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Victorian Injured Worker Outcomes Study Study 2 - Quantitative analysis of the Compensation Research Database (CRD): Predictors and outcomes of longer term claims

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Further information

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Related documents (at the time of writing).

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Study 1: A qualitative enquiry into outcomes for injured workers in Victoria who have longer term claims

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Executive Summary

This study was part of a larger mixed-methods program of research aimed at providing information to help reduce claim duration and improve recovery and return to work (RTW) outcomes for injured workers (IWs) in Victoria. The objectives of this study were to identify factors associated with claims becoming long-term, defined as 52 or more weeks of wage replacement (WR), and to examine future outcomes for these long-term claims over the ensuing 18 months (i.e. post-52 weeks to 130 weeks).

To achieve the above objectives we examined administrative workers' compensation claim data for workers' compensation claims with a first date of incapacity between January 2007 and December 2012 (N=71,607). Analyses examined the relationship between modifiable and non-modifiable characteristics early in the claim, with the likelihood of reaching 52 weeks of wage replacement. Then, among these long-term claims, regression analyses examined the relationship between these factors, and health care trajectories over the first 12 months of the claim, with various claim outcomes over the following 18 months (up to 130 weeks of wage replacement).

Consistent with previous research older workers, female workers, claimants in lower skilled occupations, small or medium sized workplaces, the construction industry, and those who had sustained an intracranial, spinal cord, or psychological injury were more likely to reach 52 weeks of wage replacement. In addition, potentially modifiable factors, such as prolonged times in each of injury reporting, employer lodgement of claim, and in the IWs receipt of WR payments were related to an increased likelihood of reaching 52 weeks of wage replacement.

Among long-term claims (those that had reached 52 weeks of wage replacement) returning to work over the following 18 months was rare. Only 5.2% of long-term claims having a claim status that indicated return to work had taken place. More common outcomes were claim termination (36.5% of long term claims) or reaching 130 weeks of wage replacement (28.2% of long-term claims). Regression analyses identified few factors that were strongly related to each of these claim outcomes. Claimants with consistently high health service use (HSU) over the first 12 months of their claim, and those who experienced a prolonged time period to report their injury to their employer were more likely to reach 130 weeks, and claimants who experienced a prolonged amount of time taken between the submission of their claim and the start of wage replacement, were more likely to be terminated, compared to RTW.

Taken together, this study has identified potentially modifiable and non-modifiable factors that are associated with a workers' compensation claim becoming long-term. It has also documented that the large majority of claim outcomes for long-term claims (those reaching 52 weeks of wage replacement) are negative outcomes, such as claim termination. In addition, we did not identify a large number of variables in the available administrative data which could accurately predict these negative claim outcomes post 52-weeks of wage replacement. Given the large number of long-term claimants who do not appear to RTW, future research should better understand how termination from the workers' compensation outcome impacts on their future recovery and work status. The large data gaps that currently exist on the predictors and outcomes of long-term claimants in the administrative data collected by WorkSafe Victoria would likely require primary data collection as part of a longitudinal to be adequately addressed.

Purpose

The overarching objective of this study was to identify factors that predict long-term claim status, and identify opportunities to improve RTW and WR outcomes. Within this objective there were two aims. First, to determine the proportion of workers' compensation claims that become long-term claims (defined as having 52 or more weeks of wage replacement (WR)); and identify modifiable and non-modifiable factors associated with this outcome. Second, among claims that reach 52 weeks of WR, we examined the proportion which have various claim outcomes (e.g. claim termination, return to work, reaching 130 weeks of wage replacement) over the following 18 month period, and sought to identify factors associated with these outcomes. For this analysis we used the same modifiable and non-modifiable factors as in the first aim, and, in addition, patterns of health service use (HSU) frequency in the first 12 months post-injury. The contribution of system and other related factors to IWs recovery or failure to recover is important to establish, as these outcomes may be modified by changes in legislation, policy and/or practice.

Rationale

There is increasing evidence that recovery is slowed for injured persons who are involved in compensable systems (1-3). While the vast majority of IWs RTW within 6 months of incurring an injury, a small percentage of claims are prolonged. An analysis of over 12,100 claims accepted between January 2005 and December 2010 under the Victorian workers' compensation system indicated that nearly 8% of workers entering and receiving WR were still receiving WR benefits 130 weeks after their claim had been accepted¹. Although this is a small proportion of accepted claims, these IWs are more likely to have complex health conditions and represent a substantial and disproportionately high cost to the workers' compensation system and broader society. Therefore, it is crucial to identify how to prevent long-term work disability, promote appropriately timed RTW, improve long term health outcomes, reduce time lost to injury, and reduce insurance premiums^{1, 2}.

¹ Statistics derived from the Compensation Research Database (CRD). The CRD is a de-identified administrative database of Victorian workers' compensation claims lodged since 1986. The CRD is managed by the Institute for Safety, Compensation and Recovery Research, Melbourne, Victoria.

Existing research has identified several factors, related to the injury, worker, workplace, and compensation systems, important in RTW^{1, 3-12}, often using comprehensive and representative administrative data. However, whilst large administrative datasets contain consistent, reliable information which enables examination of population-based personal injury claims and payment records, it is commonly restricted to non-modifiable factors. This in turn limits such research's ability to inform targeted RTW interventions focused on IW recovery and more timely resumption of work duties or policy designed to improve workers compensation systems, and related health and vocational outcomes more broadly. For example, studies which use administrative data to investigate the role of factors such as the time taken for various parts of the claim submission and adjudication process are limited¹³. Further, most existing research into predictors of RTW focus on factors which occur the start of the claim, with little attention paid to events that occur throughout the first 12 months post-injury. Finally, as studies tend to focus on what happens over the first year, and what predicts worse outcomes among all claimants, there is less focus on outcomes among the more chronically injured claimants, and if modifiable factors predict these outcomes.

The time taken to report, submit and adjudicate a workers' compensation claim may be important factors in relation to claim duration as they may indicate dysfunctional claim making and RTW processes. In addition, these factors are potentially modifiable. As such, an understanding of how and why they occur could be used to identify IWs at risk of reaching long-term claim status early in the worker's compensation process and inform the development of interventions designed to prevent this occurrence. Therefore, using routinely collected administrative data, the first part of this research study aimed to: i) examine the time taken in various parts of the claim submission and adjudication process; ii) examine the association between socio-demographic/economic, occupational, and injury-related factors and greater time taken in each of these processes; and iii) examine the relationship between time taken in reporting, submission and adjudication and reaching 52 weeks of wage replacement.

The frequency and the type of HSU have also been identified as potentially important prognostic factors when it comes to reducing work disability post-injury [22], as well as increasing IWs chances of RTW. Further, studies have shown that the way IW's experience their encounters with healthcare and social insurance professionals may also influence RTW [23]. Identifying patterns of HSU in the 12-months post-injury could prove enlightening as they may represent different recovery trajectories and, if associated with different long-term RTW outcomes post 12 months, could provide a basis for health care service delivery and describing and understanding the resources required to facilitate RTW and reduce the

number of long term claims. For example, persistent, high use of health care services may represent a cumulative burden of morbidity increasing its likelihood as a contributor to long term claim duration. Therefore, identification of this pattern before the 52-week milestone could prompt the implementation of a different management plan for these claims to stop them becoming long-term, and thus increasing the IWs likelihood of returning to work. Alternatively, consistently low use of health care services may indicate a lack of morbidity (or an untreated morbidity) and therefore an increased chance of RTW. However, despite its potential explanatory role, HSU and, more specifically, patterns of HSU, in the 12-months post work-related injury is under-examined ¹³.

This study aimed to address the paucity of research that has considered the potentially modifiable predictors of prolonged claims, and how compensation system processes can be modified to improve recovery and RTW for IWs who have complex, prolonged claims in the Victorian workers' compensation system.

Key research questions

The central research questions for the study were:

- i. Among workers' compensation claimants, what are the modifiable and non-modifiable factors associated with reaching 52 weeks of WR?
- ii. Among long-term claimants, what are the various claim outcomes over the following 18 months, and are particular factors associated with certain claim outcomes?

To address each of these research questions we focused on only administrative data collected by WorkSafe Victoria and currently available for research purposes. The use of administrative data to predict claim outcomes is optimal as this information is routinely collected and available for all claimants within the workers' compensation system.

Methods

Data Source

This study used data from the Victorian Compensation Research Database (CRD). The CRD is an administrative database established and held by the Institute for Safety Compensation and Recovery Research (ISCR)^{14, 15}, including information on the claimant and benefits paid. The CRD is publicly accessible under strict guidelines approved by WorkSafe Victoria (WSV) and the Monash University Human Research Ethics Committee (MUHREC)^{16, 17}. The information collected by WSV or their authorised insurers includes demographics, injury, payments and treatments. Information necessary for claims handling, such as healthcare providers (e.g. treatment invoices), is also collected. More detailed information on the variables collected in the WSV datasets has been published elsewhere^{18, 19}.

Exclusion and inclusion criteria

This study examined standard workers' compensation claims with an incapacity start date between January 2007 and December 2012, with at least one-day of WR (N = 98,149).

Research Question One

Non-modifiable predictors of 52 weeks of WR: Individual demographic, occupational and injury-related factors

Demographic, occupational and injury-related factors used in our analyses were age, sex, occupational physical demands, workplace size, industry, injury type, and year of incapacity. The measure of occupational physical demands was based on the Australian and New Zealand Standard Classification of Occupation (ANZSCO)²⁰ code associated with each claim. Occupational physical demands were grouped into the following four levels of load handling: limited (<5kg); light (5 but <10kg); medium (between 10 and 20kg) and heavy (>20kg). A more detailed construction of this variable has been published previously²¹.

Workplace size was split into four categories based on the employer's remuneration in 2010/11 deflated to 2005/06 Australian dollars (AUD) of small (<1million AUD), medium (1-20 million AUD), and large (>20 million AUD), and government. Industry type categories were derived using the Australian and New Zealand Standard Industry Classification (ANZSIC 2006)²² divisions. Injury type was defined using the Australian Standard Type of Occurrence Classification System (TOOCS V3)²³ which defines injury type according to the nature and

mechanism of injury. Year of incapacity was included in analyses to control for any improvements or declines that may have occurred in the claim adjudication process over time.

