics including type of injury[13], workplace level factors[14] and psychological factors including self-efficacy[15] and pain catastrophizing[16]. Globally, very little quality evidence regarding the relative impact of compensation system policy on duration of work disability has been published[17]. One study examining RTW outcomes in cohorts of workers with lower back pain from six countries identified that access to long-term disability benefits and the degree of impairment required to access such benefits were independently associated with the sustainability of RTW[17]. Another study across forty-nine states of the USA identified that waiting periods for wage replacement and policies around access to medical treatment were independently associated

with duration of disability in workers with lower back pain[18]. However, a systematic review identified that many studies of health and recovery outcomes in those with compensable injury fail to report even basic characteristics of the compensation system[9].

In Australia, more than half a million workers were injured at work in the 2013/14 financial year[19], equating to 4.3% of the labour force. The societal cost of work injury has been estimated at $60.6 billion per annum, or 4.8% of GDP[20]. Commonwealth and state governments in Australia have established an array of workers' compensation systems with the objective of returning injured workers to the workforce while minimising the costs of rehabilitation to society[10]. These are predominantly geographically based in the six states and two territories, In addition there are two commonwealth workers compensation systems[10]. All of these compensation schemes provide income replacement, healthcare and rehabilitation support to eligible injured workers. Amongst the Australian systems, there is a diversity of policy approaches. The schemes differ on multiple aspects including their coverage (e.g., industries and workers covered); entitlements (e.g., included injuries and illnesses); benefits (e.g., minimum and maximum levels and duration); rehabilitation (e.g., early RTW, access to support); health care (e.g., access to and coverage); administration (e.g., appeal procedures, oversight mechanisms); financing (e.g., who pays, experience rating); and job protection (e.g., duration of protection, employer obligation to accommodate injured worker)[10]. These are all factors that have been identified as important to fairness of coverage and outcomes for injured workers[21], and provide an opportunity to study the relative impact of different policy approaches on outcomes including RTW.

This study is the first in a planned series of analyses of a newly established national research dataset of workers' compensation outcomes. The objective of this study is to determine whether the Australian state or territory in which an injured worker makes their compensation claim is an independent predictor of the duration of time off work and if so, to determine the magnitude of this effect. Should a significant and independent effect of jurisdiction be observed, subsequent analyses will examine the contribution of specific policy settings to duration of work disability.

METHODS

Setting

In December 2010, the year of focus for this study, Australia had a labour force of 11.42 million workers. The vast majority of Australian workers are covered by compulsory workers'

compensation insurance regulated by state, territory and commonwealth government authorities. Eight of the ten major Australian compensation systems are included in this study, including the states of New South Wales, Victoria, Queensland, Western Australia, South Australia, Tasmania and the Northern Territory. In addition the Comcare scheme covering commonwealth government employees, government employees of the Australian Capital Territory (ACT) and more than 30 large national firms was included. Claims arising from private sector organisations in the ACT were incomplete; claims from Seacare were too few to include; and claims data from the military were not available.

The systems share many common features. They provide coverage for employees of working age within the relevant jurisdiction. Many common work-related physical conditions are eligible for compensation, including acute traumatic injuries and chronic or gradual onset conditions (e.g., chronic low back pain). Some diseases are also compensable and each jurisdiction maintaining a list of eligible occupational diseases. Most jurisdictions also accept 'psychological injury' or mental health claims, where there is a demonstrable link between the mental health condition and the workplace. Benefits provided by the compensation systems typically include healthcare expenses and income replacement payments to injured workers for the period of time they are off work. The Australian systems often also pay costs associated with occupational or vocational rehabilitation and re-training. Some injured workers with a permanent injury or disability may also be eligible to receive lump sum payments. Healthcare and other medical expenses are typically provided on the basis that they are 'reasonable and necessary' as determined by the claims management organisation. Income replacement payments are usually capped at a percentage of the workers' pre-injury earnings.

The process of making a workers' compensation claim is largely consistent between jurisdictions. Workers who have incurred an injury at work and are intending to make a workers' compensation claim must provide their employer, and in some cases their insurer, with information about their injury. This information, captured on a 'claim form', must be accompanied by a medical certificate from a General Practitioner or other qualified medical practitioner. The employer must then notify the claims management organisation of the claim within a specified time, and the claims management organisation usually has a period of time to determine whether the claim is eligible for workers' compensation benefits under the legislation, and to accept or deny the claim.

Despite their similarities, there are also many areas in which Australian workers' compensation jurisdiction vary in policy and practice. A detailed description of these is out of scope for this study, however it is useful to identify some of the major structural and functional differences as context to the study. There are differences relating to the waiting period for access to compensation. Victoria and South Australia each have a ten day waiting period during which the employer is required to provide income replacement. The other states and territories have waiting period of zero or one day. The relationship of claims management or insurance function to the regulation function also differs. Comcare is both the government regulator and claims manager. Queensland has a single major insurer for the majority of claims that is separate from the system regulator. South Australia has two private sector insurers that manage claims on behalf of the state regulator. Victoria has five private sector insurers managing claims that are separate to the regulator. There are differences relating to the rate and duration of income replacement. Most jurisdictions provide 100% of pre-injury average weekly earnings (PIAWE) during the first three to six months of time loss, while Queensland covers 85% for the first six months, and New South Wales and Victoria cover 95% for three months before dropping to 80%. The Victorian scheme caps the duration of income replacement at 130 weeks, whereas there are longer periods in the other states. Under the Comcare scheme, income benefits may be payable until the worker reaches the national retirement age of 65. These types of policy settings change routinely within jurisdictions. In 2012, there were some major structural reforms to the New South Wales workers compensation system that restricted access to compensation and to benefits. In 2015 the South Australian government introduced new workers' compensation legislation that radically changed the design of that state's system. A detailed description of the policy settings and changes within jurisdictions is published annually by Safe Work Australia[10].