Area level factors

Area level factors were the Index of Relative Socio-economic Advantage and Disadvantage (IRSAD), which is based on economic and social conditions of individuals and households within a geographical area, and the Accessibility/Remoteness Index of Australia (ARIA), which is an index of remoteness based on the physical road distance between an area and different classes of services. Each of these indices was assigned to individuals based on their residential postal code. Analyses were adjusted for ARIA and IRSAD.

Modifiable predictors of 52 weeks of WR

Claim timelines

Times for the following three periods were defined based on benchmark requirements of the claims submission process outlined below and using CRD data:

1. Reporting time: IWs must submit a claim to their employer within 28 days of incurring an injury. Therefore, more than 30 days between an IW's incapacity start date, which usually coincides with the date the injury was incurred, and the date the IW submitted the claim to their employer was defined as a prolonged reporting time.
2. Employer submission time: The Workplace Injury Rehabilitation and Compensation (WIRC) Act 2013 in Victoria states an employer must submit the claim with the compensation authority within 10 days of receiving it from the IW. Therefore, more than 10 days between the date when the IW provides their employer with the claim form and the date when the employer submits the claim to the compensation authority was defined as a prolonged employer submission time.
3. Wage replacement time: Once a claim is submitted to a claims agent, they have 28 days to adjudicate the claim, after which WR payments will be initiated if the claim is accepted (provided the worker has lost more than 10 days from work). In most cases the claims agent will reimburse the employer, with the worker being paid by the employer. No information is contained in the CRD for the adjudication date, nor are there specific time

periods within which WR payments should start after the adjudication date. Based on monthly reports, WSV estimates the median time between the date the scheme receives a claim and the IW receives their first compensation payment is 42 days. Therefore, we defined 45 days between the scheme received date and the first compensation received date as a prolonged WR time. This provides 17 additional days from the maximum time to adjudicate a claim for WR payments to start, and represents a period of one and a half months for the worker to receive payments from the insurance scheme for their work injury. It should be noted that the absence of wage replacement from the system to the worker, does not always indicate no wages are being paid to the worker, as the employer might continue to pay the worker, in the absence of wage replacement from the system.

First access to healthcare

The employer is liable for the first \$600 of medical and like costs following an injury. However, the time taken to receive health care, beyond this amount, may mediate the relationship between prolonged times to report, submit or start wage replacement. That is, when more time is taken in each of these aspects of the claim submission and adjudication, then this may subsequently lead to a longer time taken to access health care, which can in turn lead to worse RTW outcomes. IWs are required to see a medical professional, who determines the nature of their injury and certifies their capacity for work, within 10 days of incurring their injury prior to lodging a claim with their employer. Therefore, more than 14 days between affliction date and first medical treatment accessed date was considered a prolonged time period that needed to be adjusted for in our analyses that explored the association between prolonged claim submission and adjudication and the likelihood of reaching 52 weeks of WR.

Outcome(s)

The outcome for the first analysis was the accumulation of 52 weeks of WR. This outcome was chosen as it represents a milestone in the Victorian Workers Compensation process after which an employer is not obligated to re-employ a sick/injured worker. Subsequently, RTW rates may decrease as the claimant may not be returning to the workplace where their injury was sustained.

Within a sample of claims with an incapacity date from January 1st 2007 to December 31st 2012, WR payments were used to identify the number of weeks of WR an IW received. This approach was consistent with how weeks of WR are counted in the Victorian Workers'

Compensation legislation, where any payment received during a week, be it for one day or seven days, is counted as a week of WR. The start of WR was counted as week 3 of payment to account for employers who cover their employees for the first 10 days post-injury, and week 1 for employers who do not pay the excess. Once claims reach 52 weeks of WR they are coded as having this outcome. Details of the CRD variables used to derive this outcome, and SAS/Stata code used to create these variables, is available on request.

IWs who accumulated 52 weeks of WR represented 14.7% of all standard workers' compensation claims with an injury date between January 1st 2007 and December 31st 2012, with at least one-day of WR, and 18.1% of all non-terminated claims. Further, this outcome was classified by counting the accumulated duration of weeks where the IW received some wage replacement beginning from the IWs claim invoice start date.

For this study's second objective we focused on three claim outcomes post-52 weeks; terminations, accumulation of 130 weeks of WR, and RTW. Accumulation of 130 weeks of WR was defined using the same method as 52 weeks of WR. Terminations were defined using the CRD variable CLAIM_STATUS_REASON_CD where the date of the claim status is before the 52 week mark of the claim (365 days from the day they were first entitled to workers' compensation payments) are categorised as terminations due to RTW factors (values 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, and 14), and non-RTW factors, such as death, common-law action (values 26, 27, 28, 29, 30, 31, 32, and 33). RTW was also defined using CLAIM_STATUS_REASON_CD (value 18, 19, 20, 21, 22, 23, 24, and 25).

Statistical Analysis

Analysis Sample

The analysis sample contained accepted standard workers' compensation claims with an incapacity start date between January 2007 and December 2012, with at least one-day of WR (N=98,149). From this sample we removed 3,925 claims (4%) which were terminated due to RTW reasons within the first 52 weeks of the claims, and 8,754 (9%) which were terminated due to non-RTW factors. Return-to-work factors were:

1. termination claim (fail to provide medical certificates),
2. termination claim (fail to participate in rehabilitation),
3. termination claim (fail to make effort to return to work),
4. termination claim (fail to participate in assessments),
5. termination claim (fail to provide information on injury),

6. termination claim (over 104 weeks benefits, not serious),
7. termination claim (fraudulence),
8. termination claim (worker has reached retirement age),
9. termination claim (superannuation or termination lump sum),
10. termination claim (non-resident),
11. termination claim (imprisonment),
12. termination claim (s115 settlement),
13. termination claim (no longer entitled for other reason), and
14. rejection liability not accepted.

Further, an s115 settlement applies to a worker who:

- a) suffered an injury arising out of, or during, or due to the nature of, employment on or after 12 November 1997 and before 20 October 1999; and
- b) is receiving weekly payments of compensation in respect of the injury, or who would be entitled to receive such payments but for the operation of section 96(2); and
- c) has been assessed in respect of the injury as having no current work capacity and as likely to continue indefinitely to have no current work capacity; and
- d) has received weekly payments in respect of the injury for at least 104 weeks; and
- e) has been assessed, in accordance with sections 91 and 115C, as having a 30% or more degree of impairment in respect of the injury.

Non-RTW reasons were 26-claim opened in error, 27-worker has died, 28-common law action completed, 29-other legal action completed, 30-worker no longer wants benefits (other than RTW), 31-section 98/98a claim closure, 32-section 92 claim closure, 33-medical only closure.

An additional 5,148 claims (5%) had, no WR in the three-year follow-up period, so were removed from the sample. Together removed claims totalled 17,827, leaving a final analytical sample of 80,322 claims

Of the sample of 80,322 claims, 10.5% (n=8,453) were missing information on our main study exposure (reporting, submission or adjudication times), with another 0.3% (n=239) missing information on one or more of the study covariates (all of which were related to area level factors). Missing information was most commonly related to prolonged reporting times and in most cases was due to the date of first incapacity occurring substantially after the date when

the claim was submitted to the employer. Older age, having an injury type classified as 'other chronic condition' (compared to chronic musculoskeletal conditions), being in a government workplace (compared to a small workplace), being male, having low physical occupational demands, and claims with an incapacity date in the later part of our study period were more likely to have missing information on other study covariates. After removing claims with missing information on the processing times and covariates, the final analytical sample totalled 71,607 claims.

Multivariable logistic regression analyses investigated:

- i. The association between age, sex, occupational strength requirements, industry, workplace size, injury type, and year of incapacity and each of the compensation processing times, defined as a binary outcome (prolonged/not prolonged) according to the cut-points outlined on page 10; and
- ii. The association between age, sex, occupational strength requirements, industry, workplace size, injury type, and year of incapacity and each of the compensation process times, defined as binary outcomes according to the cut-points outlined on page 10; and
- iii. The association between each compensation process time, defined as both categorical and binary variables, and the accumulation of prolonged processing times and the accumulation of 52 weeks of WR.

All analyses were adjusted for the demographic, occupational and injury-related factors, prolonged times in the receipt of healthcare, and for the preceding prolonged time where appropriate. Stata 14.2 was used to perform all analyses (Stata Corporation, College Station, TX).

Research Question Two: Trajectories of HSU frequency and outcomes post-52 week of WR

Analysis Sample

Claims that accumulated 52 weeks of WR (N=14,509); 14.7% of all standard workers' compensation claims with an injury date between January 2007 and December 2012, with at least one-day of WR, and 18.1% of all non-terminated claims.

Trajectories of HSU frequency

Month from incapacity was defined as occurring every 28 days from the IW's incapacity start date. The service date was used to determine the month the service was accessed by determining the number of days from the incapacity start date to the service date and dividing by 28. The data was then collapsed by month, giving a sum of the number of unique services accessed. Group-based trajectory models were fitted using Stata's traj Plugin²⁴. The data were analysed using the censored normal distribution and different orders of polynomials were examined to determine the best fitting shape of the trajectories. The number of trajectories was determined (up to seven trajectories were examined) by examining the Bayesian information criterion (BIC) values, and taking into account model parsimony and comprehensibility. Posterior probabilities of group membership were examined to determine how well the model fit the data. We gleaned little extra information from the five trajectory group model, as compared to the four trajectory group model, which is described in this report.

Factors associated with trajectories of HSU frequency

Multinomial logistic regression analyses were used to determine how various socio-economic, occupational, injury and claims process-related factors related to trajectories of HSU frequency (nominal variable). Consistently low HSU frequency was used as the base outcome for these analyses.

Association between trajectories of HSU frequency and outcomes post 52 weeks of WR

Multinomial logistic regression analyses, adjusted for the previously mentioned socio-economic, occupational, injury and claims process-related factors, explored the association between trajectories of HSU frequency outcomes post-52 weeks (130 weeks, termination and RTW). Termination was defined as the cessation of WR replacement, without a resumption

within two weeks, and 130 weeks was chosen as this represents the point in the Victorian worker's compensation process when an IW can continue to receive payments Weekly payments can continue if:

- i) they have returned to work and are working at least 15 hours a week and earning \$186AUD or more a week; or
- ii) because of their injury, they're likely to remain physically or mentally incapable of working beyond this level, in any job.