Data sources

Annually the Australian workers' compensation authorities contribute case-level claims data to the National Dataset of Compensation-based Statistics (NDS), compiled by Safe Work Australia[22]. A total of 305,774 cases of compensated work injury occurring in the 2010 calendar year were extracted from the NDS.

Cases were excluded if the worker was aged less than 15 years or greater than 80 years (N=20 excluded); if the NDS indicated they had worked less than 1 or more than 100 hours per week prior to injury (N=63,225). Cases arising from the ACT private systems were removed due to that jurisdiction not reporting post-code data necessary for calculation of

some predictors (N=4,669). To ensure comparable jurisdictional-level cohorts were established, cases with two weeks or less time loss were removed to account for jurisdictional variation in compensation system criterion for claim acceptance (both Victoria and South Australia have employer excess periods of two weeks, during which employers typically cover income replacement payments – N=141,615). Finally a number of duplicate cases were also removed (N=39). Following application of inclusion and exclusion criteria, a total of 95,976 cases remained for analyses.

Outcome variables

The primary outcome was duration of time lost, measured as the cumulative number of weeks compensation paid. Cumulative duration is considered an appropriate estimate of time off work when using administrative data[23]. Duration was calculated by dividing the number of hours compensated by the number of pre-injury work hours per week to produce the number of compensated weeks. The dataset included claims information to June 2014, providing a maximum 4.5 year period of follow up. For each case in the data set duration was censored at a maximum of 104 weeks time loss, consistent with our prior analyses on similar datasets[12 24].

Independent variables

Factors have previously been associated with duration of work disability including age, gender, occupation, industry, socioeconomic status, remoteness, and injury type, were derived from the NDS dataset for inclusion in the analyses. Age refers to worker age at the time of injury/disease onset. Occupation was classified into nine occupation group codes using the Australian and New Zealand Standard Classification of Occupations (ANZSCO)[25]. Industry was classified according to the Australian and New Zealand Standard Industrial Classification (ANZSIC)[26].

Nature of injury was classified using a modification of the Type of Occurrence Classification System (TOOCS) version 3[27]. Quality assurance analyses of the dataset identified inconsistencies between jurisdictions in application of TOOCS coding, creating discrepancies in some categories, particularly musculoskeletal injuries and trauma. These could not be fully attributed to regional variations in injury type and likely reflected variations in coding practices that could not be controlled statistically. To account for this issue a modified injury coding system was developed that collapsed chronic and traumatic musculoskeletal injuries into a single category. Categories related to fractures, mental health conditions and diseases were retained.

Postcode was linked to the Accessibility/Remoteness Index of Australia (ARIA)[28 29], an indicator for remoteness, and the Index of Relative Socio-Economic Advantage and Disadvantage (IRSAD)[30], an indicator of socio-economic status (SES). ARIA classifies postcodes into five categories: major cities, inner regional, outer regional, remote, and very remote. IRSAD classifies postcodes into ranked deciles of relative socio-economic advantage or disadvantage. Claimants were assigned both an ARIA classification and IRSAD decile score given to the postcode in which they lived. The highest and lowest-ranking two IRSAD deciles were grouped into 'advantaged' and 'disadvantaged' SES quintiles for analyses. Claimants who worked 35 or more hours work per week pre-injury were classified as full time.

Jurisdiction was the final predictor and was categorised as the compensation system in which the claim was accepted. As described above, these are typically organised geographically according to state or territory of injury, with the exception of the Comcare scheme which has national coverage of employees of the federal government and approximately 35 large national corporations.

Analysis

Injured worker characteristics and median duration of time loss in weeks were summarised nationally and for each jurisdiction. Predictor variables were tested for association with the outcome variable (duration of time loss) in univariate Cox Regression. Nonparametric tests (Kruskal-Wallis for categorical [dichotomous], Mann-Whitney for categorical [>2 categories], and Spearman rank [ordered categorical]) were used to assess associations.

Predictors that were significantly associated with duration of time loss were included in a stepwise Cox Regression model. All predictor variables, with the exception of jurisdiction, were entered into the model in the first step. Jurisdiction was added in the second step to determine whether it added any explanatory power to the model, and how it affected associations with other predictor variables. Cases exceeding 104 weeks of time loss were right-censored. Outputs are reported as adjusted Hazard Ratio (HR) with 99% Confidence Interval (CI).

Duration of time loss was plotted in a survival curve to illustrate the proportion of injured workers receiving compensation over time and differences by jurisdiction. The survival curve is derived from the Cox Regression and controls for covariates. A high proportion (13.7%) of values derived from postcode data (IRSAD [advantage/disadvantage] and ARIA [remoteness])

were missing. Values were imputed using fully conditional specification multiple imputation (five imputations) on the assumption that they were Missing at Random (MAR). This model is compared to a Complete Case regression. Data manipulations and analyses were conducted in SPSS v22, with *p*-values of ≤ 0.01 considered significant.

Ethics

This study received ethics approval from the Monash University Human Research Ethics Committee (MUHREC) on 8 October 2014.

RESULTS

Participant characteristics

Participant characteristics are presented in Table 1. Western Australia (33.1%) and the Northern Territory (30.8%) had a smaller proportion of injured female workers than the national average (37.6%), while Comcare was much higher at 44.6%. Non-fracture physical health injuries were similarly common at around ¾ of claimants in each, though the distribution of mental health claims varied substantially; Comcare (14.6%), Tasmania (11.5%) and Victoria (10.2%) had the highest proportion of claims for mental health conditions, while Western Australia had the lowest (3.3%). Manufacturing was the most common employer industry in Victoria (18.8%), public administration and safety in the Northern Territory (12.0%). Healthcare and social assistance was the most common industry overall (15.3%). While labourers were the most common occupation nationally (22.9%) and in most jurisdictions, clerical and administrative workers were most common in Comcare (50.9%). Socio-economically advantaged postcodes were over-represented in Comcare (38.8%) and Western Australia (30.2%), whilst disadvantaged postcodes were overrepresented in South Australia (30.1%) and Tasmania (49.0%).

Table 1. Injured worker characteristics by jurisdiction of compensation claim.

	2010/11 covered workers (thousands)*	Workers (> 2 weeks' time loss)	Mean (SD) age in years	Female % (*n*)	Mental health condition, % (*n*)	Most common industry, % (*n*)	Most common occupation, % (*n*)	Most advantaged quintile, % (*n*)	Most dis-advantaged quintile, % (*n*)
Entire dataset	10,096	95,976	42.2 (12.6)	37.6% (36,134)	7.7% (7,349)	HC/SA 15.3% (14,491)	Labourers 22.9% (21,973)	18.5% (15,347)	17.9% (14,799)
New South Wales	3,078	33,399	42.1 (12.6)	38.2% (12,767)	8.1% (2,709)	HC/SA 14.7% (4,896)	Labourers 20.2% (6,756)	21.2% (5,477)	19.9% (5,139)
Victoria	2,577	18,965	43.2 (12.4)	36.8% (6,973)	10.2% (1,930)	Manufacturing 18.8% (3,573)	Labourers 23.8% (4,522)	18.4% (3,126)	15.7% (2,674)
Queensland	1,900	21,722	41.3 (12.8)	37.6% (8,171)	4.8% (1,032)	HC/SA 15.8% (3,406)	Labourers 27.4% (5,910)	12.8% (2,787)	16.6% (3,605)
South Australia	719	6,402	42.8 (12.1)	41.6% (2,665)	9.6% (616)	HC/SA 24.0% (1,378)	Labourers 21.4% (1,371)	9.3% (455)	30.1% (1,466)
Western Australia	1,098	9,195	41.7 (13.0)	33.1% (3,042)	3.3% (308)	HC/SA 15.8% (1,448)	Labourers 24.5% (2,257)	30.2% (2,186)	4.0% (290)
Tasmania	210	2,491	42.0 (12.3)	38.9% (969)	11.5% (286)	HC/SA 17.9% (445)	Labourers 31.8% (793)	3.3% (83)	49.0% (1,218)
Northern Territory	114	1,068	40.5 (13.3)	30.8% (329)	6.4% (68)	Public admin and safety 12.0% (128)	Labourers 23.2% (248)	18.5% (177)	15.4% (147)
Comcare	400	2,734	46.0 (10.1)	44.6% (1,218)	14.6% (400)	HC/SA 15.3% (1,557)	Clerical and administrative 50.9% (1,392)	38.8% (1,056)	9.5% (260)

SD: standard deviation; *n*: number; HC/SA: Healthcare and Social Assistance.
**N* workers covered by workers compensation in each jurisdiction. Data provided by Safe Work Australia[31].

Duration of compensated time loss

Table 2 presents summary statistics on duration of time loss between jurisdictions. Median time loss across the entire sample was 9.2 weeks (IQR: 4.2 to 26.6). Victoria (13.2 weeks) and South Australia (10.0 weeks) had the longest median durations, while Tasmania (7.1 weeks) and Queensland (7.8 weeks) had the shortest. Differences were also reflected in the proportion of claims that received at least two years' compensated time loss: 14.0% of cases in South Australia and 16.0% in Victoria received at least 104 weeks compensated time loss, compared to 1.0% of accepted claims in Queensland.

Table 2. Duration of compensated time loss by jurisdiction.

Jurisdiction	N (col %) workers included	Weeks time loss		N (row %) off work at 104 weeks
		Median	IQR	
Total	95,976 (100%)	9.2	(4.2 - 26.6)	8,127 (8.5%)
New South Wales	33,399 (34.8%)	8.5	(3.9 - 26.6)	3,189 (9.5%)
Victoria	18,965 (19.8%)	13.2	(5.6 - 51.6)	3,028 (16.0%)
Queensland	21,722 (22.6%)	7.8	(4.0 - 17.6)	223 (1.0%)
South Australia	6,402 (6.7%)	10.0	(4.6 - 39.3)	894 (14.0%)
Western Australia	9,915 (10.3%)	9.8	(4.2 - 29.0)	402 (4.4%)
Tasmania	2,491 (2.6%)	7.1	(3.8 - 16.3)	123 (4.9%)
Northern Territory	1,068 (1.1%)	9.0	(4.4 - 22.2)	36 (3.4%)
Comcare	2,734 (2.8%)	8.9	(4.1 - 26.4)	232 (8.5%)

IQR = interquartile range.