Statistical Analyses

Group based trajectory modelling and multinomial logistic regression were used to address the first, second, and third objectives, respectively.

Results

Sample Demographics

Of the 71,607 claims included in the analysis, the majority were men (65.8%). The age of IWs ranged from 15-84 years, with an average age of 42.8 years. Over a third of claims were from workers in the manufacturing, wholesale trade, and transport industries (34.1%), followed by the construction industry (13.2%). Over one-half of all claimants were from the two lowest occupational physical demands categories (limited and light) (Table 1). Almost 30% of claims were from small workplaces, 40.3% were from medium-sized businesses and 30.2% were from large or government workplaces. Nearly 39% of the included claims had sustained chronic musculoskeletal (MSK) injuries, with the second and third largest injury groups being wounds, amputations, burns (16.3%), and traumatic MSK (15.2%) respectively (Table 1).

Table 1. Distribution of all claims with incapacity data between Jan 1, 2007 and December 31, 2012 across socio-economic, demographic, work and organisation, and injury-related factors (N = 71,607 claims).

	All claims 2007-2012 (N=71,607)	
AGE	N	%
15-24 years	7,677	10.7
25-34 years	12,421	17.4
35-44 years	17,209	24.0
45-54 years	20,360	28.4
55+ years	13,940	19.5
SEX		
Male	47,155	65.9
Female	24,452	34.2
OCCUPATIONAL PHYSICAL DEMANDS		
Limited (handling loads <=5kg)	21,284	29.7
Light (handling loads >=5 but <10kg)	19,977	27.9
Medium (handling loads >=10 and <=20kg)	22,387	31.3
Heavy (handling loads >20kg)	7,959	11.1
WORKPLACE SIZE		
Small/Medium	50,004	69.8
Large/Government	21,603	30.2
INDUSTRY		
Manufacturing	24,410	34.1
Primary Industries	2,958	4.1
Construction	9,475	13.2
Retail and Accom	6,102	8.5
Public administration	4,580	6.4
Education	3,976	5.6
Healthcare and Social Assist	10,638	14.9
All other [#]	9,468	13.2
INJURY TYPE		
Chronic MSK	27,789	38.8
Intracranial, spinal cord	450	0.6
Fractures	9,022	12.6
Wounds, amputations, burns	11,676	16.3
Traumatic MSK	10,860	15.2
Other traumatic injury	948	1.3
Mental diseases	6,962	9.7
Other chronic conditions	3,900	5.5

Table 1 (cont): Distribution of all claims with incapacity data between Jan 1, 2007 and December 31, 2012 across socio-economic, demographic, work and organisation, and injury-related factors (N = 71,607 claims).

		All claims 2007-2012 (N=71,607)	
YEAR OF INJURY			
2007		11,722	16.4
2008		12,375	17.3
2009		11,499	16.1
2010		12,121	16.9
2011		12,016	16.8
2012		11,874	16.6

Information media and telecommunications, Financial and insurance services, Rental hiring and real estate services, Professional scientific and technical services, Administrative and support services, Arts and recreation services, and Other services

Research Question One: Modifiable and non-modifiable predictors of 52 week of WR

Results revealed 19.0% (n=13,614) accumulated 52 weeks of WR, and of those 27.2% (n=3,698), or approximately 5.2% of the total sample, reached 130 weeks (Figure 1). Slight increases in the proportion of claims reaching 52 weeks were observed over the time period, but the proportion of claims reaching 130 weeks of wage replacement remained relatively consistent between 2007 and 2012.

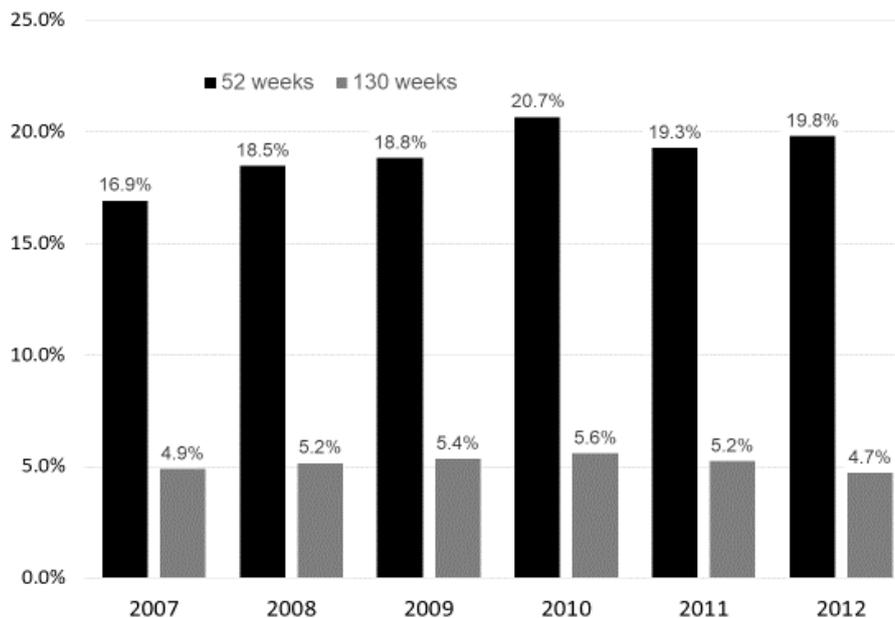


Figure 1. Proportion of claims that accumulated 52 and 130 weeks of wage replacement by year of incapacity.

Factors associated with each WR threshold

Table 2 presents the results from the logistic regression model examining factors associated with reaching 52 weeks of wage replacement. The purpose of a logistic model is to examine differences in the probability of having a given outcome (in this case 52 weeks of wage replacement versus not having 52 weeks of wage replacement) across levels of each independent variable. In a logistic model one level of each variable is considered the reference group (indicated by a value of 1.00 in the Table), and all other levels of a variable are compared to this 'reference' group. Odds ratio (OR) values that are greater than one indicate an increased likelihood of the outcome in a given group, compared to the reference group. OR values less than one indicate a decreased likelihood of the outcome compared to the reference group. For each OR there is a 95% confidence limit. These values indicate the upper and lower estimates of the OR value. When these values do not cross 1.00 the OR estimate is considered to be statistically significant. For example, if the OR value was above 1.00 and the lower confidence limit did not cross 1.00 we would consider that we would still obtain a value with an increased probability (value higher than one), 95 times out of 100. Because the logistic model included all variables, each estimate is 'adjusted' for all other variables in the table, in addition to geographic indexes of accessibility and remoteness, and relative socio-economic advantage and disadvantage. That is, the OR estimate can be interpreted more easily, given all other variables in the table were adjusted to make them equivalent across each level of a given variable.

Table 2 shows that groups at decreased risk of reaching 52 weeks of WR included workers less than 34 years of age (compared to those 35 to 44 years of age), large and government workplaces (compared to medium and small workplaces), claimants in education, health care, other service industries and public administration (compared to those in manufacturing), and those with fractures, wounds and amputations and other chronic conditions (compared to those with chronic musculoskeletal conditions). Groups at increased risk of accumulating 52 weeks of WR were 55 years and older (compared to 35 to 44 years of age), females (compared to males), working in construction (compared to manufacturing), those with moderate strength requirements (compared to those with the lowest strength requirements), those in small/medium workplaces (compared with large/government) and those with intracranial and spinal cord or psychological injuries (compared with those with chronic musculoskeletal conditions). There was also an increased likelihood of reaching 52 weeks of WR for injuries with later incapacity dates, peaking in 2010 (compared to those with an incapacity date in 2007).

Table 2. Associations between socio-demographic/economic, occupational, and injury-related factors and 52 weeks of wage replacement (N=71,607).

	OR*	95% CI	
AGE			
15-24 years	0.32	0.29	0.35
25-34 years	0.68	0.63	0.72
35-44 years	1.00		
45-54 years	1.02	0.97	1.07
55+ years	1.21	1.14	1.28
SEX			
Male	1.00		
Female	1.35	1.29	1.42
OCCUPATIONAL PHYSICAL DEMANDS			
Limited (handling loads <=5kg)	1.00		
Light (handling loads >=5 but <10kg)	1.13	1.06	1.19
Medium (handling loads >=10 and <=20kg)	1.20	1.14	1.27
Heavy (handling loads >20kg)	1.08	1.00	1.16
WORKPLACE SIZE			
Small/Medium	1.00		
Large/Government	0.74	0.71	0.78
INDUSTRY			
Manufacturing	1.00		
Primary industries	0.91	0.82	1.01
Construction	1.22	1.14	1.30
Retail trade, accomm. and food services	0.93	0.86	1.00
Public admin and safety	0.57	0.52	0.63
Education and training	0.56	0.51	0.62
Health care and social assistance	0.54	0.50	0.58
All other	0.86	0.80	0.91
INJURY TYPE			
Chronic MSK	1.00		
Intracranial and spinal cord	1.35	1.09	1.67
Fractures	0.43	0.40	0.46
Wounds, amputations, burns	0.34	0.32	0.37
Traumatic MSK	0.58	0.55	0.62
Other traumatic injuries	0.92	0.78	1.08
Mental diseases	1.71	1.61	1.82
Other chronic conditions	0.37	0.33	0.41

Table 2 (cont). Associations between socio-demographic/economic, occupational, and injury-related factors and 52 weeks of wage replacement (N=71,607).

	OR*	95% CI	
YEAR OF INJURY			
2007	1.00		
2008	1.11	1.04	1.19
2009	1.11	1.04	1.19
2010	1.24	1.16	1.33
2011	1.15	1.07	1.23
2012	1.16	1.08	1.24

* Estimates adjusted for all other variables in the table in addition to ARIA (Accessibility/Remoteness Index of Australia), IRSAD (Index of Relative Socio-economic Advantage and Disadvantage).

Table 3 presents the odds ratios and associated 95% confidence intervals for each variable and the likelihood of accumulating 130 weeks of WR. Older age, female gender, working in construction (compared to manufacturing), and sustaining an intracranial injuries or psychological injury (compared to a chronic MSK condition) were associated with increased risk of reaching 130 weeks of wage replacement. Working in a large or government organisation (compared to a medium or small organisation) was associated with a decreased risk of reaching 130 weeks of wage replacement.

Table 3. Associations between socio-demographic/economic, occupational, and injury-related factors and 130 weeks of wage replacement (N=71,607).

	OR*	95% CI	
AGE			
15-24 years	0.20	0.16	0.25
25-34 years	0.60	0.53	0.67
35-44 years	1.00		
45-54 years	1.11	1.01	1.21
55+ years	1.30	1.19	1.43
SEX			
Male	1.00		
Female	1.17	1.07	1.27
OCCUPATIONAL PHYSICAL DEMANDS			
Limited (handling loads <=5kg)	1.00		
Light (handling loads >=5 but <10kg)	1.03	0.93	1.14
Medium (handling loads >=10 and <=20kg)	1.14	1.04	1.26
Heavy (handling loads >20kg)	0.91	0.79	1.04
WORKPLACE SIZE			
Small/Medium	1.00		
Large/Government	0.66	0.60	0.73
INDUSTRY			
Manufacturing	1.00		
Primary industries	1.07	0.90	1.27
Construction	1.38	1.24	1.53
Retail trade, accomm. and food services	0.99	0.87	1.13
Public admin and safety	0.55	0.47	0.65
Education and training	0.55	0.47	0.66
Health care and social assistance	0.50	0.44	0.57
All other	0.84	0.75	0.94
INJURY TYPE			
Chronic MSK	1.00		
Intracranial and spinal cord	2.42	1.82	3.21
Fractures	0.57	0.51	0.65
Wounds, amputations, burns	0.43	0.38	0.49
Traumatic MSK	0.55	0.49	0.62
Other traumatic injuries	1.12	0.86	1.46
Mental diseases	2.27	2.05	2.51
Other chronic conditions	0.48	0.40	0.57

Table 3 (cont). Associations between socio-demographic/economic, occupational, and injury-related factors and 130 weeks of wage replacement (N=71,607).

	OR*	95% CI	
YEAR OF INJURY			
2007	1.00		
2008	1.05	0.93	1.18
2009	1.06	0.94	1.19
2010	1.10	0.98	1.23
2011	1.04	0.92	1.17
2012	0.91	0.80	1.02

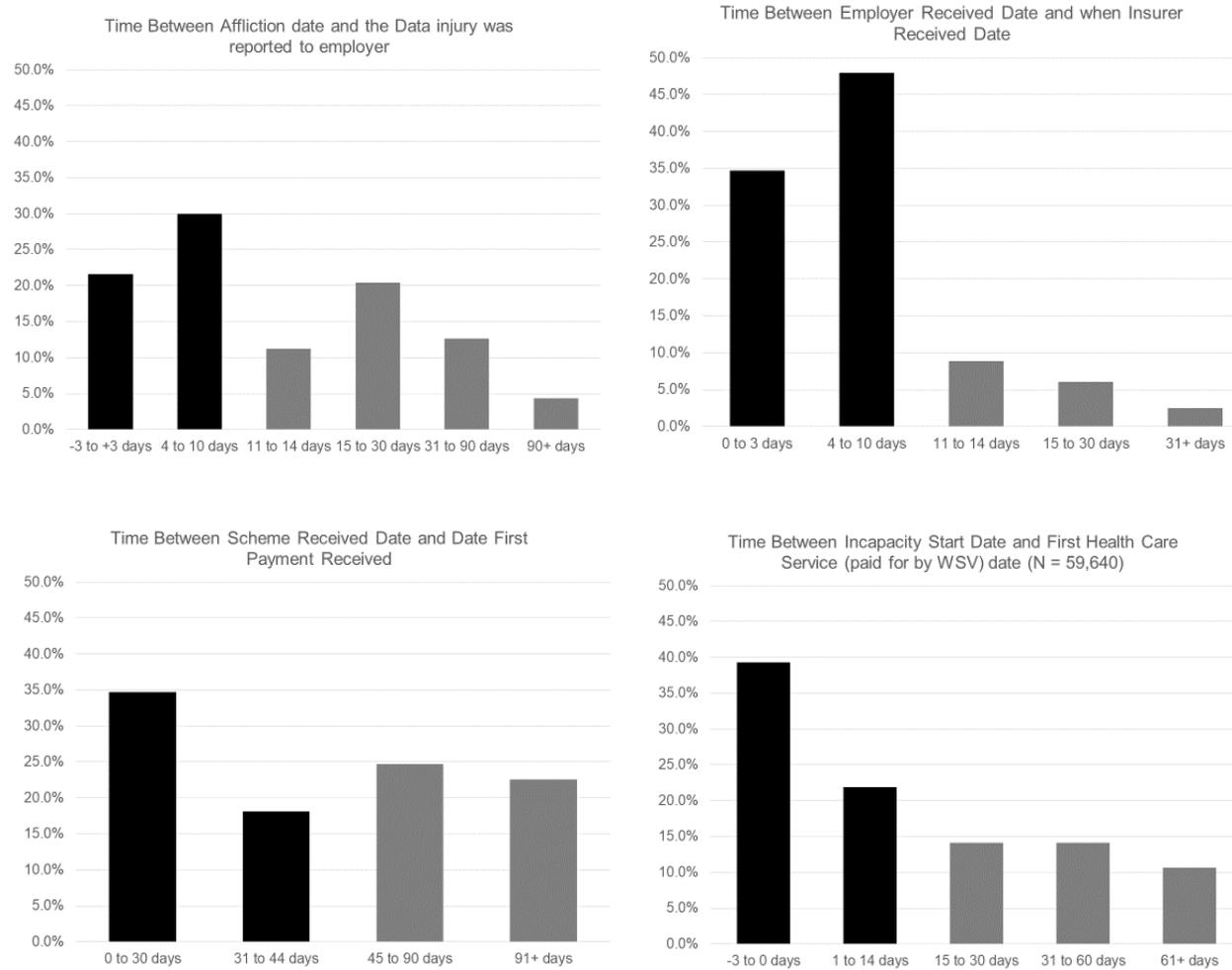
* Estimates adjusted for all other variables in the table in addition to ARIA (Accessibility/Remoteness Index of Australia), IRSAD (Index of Relative Socio-economic Advantage and Disadvantage).

Research Question One: Modifiable and non-modifiable predictors of 52 week of WR

Compensation process time periods

We observed that 16.9% of claims had a prolonged reporting time and 17.4% had a prolonged employer submission time. Further, 4-10 days was the most common group for both types (Figure 2). The most common payment time group was 0-30 days, and 47.2% did not receive their first payment for 45 days or more after the insurer received their claim from their employer. The majority (50.9%) of claimants accessed their first health care service within 14 days of incurring their injury, and 32.3% received their first health care services more than 14 days after sustaining it. Differences were also observed in the trends over time, with a declining likelihood of prolonged employer processing times in more recent claim years, while an increased likelihood of prolonged payment times was present in more recent years.

Figure 2. Distribution of claims by days taken to report an injury, lodge a claim, receive wage replacement, and receive healthcare (N = 71,607). Prolonged times are shaded in grey.



Factors associated with prolonged time to injury reporting, employer submission and compensation payment

Only the variable of being female (compared to male) was consistently associated with each type of prolonged processing time, which persisted following adjustment for injury type (Table 4). More specifically, being female was most strongly associated with a prolonged payment time in the claim adjudication process. Older age was associated with an increased likelihood of having a prolonged reporting time, and younger age was associated with a lower likelihood of a prolonged reporting and payment time. Occupations with medium physical demands were the least likely to have a prolonged reporting and payment time, but no relationship was observed between occupational physical demands and prolonged employer submission time. Education, public administration and health care industries were associated with a higher likelihood of prolonged employer submission times compared to manufacturing industries, although they had a reduced likelihood of prolonged payment times.

Additionally, the construction industry was associated with a higher likelihood of prolonged reporting and employer submission times, and primary industry, retail, public administration and safety and other service industries were all associated with a higher likelihood of prolonged employer submission times. In contrast, compared to the manufacturing industry, the construction, public administration and safety, health and social assistance, and other service industries were all associated with lower likelihood of prolonged payment times. Medium, large and government workplaces had a lower likelihood of prolonged reporting and employer submission times, but a higher likelihood of prolonged payment times compared to smaller workplaces.

Compared to claimants with chronic MSK injuries, claimants with acute/traumatic injuries (fractures and intracranial injuries) had consistently lower likelihood of prolonged time for reporting, employment submission and provision of wage replacement. Those with a mental health claims or a chronic condition had significantly higher odds of prolonged reporting and compensation payment times.

Table 4. Odds ratios and 95% confidence intervals for prolonged reporting time, employer submission time and time to first wage replacement payment across study covariates (N = 71,607)

	Prolonged reporting time			Prolonged employer submission time			Prolonged time to first WR payment		
	OR*	95% CI		OR*	95% CI		OR*	95% CI	
AGE									
15-24 years	0.85	0.79	0.92	1.01	0.94	1.08	0.84	0.79	0.89
25-34 years	0.89	0.83	0.94	1.06	0.92	1.12	0.92	0.88	0.97
35-44 years	1.00			1.00			1.00		
45-54 years	1.09	1.03	1.15	1.00	0.95	1.06	1.01	0.97	1.06
55+ years	1.14	1.07	1.20	1.01	0.95	1.07	1.04	1.00	1.09
SEX									
Male	1.00			1.00			1.00		
Female	1.09	1.03	1.14	1.08	1.03	1.14	1.19	1.15	1.24
OCCUPATIONAL PHYSICAL DEMANDS									
Limited	1.00			1.00			1.00		
Light	0.97	0.92	1.03	1.03	0.97	1.09	1.02	0.98	1.07
Medium	0.90	0.85	0.95	1.03	0.97	1.09	0.89	0.85	0.93
Heavy	0.94	0.87	1.01	1.01	0.94	1.10	0.97	0.92	1.03
WORKPLACE SIZE									
Small	1.00			1.00			1.00		
Medium	0.79	0.75	0.83	0.86	0.82	0.90	1.19	1.14	1.23
Large	0.77	0.73	0.82	0.45	0.42	0.48	1.46	1.39	1.53
Government	0.74	0.67	0.82	0.40	0.35	0.44	1.25	1.16	1.35

Table 4 (cont). Odds ratios and 95% confidence intervals for prolonged reporting time, employer submission time and time to first wage replacement payment across study covariates (N = 71,607)