Cox regression analysis

In univariate analyses all independent variables were significantly associated with the outcome variable at the $p < 0.01$ level, and as such were entered into the multivariate model. Cox regression models included 95,655 cases, 8,109 (8.5%) of which were censored for having time loss durations that exceeded 104 weeks. Values were missing for 13.7% of advantage/disadvantage (n = 13,189) and remoteness variables (n = 13,164) due to missing, invalid, and unmatched postcode data. Values were assigned using multiple imputation. Higher hazard ratios indicate greater likelihood of leaving the compensation system at any point and thus shorter durations of time loss. Results of the final Cox proportional hazards model are reported in Table 3.

Table 3. Factors associated with duration of time loss (weeks), Cox Regression with multiple imputation for advantage/disadvantage and remoteness. Model 1 includes all predictors excluding jurisdiction while model 2 includes jurisdiction.

	Model 1			Model 2		
Variables in equation	Hazard Ratio	(99% CI)	*p*-value	Hazard Ratio	(99% CI)	*p*-value
Jurisdiction (Reference: New South Wales)						
Victoria				0.75	(0.73 - 0.77)	< .001
Queensland				1.32	(1.29 - 1.36)	< .001
South Australia				0.84	(0.81 - 0.88)	< .001
Western Australia				0.99	(0.96 - 1.02)	.492
Tasmania				1.31	(1.24 - 1.39)	< .001
Northern Territory				1.09	(1.00 - 1.19)	.012
Commonwealth Comcare				0.91	(0.85 - 0.96)	< .001
Gender (Reference: male)						
Female	0.89	(0.87 - 0.91)	< .001	0.89	(0.87 - 0.91)	< .001
Age (Reference: 26 to 35 years)						
15 to 24 years	1.30	(1.26 - 1.35)	< .001	1.30	(1.26 - 1.34)	< .001
35 to 44 years	0.85	(0.83 - 0.88)	< .001	0.85	(0.83 - 0.88)	< .001
45 to 54 years	0.82	(0.80 - 0.84)	< .001	0.83	(0.81 - 0.85)	< .001
55 years and over	0.80	(0.78 - 0.83)	< .001	0.82	(0.79 - 0.84)	< .001
Advantage/dis-advantage (Reference: Middle three quintiles)						
Most dis-advantaged quintile	0.95	(0.92 - 0.97)	< .001	0.95	(0.92 - 0.98)	< .001
Most advantaged quintile	1.07	(1.05 - 1.10)	< .001	1.09	(1.06 - 1.12)	< .001
Remoteness (Reference: Major city)						
Inner region	1.04	(1.02 - 1.07)	< .001	1.02	(0.99 - 1.04)	.063
Outer region	1.10	(1.06 - 1.14)	< .001	1.02	(0.99 - 1.06)	.076
Remote	1.08	(1.01 - 1.16)	.004	1.05	(0.97 - 1.12)	.118
Very remote	1.18	(1.06 - 1.32)	< .001	1.07	(0.96 - 1.20)	.123
Part time/Full time hours (Reference: Part time)						
Full time	1.06	(1.04 – 1.09)	< .001	1.06	(1.04 - 1.09)	< .001
Employer industry (Reference: Health care and social assistance)						
Agriculture, forestry, and fishing	0.80	(0.75 - 0.85)	< .001	0.78	(0.73 - 0.83)	< .001
Mining	0.79	(0.74 - 0.85)	< .001	0.76	(0.71 - 0.82)	< .001
Manufacturing	0.83	(0.80 - 0.86)	< .001	0.84	(0.81 - 0.88)	< .001
Electricity, gas, water, and waste services	0.95	(0.86 - 1.05)	.184	0.92	(0.83 - 1.01)	.024
Construction	0.75	(0.72 - 0.78)	< .001	0.74	(0.71 - 0.77)	< .001
Wholesale trade	0.77	(0.73 - 0.81)	< .001	0.79	(0.75 - 0.83)	< .001
Retail trade	0.78	(0.74 - 0.82)	< .001	0.78	(0.74 - 0.82)	< .001
Accommodation and food services	0.90	(0.85 - 0.94)	< .001	0.85	(0.81 - 0.90)	< .001
Transport, postal, and warehousing	0.83	(0.79 - 0.87)	< .001	0.84	(0.80 - 0.88)	< .001
Information media and telecommunications	0.82	(0.72 - 0.93)	< .001	0.81	(0.71 - 0.92)	< .001
Financial and insurance services	0.86	(0.79 - 0.94)	< .001	0.85	(0.78 - 0.94)	< .001
Rental, hiring, and real estate services	0.88	(0.81 - 0.96)	< .001	0.88	(0.80 - 0.96)	< .001
Professional, scientific, and tech services	0.86	(0.81 - 0.92)	< .001	0.85	(0.79 - 0.91)	< .001
Administrative and support services	0.84	(0.80 - 0.88)	< .001	0.80	(0.76 - 0.84)	< .001
Public administration and safety	0.93	(0.89 - 0.96)	< .001	0.90	(0.87 - 0.94)	< .001
Education and training	1.10	(1.06 - 1.15)	< .001	1.06	(1.01 - 1.11)	.001
Arts and recreation services	0.80	(0.74 - 0.86)	< .001	0.85	(0.79 - 0.92)	< .001
Other services	0.83	(0.78 - 0.88)	< .001	0.81	(0.77 - 0.86)	< .001
Occupation (Reference: labourers)						
Managers	1.03	(0.98 - 1.07)	.177	1.06	(1.02 - 1.12)	.001
Professionals	1.07	(1.03 - 1.11)	< .001	1.09	(1.05 - 1.13)	< .001
Technicians and trades workers	1.06	(1.03 - 1.09)	< .001	1.07	(1.04 - 1.11)	< .001
Community and personal service workers	1.02	(0.98 - 1.05)	.244	1.02	(0.98 - 1.05)	.190
Clerical and administrative workers	1.06	(1.02 - 1.11)	< .001	1.09	(1.04 - 1.13)	< .001
Sales workers	1.03	(0.98 - 1.09)	.082	1.05	(1.00 - 1.10)	.017
Machinery operators and drivers	1.01	(0.97 - 1.04)	.671	1.01	(0.98 - 1.04)	.380
Injury/illness (Reference: physical injuries, excluding fractures)						
Fractures	1.03	(1.00 - 1.06)	.010	1.01	(0.98 - 1.04)	.490
Mental health condition	0.61	(0.59 - 0.64)	< .001	0.63	(0.61 - 0.65)	< .001
Other diseases	1.35	(1.30 - 1.40)	< .001	1.35	(1.30 - 1.40)	< .001

In the final model, female workers (HR: 0.89; CI [99%]: 0.87-0.91) had significantly longer duration than male workers. Compared to injured workers from the middle six IRSAD deciles, those from the most disadvantaged areas had significantly longer durations (HR: 0.95; CI [99%]: 0.92-0.98) while those from the most advantaged areas had significantly shorter durations (HR: 1.09; CI [99%]: 1.06-1.12). The age of the worker displayed a graded relationship with duration of time loss; compared to the reference group aged 25 to 34 years, the youngest group (15-24 years) had significantly shorter durations (HR: 1.30; CI [99%]: 1.26-1.34) while older groups had longer durations (HR: 0.82 to 0.85; all $p < .001$). Remoteness was significantly associated with shorter durations in the model excluding jurisdiction. In the final model were remoteness was no longer significant (p-value range: .063 to .123), indicating that associations between greater remoteness and duration of time loss is not independent of jurisdiction.

Workers from manual-labour industries, including agriculture, forestry, fishing, manufacturing (HR: 0.78; CI [99%]: 0.73-0.83), mining (HR: 0.76; CI [99%]: 0.71-0.82), and construction (HR: 0.74; CI [99%]: 0.71-0.77) had longer durations when compared to the most common industry of healthcare and social assistance. Managers (HR: 1.06; CI [99%]: 1.02-1.12), professionals (HR: 1.09; CI [99%]: 1.05-1.13), technicians and trade workers (HR: 1.07; CI [99%]: 1.04-1.11), and clerical/administrative workers (HR: 1.09; CI [99%]: 1.04-1.13) experienced shorter durations of time loss than the comparison group of labourers. Full time workers had shorter time loss durations (HR: 1.06; CI [99%]: 1.04-1.09). Notably, this effect was a reversal from what was observed in the complete case models (see Supplementary Table and Impact of missing data below).

Using physical injury (excluding fractures) as the comparator, workers with mental health conditions had significantly longer durations of time loss (HR: 0.63; CI [99%]: 0.61-0.65), while workers with diseases had significantly shorter durations (HR: 1.35; CI [99%]: 1.30-1.40).

Adjusting for covariates and using New South Wales as the reference category, workers in Victoria (HR: 0.75; CI [99%]: 0.73-0.77), South Australia (HR: 0.84; CI [99%]: 0.81-0.88), and Comcare (HR: 0.91; CI [99%]: 0.85-0.96) had significantly longer durations. Injured workers in Queensland (HR: 1.32; CI [99%]: 1.29-1.36), and Tasmania (HR: 1.31; CI [99%]: 1.24-1.39) had significantly shorter durations than workers in New South Wales. Northern

Territory approached significance (p = .012) as having shorter duration (HR: 1.09; CI [99%]: 1.00-1.20).

Adjusted survival estimates (Figure 1) illustrate the variation in time loss durations between jurisdictions, after accounting for other factors that are associated with duration. Workers in Victoria had the highest probability of receiving time loss benefits (being off work) throughout the 104 week follow up period, followed by workers from South Australia and Comcare. Workers in Tasmania and Queensland had the lowest probability, their curves practically overlapping. The remaining three jurisdictions of New South Wales, Western Australia and the Northern Territory are clustered with similar survival trajectories. The differences between jurisdictions are marked. The cumulative probability of survival at 20 weeks is approximately 0.5 in Victoria, whereas in Tasmania and Queensland the probability at this time point is approximately half that at 0.2. These differences persist throughout the 104 week follow up period.

[Insert Figure 1 about here]

Impact of missing data

Missing values for SES advantage/disadvantage and remoteness variables were multiply imputed under the assumption they were Missing at Random (not independent of variables outside the model). For comparison, Complete Case Cox Regression outputs are presented in the Supplementary Table.

The direction and significance of most findings remain the same, though there were a few notable differences, particularly within industry and occupation variables. Further, there was a change to the direction of association between part time/full time hours, where full time hours switched from being associated with longer time loss duration in Complete Case analyses (model excluding jurisdiction only) to shorter time loss in multiple imputation analysis (both models). Additionally, the jurisdiction of Comcare was significantly associated with longer time loss durations in the multiple imputation analyses but not in the Complete Case analysis.

It is unclear why these last two associations would change in the multiple imputation model. Missingness did not differ substantially between part time (14.8%) and full time workers (13.5%), nor did Comcare have a high proportion of missing (1.1%). For the latter, the difference may be attributable to imputations within New South Wales, the comparator,

which was missing 22.8% of its advantage/disadvantage or remoteness variables, compared to 13.7% across the dataset.