	Prolonged reporting time			Prolonged employer submission time			Prolonged time to first WR payment		
INDUSTRY									
Manufacturing	1.00			1.00			1.00		
Primary industries	0.99	0.89	1.10	1.12	1.02	1.24	0.96	0.88	1.04
Construction	1.11	1.04	1.19	1.11	1.05	1.19	0.91	0.86	0.96
Retail trade, accomm. and food services	1.03	0.96	1.12	1.26	1.17	1.35	0.99	0.94	1.06
Public admin and safety	0.94	0.84	1.04	1.25	1.12	1.40	0.89	0.83	0.97
Education and training	1.05	0.95	1.17	1.39	1.25	1.55	0.72	0.66	0.78
Health care and social assistance	0.68	0.63	0.73	0.97	0.90	1.05	0.84	0.79	0.88
All other	1.02	0.96	1.09	1.09	1.02	1.16	0.88	0.84	0.93
INJURY									
Chronic MSK	1.00			1.00			1.00		
Intracranial	0.78	0.60	1.00	0.73	0.56	0.95	0.80	0.66	0.97
Fractures	0.50	0.47	0.54	0.82	0.77	0.88	0.57	0.54	0.60
Wounds etc.	0.60	0.56	0.64	0.96	0.90	1.01	0.65	0.62	0.68
Traumatic MSK	0.85	0.80	0.90	0.92	0.86	0.97	1.01	0.97	1.06
Other traumatic	0.90	0.76	1.07	0.77	0.67	0.87	0.90	0.78	1.02
Mental	1.21	1.12	1.29	0.76	0.70	0.82	1.40	1.33	1.49
Other chronic	1.20	1.11	1.30	0.80	0.73	0.88	1.80	1.67	1.93

Table 4 (cont). Odds ratios and 95% confidence intervals for prolonged reporting time, employer submission time and time to first wage replacement payment across study covariates (N = 71,607)

	Prolonged reporting time			Prolonged employer submission time			Prolonged time to first WR payment		
YEAR OF INJURY									
2007	1.00			1.00			1.00		
2008	1.02	0.95	1.09	1.09	1.02	1.17	1.00	0.95	1.06
2009	1.01	0.94	1.08	0.97	0.91	1.04	1.00	0.95	1.05
2010	0.94	0.88	1.01	0.95	0.88	1.01	1.38	1.31	1.45
2011	0.98	0.91	1.05	0.97	0.90	1.03	1.82	1.73	1.92
2012	1.02	0.96	1.10	0.85	0.79	0.91	1.32	1.25	1.39

* Estimates adjusted for all other variables in the table in addition to ARIA (Accessibility/Remoteness Index of Australia), IRSAD (Index of Relative Socio-economic Advantage and Disadvantage)

Table 5 presents the odds ratios and 95% confidence intervals for categories of differences in time taken to report injury, employer submission and provision of wage replacement and the likelihood of accumulating 52 weeks of WR. More prolonged compensation processing times increased the likelihood of accumulating 52 weeks of WR, but this was not seen for prolonged employer submission times. The relationship between a prolonged payment time and likelihood of accumulating 52 weeks of WR indicated a threshold effect, with all lengths of time of 31 days and greater associated with an increase likelihood of accumulating 52 weeks of WR. Model 2 (adjustment for various confounders) and Model 3 (further adjustment for preceding delayed times in the claim process) demonstrate that adjusting for socio-demographic/economic, occupational, and injury related factors and preceding time periods did not change the pattern of results for any of the time periods.

Table 5: Association between various time taken to report, submit and provide payment and likelihood of reaching 52 weeks of wage replacement (N = 71,607)

Reporting Time	Model 1	95% CI		Model 2	95% CI	
+/-3 days	1.00			1.00		
4-10 days	1.07	1.01	1.13	1.07	1.02	1.14
11-14 days	1.15	1.07	1.23	1.13	1.05	1.21
15-30 days	1.22	1.15	1.29	1.16	1.09	1.24
31-90 days	1.52	1.43	1.63	1.37	1.28	1.46
91+ days	2.43	2.23	2.65	2.01	1.84	2.19

Employer Submission Time	Model 1	95% CI		Model 2	95% CI		Model 3	95% CI	
0-3 days	1.00			1.00					
4-10 days	0.96	0.92	0.99	0.97	0.93	1.00	1.02	0.97	1.06
11-14 days	1.02	0.95	1.09	1.00	0.93	1.08	1.06	0.98	1.14
15-30 days	1.02	0.94	1.11	0.97	0.89	1.06	1.01	0.93	1.10
31+ days	0.99	0.88	1.13	0.98	0.86	1.11	1.01	0.88	1.15

Payment Time	Model 1	95% CI		Model 2	95% CI		Model 3	95% CI	
0-30 days	1.00			1.00					
31-44 days	1.45	1.38	1.53	1.31	1.24	1.39	1.30	1.23	1.38
45-90 days	1.43	1.36	1.49	1.29	1.23	1.36	1.26	1.20	1.33
91+ days	1.37	1.30	1.45	1.17	1.10	1.23	1.09	1.03	1.15

Model 1 = unadjusted model; Model 2 = Adjusted for age, sex, IRSAD, ARIA, industry, minimum occupational strength requirements, skill level, workplace size, year of incapacity, injury type, healthcare delay; Model 3 = also adjusted for preceding delays

Table 6 demonstrates 38.5% (n=27,568) had no prolonged time periods in claim submission or adjudication, while 43.1% (n=30,885) had one prolonged time period, 16.7% (n=11,965) had two prolonged time periods, and 1.7% (n=1,188) experienced three prolonged time periods at each process. This indicates that not just the individual delays themselves but the combination and accumulation of delays is an important consideration. As the number of prolonged time periods increased, the odds of accumulating 52 weeks of wage replacement also increased. Adjusting for prolonged time to receive health care (model 2) had minimal impact on these associations.

Table 6. Logistic regression models for number of prolonged processing times and likelihood of reaching 52 weeks of WR.

Number of Prolonged Processing Times	N (%)	Model 1*			Model 2*		
		OR	95%CI		OR	95%CI	
0 Prolonged Processing Times	27,568 (38.5)	1.00					
1 Prolonged Processing Time	30,885 (43.1)	1.10	1.05	1.15	1.05	1.00	1.10
2 Prolonged Processing Times	11,965 (16.7)	1.32	1.25	1.39	1.24	1.16	1.32
3 Prolonged Processing Times	1,188 (1.7)	1.47	1.28	1.68	1.43	1.23	1.66

*Model 1 = adjusted for age, sex, IRSAD, ARIA, industry, workplace size, minimum occupational strength requirements, injury type, year of incapacity; Model 2 = additionally adjusted for healthcare delay

Research Question Two: Outcomes post-52 week of WR

Of the 14,509 IWs that accumulated 52 weeks of WR, 5.2% (N=753) returned to work, 27.6% (n=4008) went on to accumulate 130 weeks of WR, and over a third (n=5141, 35.4%) had their wage replacement terminated. The remainder of almost 30% had a claim status of “unknown” (n=2508, 17.2%) or “other” (n=2099, 14.5%). Further, 51% of IWs with an “other” claim status reason were classified as medical only closures, and 12% were common law actions (Figure 3).

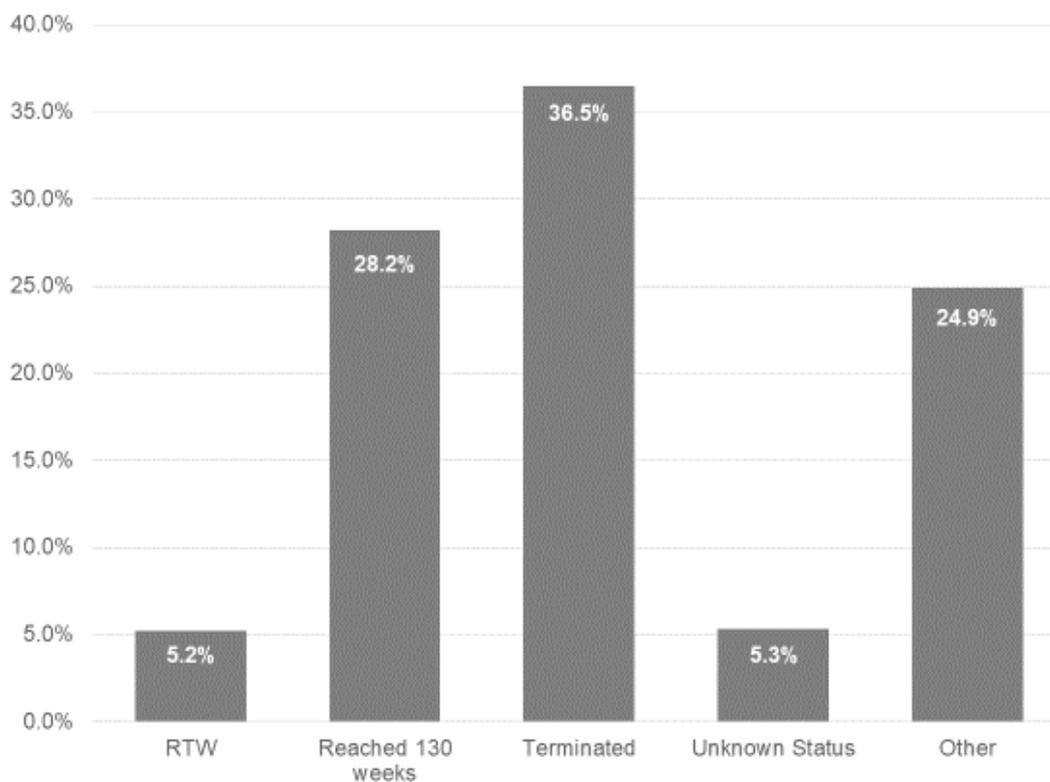


Figure 3: Claim outcomes for chronically injured workers (workers with at least 52 weeks of wage replacement, N = 14,509)

Health service use trajectories

Analysis revealed four clear trajectories of HSU frequency (Figure 4). The first trajectory group (diamond markers) showed consistently low HSU across the first 12 months post-injury, and accounted for 36.0% of the sample. A second trajectory group (square markers) showed HSU that started at a moderate rate and decreased by 12 months to become low (Mod-Low). This group accounted for 25.8% of the sample. A third trajectory group (triangle markers) showed HSU that increased steadily becoming moderate by 12 months (Low-Mod), and accounted for 22.9% of the sample. Finally, a fourth trajectory group (circle markers) showed consistently high HSU in the 12-months post-injury, and accounted for 15.3% of the sample.

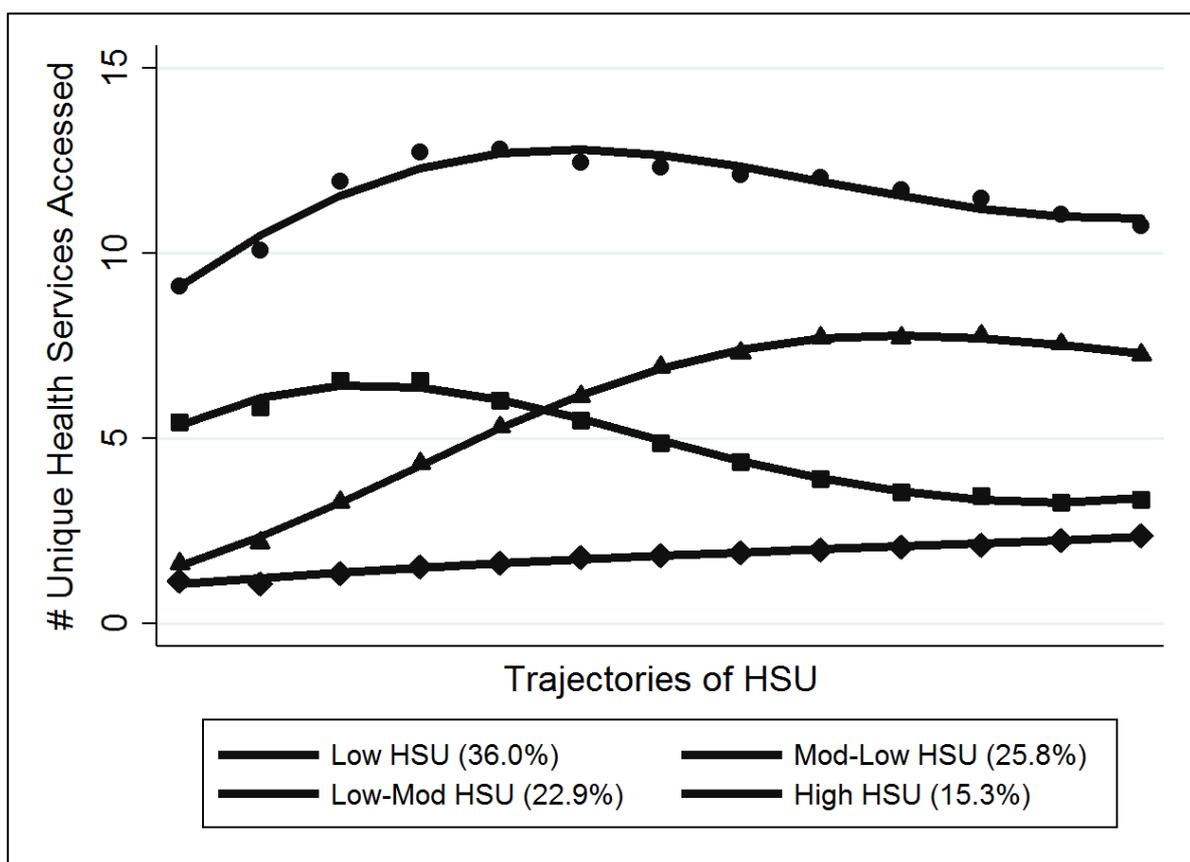


Figure 4. Trajectories of HSU frequency over first 12 months of a claim for claimants who accumulated at least 52 weeks of wage replacement (N = 14,509).

Factors associated with HSU trajectories

We ran a multinomial logistic regression analysis to examine factors associated with different health service trajectories among our sample of workers with at least 52 weeks of WR. The multinomial model is an extension of the logistic model used earlier, when there are more than two possible outcomes (i.e. in the case of health service trajectories there are four possible outcomes), and there is no clear order between the groups. The reference group for all models was the consistently low HSU group. These models are presented in Tables 8a through 8c.

Prolonged time periods for reporting, employer submission or wage replacement payments, having a mental health claim or a claim for other chronic conditions, and being 55+ years of age (compared to those 35 to 44 years) were associated with a reduced likelihood of being in the **Moderate-to-Low** HSU trajectory (compared to the consistently low HSU group) (see Table 8a). Similar variables were associated with a decreased likelihood of being in the **Low-to-Moderate** HSU trajectory (compared to the consistently low HSU group), while being female (compared to male) was associated with an increased likelihood of being in this group (Table 8b). Finally, variables associated with an increased likelihood of being in the **High HSU** trajectory group (compared to the consistently low HSU group) were having a intracranial injury or fracture, being in a medium to large employer (compared to a small employer), being female (compared to male) and being in the education industry. Each type of prolonged time for claim reporting, employer submission and payment of wage replacement were associated with a decreased likelihood of being in the highest HSU group, compared to the lowest HSU group (Table 8c). This reduced risk is likely related to prolonged time periods for submission and payment being less likely to occur among the most acute and traumatic injuries.

Table 8a. Odds ratios and 95% confidence intervals for having a moderate to low health service use trajectory compared to a low health service use trajectory across study variables (N = 14,509).

Variable	OR	95% CI	
Prolonged time periods			
No prolonged time periods	1.00		
Prolonged reporting time	0.59	0.52	0.66
Prolonged employer submission time	0.73	0.64	0.84
Prolonged time to wage replacement	0.44	0.39	0.49
Prolonged time to first healthcare	0.40	0.36	0.45
AGE			
35-44 years	1.00		
15-24 years	0.75	0.57	0.99
25-34 years	1.12	0.94	1.34
45-54 years	0.90	0.77	1.04
55+ years	0.78	0.67	0.92
SEX			
Male	1.00		
Female	1.29	1.12	1.49
OCCUPATIONAL PHYSICAL DEMANDS			
Limited (handling loads <=5kg)	1.00		
Light (handling loads >=5 but <10kg)	0.92	0.78	1.09
Medium (handling loads >=10 and <=20kg)	0.98	0.84	1.15
Heavy (handling loads >20kg)	0.88	0.71	1.10

Table 8a (cont). Odds ratios and 95% confidence intervals for having a moderate to low health service use trajectory compared to a low health service use trajectory across study variables (N = 14,509).

Variable	OR	95% CI	
INDUSTRY			
Manufacturing	1.00		
Agriculture	0.82	0.76	2.56
Construction	0.86	1.00	1.57
Retail	1.01	0.94	1.40
Public administration	0.56	0.76	1.07
Education	1.17	0.64	1.48
Healthcare, social	1.00	0.20	0.29.
All other	0.89	0.17	0.34
WORKPLACE SIZE			
Small	1.00		
Medium	1.20	1.05	1.37
Large	1.19	1.00	1.42
Government	0.95	0.69	1.30
INJURY TYPE			
Chronic MSK	1.00		
Intracranial, spinal cord	1.40	0.76	2.56
Fractures	1.25	1.00	1.57
Wounds, amputations, burns	1.15	0.94	1.40
Traumatic MSK	0.90	0.76	1.07
Other traumatic injury	0.97	0.64	1.48
Mental diseases	0.24	0.20	0.29
Other chronic conditions	0.24	0.17	0.34

Table 8b. Odds ratios and 95% confidence intervals for having a low to moderate health service use trajectory compared to a low health service use trajectory across study variables (N = 14,509).

Variables	OR	95% CI	
Prolonged time periods			
No prolonged time periods	1.00		
Prolonged reporting time	0.78	0.69	0.87
Prolonged employer submission time	0.88	0.77	1.01
Prolonged time to wage replacement	0.66	0.59	0.74
Prolonged time to first healthcare	0.81	0.71	0.91
AGE			
35-44 years	1.00		
15-24 years	0.64	0.48	0.86
25-34 years	0.89	0.74	1.08
45-54 years	0.96	0.83	1.11
55+ years	0.85	0.72	0.99
SEX			
Male	1.00		
Female	1.33	1.16	1.53
OCCUPATIONAL PHYSICAL DEMANDS			
Limited (handling loads <=5kg)	1.00		
Light (handling loads >=5 but <10kg)	0.98	0.83	1.16
Medium (handling loads >=10 and <=20kg)	0.90	0.77	1.05
Heavy (handling loads >20kg)	0.75	0.60	0.94

Table 8b (cont). Odds ratios and 95% confidence intervals for having a low to moderate health service use trajectory compared to a low health service use trajectory across study variables (N = 14,509).

Variables	OR	95% CI	
INDUSTRY			
Manufacturing	1.00		
Agriculture	0.89	0.66	1.19
Construction	1.00	0.84	1.19
Retail	1.14	0.92	1.41
Public administration	0.80	0.59	1.08
Education	1.49	1.08	2.06
Healthcare, social	1.21	0.98	1.50
All other	0.96	0.80	1.16
WORKPLACE SIZE	RRR	95% CI	
Small	1.00		
Medium	1.24	1.09	1.42
Large	1.17	0.98	1.40
Government	1.16	0.87	1.56
INJURY TYPE	RRR	95% CI	
Chronic MSK	1.00		
Intracranial, spinal cord	0.72	0.35	1.49
Fractures	0.76	0.58	0.98
Wounds, amputations, burns	0.61	0.49	0.78
Traumatic MSK	0.88	0.75	1.04
Other traumatic injury	0.62	0.38	1.00
Mental diseases	0.21	0.17	0.25
Other chronic conditions	0.25	0.18	0.35

Table 8c. Odds ratios and 95% confidence intervals for having a high health service use trajectory compared to a low health service use trajectory across study variables (N = 14,509).