[Link to supplementary table about here]

DISCUSSION

This study of over 90,000 injured Australian workers presents evidence that the state or territory in which a work-related compensation claim is made has a substantial and independent impact on duration of work disability as measured by the compensated time away from work. This effect persists even after accounting for demographic, socio-economic, employment and injury-related factors known to affect duration of time loss.

Descriptive analysis and data visualisation using survival curves illustrate the substantial variation in duration between Australian states and territories. In Queensland as few as 1% of injured workers continue to receive income benefits after 104 weeks post injury while the equivalent figure in Victoria is 16%. This variation was evident despite excluding cases of 'minor' injury resulting in less than two weeks' time loss from all jurisdictions.

Engagement in injury compensation systems has been associated with slower recovery and RTW[32], including in Australian injury compensation jurisdictions[33]. Despite this evidence, many studies of people with compensable injury fail to report even the most basic aspects of the compensation system in the jurisdiction from which the study population was derived[9]. There is emerging literature on the impact of individual compensation system policy settings on injury outcomes. For example, level of compensation benefits has been positively associated with claim incidence rates and time-loss duration[34 35]. Some studies have also examined the impact of waiting/excess periods on workers' compensation outcomes, with waiting periods having a negative association with time away from work[34]. One study examined the impact of workers' compensation policies on RTW outcomes using a comparative, cross-jurisdictional paradigm in six countries[17]. More recently, a USA study identified that waiting periods for wage replacement, limiting initial choice of treating provider and limitations on switching treating medical provider were independently associated with duration of disability in workers with lower back pain[18]. With these exceptions there is very little comparative evidence of the relative effectiveness of different approaches to public insurance for work-related injury.

The current study adds to this evidence base. The findings suggest that, even after accounting for worker, workplace and system characteristics that affect duration of work disability, jurisdictional level factors are significantly associated with duration. Combined with this previous literature, this finding suggests that the design and management of public insurance schemes for injury compensation is having a substantial effect on duration of work disability for injured workers receiving income replacement benefits. Unlike some factors affecting claim duration such as SES or injury type, policy and practice are highly modifiable. Prior research has demonstrated that modifications to compensation scheme management practices such as claims handling can have a positive impact on outcomes in Australian injury compensation settings[36]. Internationally, changes to the macro-level design of injury compensation systems have produced substantial improvements in health outcomes[35]. The present findings suggest that similar changes to scheme design and management have the potential to improve outcomes for injured workers in Australian states and territories.

While this study was not designed to identify the impact of specific policy settings, there are some significant differences between jurisdictions that may be contributing to the observed effect, and that will be the subject of future analyses. One major difference is the claim waiting period. In two states (Victoria and South Australia) the employer is responsible for the first ten days of income replacement post injury, whereas this period is zero or one day in the other states and territories. Combined with policies that provide an additional period of time for claim reporting to a workers' compensation insurer (e.g., a further 10 days in Victoria), this policy may interfere with the ability for early intervention post-injury. Some states that have shorter durations in this study have developed work practices that encourage early reporting. For example in Queensland there is a financial incentive for General Practitioners to report work-related injury claims to the state's workers' compensation insurer. The Australian workers' compensation systems provide access to medical care largely using a 'worker choice' approach, where the injured worker is able to access the provider of their choice through either the public or private healthcare system. This is quite different to the approach reported by Shraim et al[18] who identified that policies that limit initial choice of provider and restrict movement between providers had a substantial impact on duration of work disability. This same effect is unlikely to be observed in the Australian setting.

Study strengths include the large dataset encompassing the eight major workers' compensation jurisdictions in Australia. The variables within the dataset permitted regression analyses that controlled for many covariates known to influence RTW outcomes, enabling the

isolation of the impact of jurisdiction on outcome. Limitations include the use of administrative payment data (compensated time loss) as the primary outcome metric. Compensated time loss generally underestimates the amount of time an injured worker is away from work[37]. Further, income benefit cessation does not necessarily reflect RTW but in some workers may indicate retirement, return to education or other outcomes. The dataset reports only the primary injury and thus does not enable analyses of the impact of co-morbid conditions or other conditions developing secondary to the primary work-related condition. Research suggests that some injured workers develop mental health conditions during compensation processes[38] but it was not possible to examine this. Globally there is a diversity of approaches to compensation for time off work after work-related conditions and these findings may not be generalizable to other systems or settings.

The report also demonstrates that it is feasible to conduct comparative studies in Australian workers' compensation systems using existing administrative datasets. The associations between regression covariates and time loss durations replicate findings of prior research, providing confidence in the study methodology. Such associations include longer time loss durations for female and older claimants[11], manual labour occupations[39], and mental health claims[13].

In Australia, commonwealth, state and territory governments have chosen workers' compensation systems as the primary means via which they seek to encourage RTW of injured workers. Variations on this approach are in place in most other industrialised and many developing nations. Workers' compensation policy is composed of myriad and complex rules, each of which may improve or worsen RTW outcomes for injured workers. This study provides evidence that in Australia, the jurisdiction in which a workers' compensation claim is made has a significant impact on duration of time off work, independent of other factors. While this study does not identify specific policies and practices that improve or limit RTW, the findings justify further research in this area.

AUTHOR CONTRIBUTIONS

AC conceived the study and drafted the manuscript. TL conducted analyses and contributed to manuscript preparation. BHM, CM and JT contributed to analyses and manuscript preparation. All authors approved the final manuscript.

ACKNOWLEDGMENTS

The study was funded by Safe Work Australia and Worksafe Victoria. The authors would also like to acknowledge the contribution of state and territory workers' compensation agencies for data provision, and Shannon Gray for assistance with preparation of the manuscript for publication.

Funding Statement

This study was supported by a grant from Safe Work Australia and Worksafe Victoria.

Competing Interests

AC, TL, JT and BHM receive salary support via a grant from Worksafe Victoria and the Transport Accident Commission. Both are state government regulatory agencies in the state of Victoria, Australia. There are no other competing interests.

Data Sharing

No additional data available

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TABLE LEGEND

Table 1. Injured worker characteristics by state or territory of compensation claim.

Table 2. Duration of compensated time loss by jurisdiction.

Table 3. Factors associated with duration of time loss (weeks), Cox Regression (multiply imputed values for advantage/disadvantage and remoteness). Model 1 includes all predictors excluding jurisdiction while model 2 includes jurisdiction.

Supplemental Table. Factors associated with duration of time loss (weeks), Cox Regression (Complete Case analysis). Model 1 includes all predictors excluding jurisdiction while model 2 includes jurisdiction.

FIGURE LEGEND

Figure 1. Adjusted survival plots for duration of time loss (weeks) by jurisdiction.

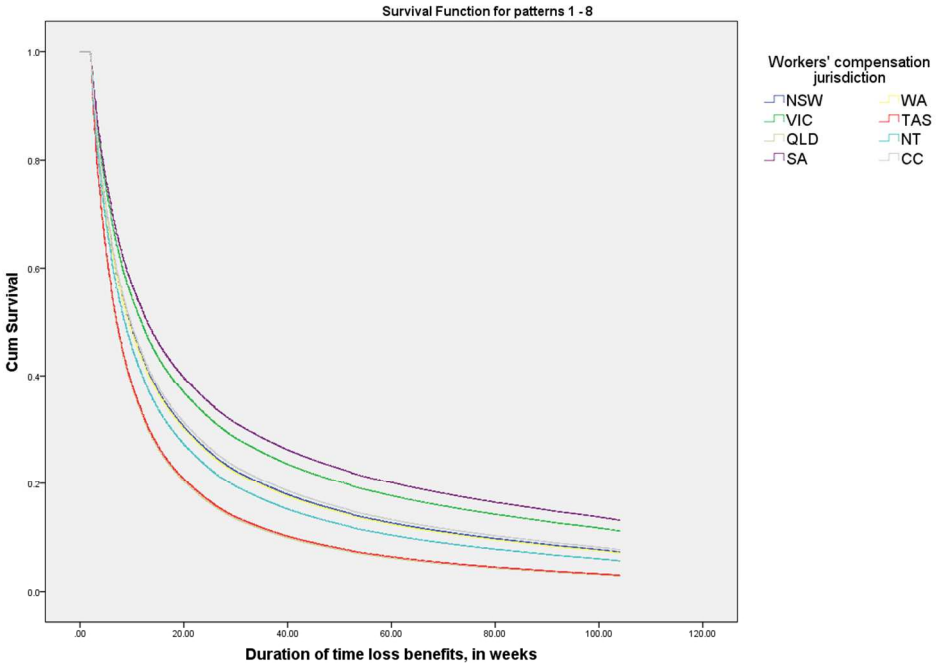

Figure 1. Adjusted survival plots for duration of time loss (weeks) by jurisdiction
104x72mm (300 x 300 DPI)

Supplemental Table. Factors associated with duration of time loss (weeks), Cox Regression (Complete Case analysis). Model 1 includes all predictors excluding jurisdiction while model 2 includes jurisdiction.