Variables	OR	95%CI	
Prolonged time periods			
No prolonged time periods	1.00		
Prolonged reporting time	0.50	0.44	0.57
Prolonged employer submission time	0.62	0.52	0.74
Prolonged time to wage replacement	0.41	0.35	0.47
Prolonged time to first healthcare	0.30	0.26	0.34
AGE			
35-44 years	1.00		
15-24 years	0.53	0.37	0.76
25-34 years	1.05	0.84	1.30
45-54 years	0.84	0.71	1.00
55+ years	0.75	0.62	0.91
SEX			
Male	1.00		
Female	1.30	1.10	1.54
OCCUPATIONAL PHYSICAL DEMANDS			
Limited (handling loads <=5kg)	1.00		
Light (handling loads >=5 but <10kg)	0.87	0.72	1.06
Medium (handling loads >=10 and <=20kg)	1.04	0.87	1.26
Heavy (handling loads >20kg)	0.93	0.71	1.21

Table 8c (cont). Odds ratios and 95% confidence intervals for having a high health service use trajectory compared to a low health service use trajectory across study variables (N = 14,509).

Variables	OR	95%CI	
INDUSTRY			
Manufacturing	1.00		
Agriculture	0.71	0.50	1.02
Construction	0.60	0.48	0.74
Retail	0.84	0.64	1.09
Public administration	0.69	0.47	1.01
Education	1.59	1.04	2.43
Healthcare, social	1.02	0.78	1.33
All other	0.79	0.63	0.98
WORKPLACE SIZE			
	RRR	95% CI	
Small	1.00		
Medium	1.55	1.32	1.81
Large	1.31	1.06	1.63
Government	1.10	0.73	1.65
INJURY TYPE			
	RRR	95% CI	
Chronic MSK	1.00		
Intracranial, spinal cord	2.75	1.50	5.04
Fractures	2.08	1.64	2.63
Wounds, amputations, burns	1.00	0.79	1.26
Traumatic MSK	0.89	0.73	1.08
Other traumatic injury	1.36	0.86	2.14
Mental diseases	0.05	0.04	0.07
Other chronic conditions	0.16	0.10	0.27

Modifiable factors (HSU trajectories, prolonged reporting, submission, provision of wage replacement and access to healthcare times) associated with outcomes post 52-weeks of WR

Table 9 presents odds ratios and 95% confidence limits for modifiable factors (prolonged reporting, submission, provision of wage replacement and access to healthcare times; and health service use trajectory groups) and three (RTW, claim termination and reaching 130 weeks of wage replacement) of the five possible claim outcomes in the 18 months following reaching the 52nd week of wage replacement. Prolonged time to receive wage replacement (but not other prolonged times) was associated with an increased likelihood of claim termination in the 18 months following reaching 52 weeks of wage replacement, compared to returning to work. Having high health service use in the first 12 months of the claim was associated with a higher likelihood of reaching 130 weeks of wage replacement, compared to returning to work. (Table 9).

Other non-modifiable factors associated with a higher likelihood of termination (compared to RTW) included older age (45+ years compared to 35 to 44 years), being female, low occupational skill level and being employed by a medium or large employer. Younger age, psychological injury, fractures and other chronic conditions were associated with a reduced likelihood of termination versus RTW. Similar relationships were observed for the relationship between age, sex and occupational skill level and likelihood of reaching 130 weeks of wage replacement (compared to RTW). Intracranial and spinal cord injuries were also associated with an increased likelihood of reaching 130 weeks of wage replacement compared to chronic MSK conditions (results presented in Appendix).

Table 9. Odds ratios and 95% confidence intervals from multinomial logistic regression models examining termination and reaching 130 weeks of wage replacement, compared to returning to work, for modifiable claim and health service use factors.

Termination versus RTW			
	OR*	95% CI	
TRAJECTORY GROUP			
Low HSU	1.00		
Mod-Low HSU	0.92	0.75	1.14
Low-Mod HSU	0.95	0.76	1.18
High HSU	1.13	0.85	1.50
Prolonged time periods			
No prolonged time periods	1.00		
Prolonged reporting time	1.14	0.97	1.33
Prolonged employer submission time	1.01	0.83	1.22
Prolonged time to wage replacement	1.20	1.02	1.41
Prolonged time to first healthcare	1.08	0.91	1.28
Reaching 130 weeks versus RTW			
	OR*	95% CI	
TRAJECTORY GROUP			
Low HSU	1.00		
Mod-Low HSU	1.06	0.85	1.31
Low-Mod HSU	1.16	0.93	0.93
High HSU	1.86	1.40	1.40
Prolonged time periods			
No prolonged time periods	1.00		
Prolonged reporting time	1.25	1.06	1.47
Prolonged employer submission time	0.94	0.77	1.15
Prolonged time to wage replacement	0.97	0.82	1.14
Prolonged time to first healthcare	0.93	0.78	1.10

*Adjusted for age, sex, occupational strength demands, industry, workplace size, injury type, year of incapacity and ARIA (Accessibility/Remoteness Index of Australia), IRSAD (Index of Relative Socio-economic Advantage and Disadvantage)

Discussion

This study formed part of a mixed-methods program of research intended to assist in reducing claim duration and improve recovery and return to work outcomes for injured workers in Victoria. More specifically, this study aimed to identify factors associated with claims becoming long-term, defined as 52 or more weeks of WR, and future outcomes for long-term claims over the next 18 months. These objectives were achieved by examining administrative data for workers' compensation claims with a first date of incapacity between January 1st 2007 and December 31st 2012 (N=71,607). Firstly, analyses examined the relationship between modifiable and non-modifiable characteristics early in the claim, with the likelihood of reaching 52 weeks of WR. Secondly, among these long-term claims, regression analyses examined the relationship between these modifiable and non-modifiable factors, and health care trajectories over the first 12 months of the claim, with various claim outcomes over the following 18 months (up to 130 weeks of WR).

Key Findings

Older workers, female workers, IWs in lower skilled occupations, small or medium sized workplaces, the construction industry, and those who had sustained an intracranial, spinal cord, or psychological injury were significantly more likely to accumulate 52 weeks of WR. In addition, this study also identified potentially modifiable prolonged time periods in injury reporting by claimants, employer lodgement of claims, and receipt of WR payments were significantly associated with accumulating 52 weeks of WR, over and above a prolonged time in seeking treatment and differences in injury type. Further, the more prolonged the time periods, the greater likelihood an IW had of accumulating 52 weeks of WR. Analyses also identified four distinct health care trajectories over the first 12 months of these claims.

Examination of outcomes for IWs post-52 weeks revealed 36.5% (n=5,290) of claims that reach 52 weeks of wage replacement are subsequently terminated for various RTW-related reasons, 28.2% (n = 4,086) go on to accumulate 130 weeks of WR; and only 5.2% (n = 760) have a current claim status that indicates that they have returned to work in any capacity. Few modifiable factors were associated with different claim outcomes post-52 weeks. Prolonged wait times for compensation payments to start were associated with a higher likelihood of termination (compared to RTW), and high health care service use in the first 12 months of the claim was associated with a higher likelihood of accumulating 130 weeks of wage replacement (compared to RTW). Other factors associated with an increased risk of claim termination (compared to RTW) included older age, female gender, lower occupational skill level, and working for a medium or large sized employer (compared to a small employer).

Workers in construction (compared to manufacturing), and those with fractures or psychological injuries (compared to chronic MSK conditions) were less likely to be terminated. Older age, female gender, lower occupational skills level were also associated with an increased risk of reaching 130 weeks of age replacement (compared to RTW), as was having an intracranial or spinal cord injury (compared to having a chronic MSK condition).

Implications for Policy and Practice

Prolonged time periods in claim submission and claim adjudication represent important modifiable factors that are associated with negative claim outcomes (i.e. reaching 52 weeks of wage replacement). Further, this study established that, whilst there is a cumulative impact of the number of extended time periods on the probability of reaching 52 weeks of WR, different demographic, occupational and injury-related factors are associated with each type of delay. Therefore, it is potentially possible to reduce time periods to report, submit and provide wage replacement. Such tailored interventions could promote appropriately timed RTW and thus reduce the number and impact of long-term claims.

Trends over time, as demonstrated by the associations between year of incapacity and each prolonged reporting time, suggest times taken to report and employer submitting times are steadily decreasing. This may indicate an increased awareness of the benefit of prompt disclosure and treatment on the part of employees and employers. However, prolonged compensation payment times increased over the same time period. As mentioned, prolonged time to receive wage replacement represent a possible interruption to the claims adjudication process. This prolonged time could prove particularly stressful for an IW who has promptly reported their injury and has met all the requirements of claim submission, within the legislated timeframes. In turn, this stress and frustration could impact on the IWs recovery, thus delaying their RTW and prolonging their period of compensation^{32, 33}. Therefore, despite, improvements in reporting and employer processing times over time, the adjudication process is still vulnerable to interruption. This trend is particularly pronounced among IWs with mental diseases, and for female claimants, the recovery from which may be even more adversely affected by prolonged times in adjudication³²⁻³⁴. Therefore, these findings suggest that prolonged times in claim adjudication require specific consideration in WSV's efforts to improve IW outcomes and reduce the number of long terms claims. Part of these improvements could consider clearer guidance to injured workers on what time period is likely to occur between claim submission and the start of compensation payments.

Whilst this study was able to identify which modifiable and non-modifiable factors predict which IWs are likely to reach 52 weeks of WR, we were less able to identify which factors would predict outcomes for them after reaching this milestone. That is, after accumulating 52 weeks of WR it is much less clear which members of this chronically injured group of workers are likely to have their claim terminated, which are likely to RTW and which are likely to go on to accumulate 130 weeks of WR. Generally speaking, information collected about the IW and their injury has strong predictive capabilities when it comes to determining outcomes in the first year of their claim. However, these same “early” factors, which make up the majority of the information collected by the CRD, are not as effective when it comes to predicting long-term outcomes for this group of injured workers, as psychosocial factors begin to play a more important role the longer the claim duration³⁵. Therefore, primary data collection is required to allow the identification modifiable factors, that potentially occur later in the life of a claim (i.e. post-52 weeks), are not limited to the time of the injury, and predict longer term RTW outcomes among chronically IWs.

Strengths and Limitations of the Study

A notable strength of this study is the use of a large administrative dataset, containing data reliably and consistently collected by claims agents. This makes the CRD a unique resource that enables examination of population-based personal injury claims and payment records, arising from workplace accidents or other compensable conditions¹⁹. It also provides information about claims from diverse industries and occupations, with a variety of injury types, and uses standard coding systems which are consistent with other jurisdictions in Australia and can be mapped to international classification systems¹⁹. Therefore, the findings of this study are generalizable to a broad range of claimants and their employers both locally and internationally.

There are also notable limitations to using the CRD to identify factors associated with claim duration and long-term outcomes. For example, the information available for examination related to injury- and health service-related factors is collected early in the compensation pathway. This limits researchers’ ability to determine potentially modifiable predictors of claim duration and long-term outcomes (RTW, termination and 130 weeks of WR) that occur throughout the first 12 months of a claim and after reaching the 52 week WR threshold. Additionally, adjustment for a variety of potential confounders that may arise throughout the life of the claim was not possible in the current data source. For example, this study was unable to explore the influence of attitudes to injury and illness within the workplaces, the IWs relationship with their employer, or objective and psychosocial indicators

of job quality such as casual, precarious employment or shift work, job demands and control, all of which have been shown to be associated with RTW ²⁵⁻²⁷.

Further, whilst existing research has identified the frequency of interactions with various stakeholders such as healthcare providers, insurers, lawyers, and employers, are important predictors of RTW ^{1, 3-12, 28-31}, the use of administrative data prevents examination of the *quality* of the interactions claimants have with different stakeholders. VIWOS Study 1 has gone some way to addressing this research gap by using qualitative data to identify that IW recovery and RTW can be hampered by key events such as the continual change of claims managers, delays in decision making, repeated medical evaluations, lengthy, escalating disputes, and adversarial system processes which contribute to the distress the IW. However, replicating and potentially confirming these findings using quantitative research data and methodologies on a large representative sample of IWs is required, but currently not possible by just using the limited data routinely collected by the CRD.

In relation to the investigation of various times taken to report, submit and start wage replacement for claims, and establish that prolonged times in these areas were associated with negative claim outcomes, we are not able to determine *why* these delays have occurred. We also do not know if informal reporting of injuries had occurred between employees and employers prior to the submission of a formal workers' compensation claim, or if workers were continuing to be paid by their employer while the adjudication process was taking place. Finally, the information available to determine the time period for adjudication and start of WR was limited in the available data, as are specific time frames for when workers in Victoria can expect WR to start, following claim adjudication. It is also possible that employers may continue to pay the wages for workers beyond the 10 days that they are required to. As a result, for some workers who experience a prolonged time between claim submission and WR start, may not have a cessation in employment income. In each case these factors would lead to misclassification of our primary exposure variables and as a result the impact of prolonged processing times reported in this paper may be underestimated

Finally, the CRD does not provide any information as to what happens to IWs once they have separated from the workers' compensation system, whether due to RTW or non-RTW reasons such as claim termination. Given the proportion of claims that are terminated for non-RTW reasons after accumulating 52 weeks of WR, the latter limitation of the CRD is particularly noteworthy. We are currently unable to determine the long-term impact on the worker's family, their finances, their re-employment in another field, or whether these workers go on to other income support programs, become homeless, or increase their reliance on government provided health and social services.

Future Research

Encouragingly, this study identified that potentially modifiable prolonged times in claim adjudication and processing of wage replacement are associated with claim duration, and their reduction could see a decline in long-term claims. Approximately a third of injured workers who accumulated 52 weeks of wage replacement between January 1st 2007 and December 31st 2012 were terminated between 52 weeks and 130 weeks of wage replacement, while only 5% had a claim status that indicated they had successfully returned to employment. Unfortunately, once workers are terminated from workers' compensation no information is available on their recovery or future RTW status or sources of income replacement if they have not returned to work. This is particularly pertinent given that young workers, and those in lower skilled occupations are more likely to be terminated, which emphasizes the need for a prospective study and primary data collection to identify why this is occurring, identify factors that could improve RTW outcomes, and assess the health, employment and social and economic consequences among workers' who exit the workers' compensation system, especially those where benefits have been terminated.

Whilst identifying modifiable factors that may improve outcomes for IWs and our understanding of both failed and successful RTW attempts for these often very complex claims are important aspects of the VIWOS research program, the lack of knowledge of what happens to IWs when they disconnect from the system and the range of physical and mental health, psychosocial and economic factors that influence RTW prospectively cannot be answered fully by VIWOS Studies 1 or 2. These are compelling reasons for undertaking a prospective study that can utilise survey questionnaires at several time points in addition to data linkage with established health and social administrative datasets. Specifically, future research should build on the foundation and findings of Studies 1 and 2 and involve a longitudinal cohort study of IWs who reach 52 weeks or more of WR, with an overall aim will to determine the long-term health, social and economic outcomes for workers who do not return to work after a long term compensable injury, and assess the factors impacting on RTW.

Conclusions

This study identified some factors, measured at the time of injury and during the injury compensation process, which are associated with claim duration up to, and in excess of, 52 weeks of WR. These findings can be used to inform process change, such as efforts to reduce the time taken to adjudicate claims and start wage replacement benefits, as one approach to improve long-term claim outcomes among injured workers in Victoria. However, the large cohort of chronically IWs who become separated from the system after reaching 52 weeks of WR, due to termination or RTW, require dedicated research attention to understand the full health and economic impact of long-term claims in Victoria.

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APPENDICES

Appendix 1. Number of lags by lag type for all claims (N=80,322).

LAG TYPE			TOTAL	
Reporting Delay	Employer Delay	Payment Delay	n	%
No	No	No	17606	21.9
No	No	Yes	18468	23.0
No	Yes	No	3837	4.8
No	Yes	Yes	4802	6.0
Yes	No	No	14854	18.5
Yes	No	Yes	14223	17.7
Yes	Yes	No	3030	3.8
Yes	Yes	Yes	3502	4.4

Appendix 2. Odds ratios and 95% confidence intervals from multinomial logistic regression models examining termination and reaching 130 weeks of wage replacement, compared to returning to work. Results from full model (N = 14,509)

Termination versus RTW			
	OR*	95% CI	
AGE			
35-44 years	1.00		
15-24 years	0.56	0.41	0.76
25-34 years	0.84	0.67	1.06
45-54 years	1.26	1.02	1.55
55+ years	1.98	1.53	2.55
SEX			
Male	1.00		
Female	1.47	1.20	1.81
OCCUPATIONAL PHYSICAL DEMANDS			
Limited (handling loads <=5kg)	1.00		
Light (handling loads >=5 but <10kg)	1.14	0.89	1.46
Medium (handling loads >=10 and <=20kg)	0.81	0.65	1.02
Heavy (handling loads >20kg)	0.85	0.63	1.13
OCCUPATIONAL SKILL LEVEL			
Level 1 (highest)	1.00		
Level 2	1.08	0.76	1.53
Level 3	1.28	0.89	1.85
Level 4	1.37	0.98	1.92
Level 5 (lowest)	2.06	1.42	2.99
IRSAD			
Deciles 5 & 6	1.00		
Deciles 1 & 2 (bottom 20%)	1.03	0.81	1.31
Deciles 3 & 4	1.13	0.88	1.45
Deciles 7 & 8	0.95	0.74	1.21
Deciles 9 & 10 (top 20%)	0.75	0.58	0.96
INDUSTRY			
Manufacturing	1.00		
Agriculture	0.96	0.64	1.45
Construction	0.69	0.54	0.87
Retail	0.90	0.66	1.24
Public administration	0.69	0.46	1.03
Education	0.65	0.41	1.03
Healthcare, social	1.06	0.75	1.49
All other	0.84	0.65	1.10

Termination versus RTW (cont)			
	OR*	95% CI	
WORKPLACE SIZE			
Small	1.00		
Medium	1.42	1.18	1.72
Large	1.46	1.11	1.92
Government	0.90	0.61	1.36
INJURY TYPE			
Chronic MSK	1.00		
Intracranial, spinal cord	1.57	0.47	5.22
Fractures	0.69	0.52	0.92
Wounds, amputations, burns	0.79	0.59	1.06
Traumatic MSK	0.80	0.63	1.01
Other traumatic injury	0.99	0.51	1.90
Mental diseases	0.51	0.39	0.66
Other chronic conditions	0.64	0.41	0.97

Reaching 130 weeks versus RTW			
	OR*	95% CI	
AGE			
35-44 years	1.00		
15-24 years	0.26	0.18	0.37
25-34 years	0.59	0.47	0.75
45-54 years	1.45	1.18	1.80
55+ years	2.29	1.77	2.95
SEX			
Male	1.00		
Female	1.33	1.08	1.63
OCCUPATIONAL PHYSICAL DEMANDS			
Limited (handling loads <=5kg)	1.00		
Light (handling loads >=5 but <10kg)	1.14	0.89	1.46
Medium (handling loads >=10 and <=20kg)	0.84	0.67	1.05
Heavy (handling loads >20kg)	0.84	0.62	1.13
OCCUPATIONAL SKILL LEVEL			
Level 1 (highest)	1.00		
Level 2	0.80	0.57	1.14
Level 3	0.97	0.67	1.41
Level 4	1.04	0.74	1.46
Level 5 (lowest)	1.54	1.06	2.25

Reaching 130 weeks versus RTW (cont)			
	OR*	95% CI	
IRSAD			
Deciles 5 & 6	1.00		
Deciles 1 & 2 (bottom 20%)	1.08	0.85	1.38
Deciles 3 & 4	1.18	0.92	1.52
Deciles 7 & 8	0.87	0.68	1.12
Deciles 9 & 10 (top 20%)	0.76	0.58	0.99
INDUSTRY			
Manufacturing	1.00		
Agriculture	1.03	0.68	1.57
Construction	0.82	0.64	1.04
Retail	0.86	0.62	1.18
Public administration	0.65	0.42	0.97
Education	0.67	0.42	1.08
Healthcare, social	0.86	0.60	1.21
All other	0.74	0.57	0.98
WORKPLACE SIZE			
Small	1.00		
Medium	1.10	0.91	1.34
Large	1.11	0.85	1.47
Government	0.64	0.42	0.96
INJURY TYPE			
Chronic MSK	1.00		
Intracranial, spinal cord	3.53	1.08	11.53
Fractures	0.69	0.52	0.93
Wounds, amputations, burns	0.85	0.63	1.14
Traumatic MSK	0.64	0.49	0.82
Other traumatic injury	1.09	0.56	2.12
Mental diseases	1.13	0.87	1.47
Other chronic conditions	0.78	0.51	1.20