	Model 1			Model 2		
Variables in equation	Hazard Ratio	(99% CI)	*p*-value	Hazard Ratio	(99% CI)	*p*-value
Jurisdiction (Reference: New South Wales)						
Victoria				0.84	(0.82 - 0.86)	< .001
Queensland				1.34	(1.30 - 1.37)	< .001
South Australia				0.78	(0.74 - 0.81)	< .001
Western Australia				1.01	(0.98 - 1.05)	.430
Tasmania				1.32	(1.25 - 1.40)	< .001
Northern Territory				1.09	(1.00 - 1.20)	.012
Commonwealth Comcare				0.98	(0.92 - 1.04)	.375
Gender (Reference: male)						
Female	0.86	(0.84 - 0.88)	< .001	0.86	(0.84 - 0.89)	< .001
Age (Reference: 26 to 35 years)						
15 to 24 years	1.29	(1.25 - 1.34)	< .001	1.29	(1.25 - 1.34)	< .001
35 to 44 years	0.84	(0.82 - 0.87)	< .001	0.85	(0.82 - 0.87)	< .001
45 to 54 years	0.81	(0.78 - 0.83)	< .001	0.81	(0.79 - 0.84)	< .001
55 years and over	0.78	(0.75 - 0.80)	< .001	0.79	(0.77 - 0.82)	< .001
Advantage/dis-advantage (Reference: Middle three quintiles)						
Most dis-advantaged quintile	0.93	(0.91 - 0.95)	< .001	0.94	(0.92 - 0.96)	< .001
Most advantaged quintile	1.07	(1.04 - 1.10)	< .001	1.09	(1.06 - 1.11)	< .001
Remoteness (Reference: Major city)						
Inner region	1.06	(1.03 - 1.08)	< .001	1.02	(1.00 - 1.05)	.028
Outer region	1.12	(1.08 - 1.15)	< .001	1.04	(1.00 - 1.07)	.010
Remote	1.13	(1.04 - 1.23)	< .001	1.09	(1.00 - 1.19)	.007
Very remote	1.22	(1.08 - 1.38)	< .001	1.10	(0.97 - 1.24)	.063
Part time/Full time hours (Reference: Part time)						
Full time	0.96	(0.94 - 0.99)	< .001	0.99	(0.96 - 1.01)	.156
Employer industry (Reference: Health care and social assistance)						
Agriculture, forestry, and fishing	0.83	(0.78 - 0.88)	< .001	0.82	(0.77 - 0.87)	< .001
Mining	0.83	(0.77 - 0.89)	< .001	0.81	(0.75 - 0.88)	< .001
Manufacturing	0.91	(0.87 - 0.94)	< .001	0.91	(0.87 - 0.95)	< .001
Electricity, gas, water, and waste services	1.01	(0.92 - 1.12)	.739	0.98	(0.88 - 1.08)	.541
Construction	0.77	(0.74 - 0.81)	< .001	0.77	(0.73 - 0.81)	< .001
Wholesale trade	0.82	(0.77 - 0.86)	< .001	0.83	(0.79 - 0.88)	< .001
Retail trade	0.92	(0.87 - 0.96)	< .001	0.88	(0.84 - 0.93)	< .001
Accommodation and food services	0.93	(0.89 - 0.98)	< .001	0.89	(0.85 - 0.94)	< .001
Transport, postal, and warehousing	0.94	(0.90 - 0.99)	.002	0.93	(0.88 - 0.98)	< .001
Information media and telecommunications	0.86	(0.76 - 0.98)	.002	0.86	(0.76 - 0.98)	.002
Financial and insurance services	1.00	(0.90 – 1.10)	.915	0.97	(0.88 - 1.07)	.378
Rental, hiring, and real estate services	0.90	(0.82 - 0.98)	.002	0.90	(0.82 - 0.99)	.004
Professional, scientific, and tech services	0.92	(0.85 - 0.98)	.001	0.90	(0.84 - 0.97)	< .001
Administrative and support services	0.88	(0.83 - 0.92)	< .001	0.85	(0.80 - 0.89)	< .001
Public administration and safety	1.03	(0.98 - 1.08)	.145	0.99	(0.94 - 1.04)	.614
Education and training	1.08	(1.03 - 1.14)	< .001	1.03	(0.98 - 1.08)	.151
Arts and recreation services	0.91	(0.84 - 0.99)	.003	0.93	(0.86 - 1.01)	.021
Other services	0.87	(0.82 - 0.92)	< .001	0.86	(0.81 - 0.92)	< .001
Occupation (Reference: labourers)						
Managers	1.05	(1.00 - 1.11)	.005	1.08	(1.03 - 1.14)	< .001
Professionals	1.05	(1.01 - 1.09)	.003	1.07	(1.02 - 1.11)	< .001
Technicians and trades workers	1.07	(1.03 - 1.10)	< .001	1.08	(1.05 - 1.11)	< .001
Community and personal service workers	1.04	(1.00 - 1.08)	.011	1.04	(1.00 - 1.08)	.005
Clerical and administrative workers	1.06	(1.02 - 1.11)	< .001	1.07	(1.03 - 1.12)	< .001
Sales workers	1.06	(1.00 - 1.11)	.006	1.07	(1.01 - 1.12)	.001
Machinery operators and drivers	1.00	(0.96 - 1.03)	.672	1.00	(0.97 - 1.04)	.772
Injury/illness (Reference: physical injuries, excluding fractures)						
Fractures	1.01	(0.98 - 1.04)	.612	0.99	(0.97 - 1.02)	.572

Mental health disorders	0.66	(0.64 - 0.69)	< .001	0.68	(0.65 - 0.71)	< .001
Other diseases	1.40	(1.34 - 1.45)	< .001	1.39	(1.34 - 1.44)	< .001

STROBE 2007 (v4) checklist of items to be included in reports of observational studies in epidemiology*

Checklist for cohort, case-control, and cross-sectional studies (combined)

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	Title page
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5-6
Objectives	3	State specific objectives, including any pre-specified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	6-10
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6-7
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	8-9
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	n/a
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	9-10
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	9-10
Bias	9	Describe any efforts to address potential sources of bias	8-9
Study size	10	Explain how the study size was arrived at	8-9
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	9-10
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	10-11
		(*b*) Describe any methods used to examine subgroups and interactions	n/a
		(*c*) Explain how missing data were addressed	13
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed	10-11,13

		Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy	
		(*e*) Describe any sensitivity analyses	n/a
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	13
		(b) Give reasons for non-participation at each stage	13
		(c) Consider use of a flow diagram	n/a
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Table 1, page 12
		(b) Indicate number of participants with missing data for each variable of interest	13
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	9
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	Table 2, page 13
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	n/a
		Cross-sectional study—Report numbers of outcome events or summary measures	n/a
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Table 2, page 13 (unadjusted) Table 3, page 14 (adjusted)
		(*b*) Report category boundaries when continuous variables were categorized	9-10, table 1, table 2
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	n/a
Discussion			
Key results	18	Summarise key results with reference to study objectives	16-17
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	18-19
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	19
Generalisability	21	Discuss the generalisability (external validity) of the study results	18-19
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	acknowledgments

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.