

Measuring return-to-work in workers' compensation

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Abstract

This paper describes an ongoing project to measure the success of schemes in actually returning injured workers to work - as opposed to measuring whether the injured worker has simply ceased to receive benefits. Workers Compensation schemes aim to help injured workers while off work and get them back to work. Historically, success of a scheme was measured by financial outcomes, such as average claim cost. This is recognised as being inadequate: schemes need to know how they are performing in achieving genuine return-to-work. However, there is no agreed methodology to measure this. We discuss the need for a standardised measure of RTW by reviewing the merits and limitations of the existing measures from past studies. We propose approaches to analysing claims and survey data and outline potentially useful standardised measures. Further developments await the arrival of the data from the providers. The project is sponsored by the Actuarial Research Centre of Australia (ARCA).

Keywords: Return-to-work (RTW), Workers' Compensation (WC) schemes, survival analysis, multiple-state modeling.

1 Introduction

Workers' Compensation (WC) schemes provide injured workers with financial benefits while unable to work and aim to assist them to return to work (RTW). The sooner an injured worker returns to their former full time duties the sooner benefits cease.

One measure of the success of a scheme is the time taken for an injured worker to RTW and to cease receiving benefits. This has been a major area of interest for researchers for at least 30 years.

The question remains, what does RTW mean? This term has been used interchangeably to define outcomes ranging from the claimant performing paid work duties to the claimant performing their pre-injury duties, without recurrences of their past injuries and experiencing physical, mental, social and financial well-being. The following definitions of RTW have been used:

- **First RTW.** The claimant has made a first return to paid work, whether this may be the same level or type of duties as their pre-injury duties.

- **Durable RTW (DRTW).** The claimant has made a return to paid work and has continued their duties without further interruptions. Again, this does not consider the nature of the duties.
- **Temporary RTW.** Any non-durable RTW outcome.
- **Partial RTW.** The claimant has made a return to paid work. However, for reasons such as change of duties or residual injuries, their post-return salary is less than their pre-injury salary. So, schemes supplement this shortfall with "top-up" benefits.
- **Successful RTW.** The claimant has achieved the highest possible stable level of recovery and is now working with the same employer in their pre-injury duties. Furthermore, the claimant is experiencing satisfaction with all aspects of life. This paper defines this as stable recovery and this term is used to represent successful RTW.

Past studies have summarised a measure of RTW, such as the probability of RTW or duration to RTW without referring specifically to an outcome. Interest centres on stable recovery, rather than just at the resumption of work duties at a performance level that best matches their skills and residual work disability. In addition to their resumption of work duties, the claimant experiences no further absences from the injury. We wish to emphasise the difference between defining RTW and stable recovery. The former focuses on the financial and employment aspect; the claimant being back at work and not receiving injury benefits.

However, not all claimants recover meaning allowances have to be made to prevent measuring bias. Focus should be placed on measuring the claimant's stable health outcome. A suitable approach of measuring scheme performance is the "Time To Stable Health" (TTSH). However, the obstacles to developing this successful measure include data reliability, differences in scheme design, claimant characteristics, etc. A standardised measure accounting for such differences is desirable because this allows for better practices in data collection and increased comparability across schemes. In turn, more effective rehabilitation measures and policy-setting can be implemented to assist in improving the claimant's welfare and reduce scheme expenditure.

The aim of the ARCA project is to combine the merits of existing RTW measures and develop a standardised TTSH measure. The standardised measure will be tested and verified using claims and appropriate supplementary data such as surveys on claimants and employers. Various definitions of RTW are investigated, with a view of including the desirable features into defining stable health. Our focus is on the claimant's long-term health status, using the claimant's full history in the recovery process.

The data is fitted using survival regression models to identify the major factors that determine the achieved stable recovery outcome. The impact across different schemes, claimants' occupation and personal characteristics, including type of injury or illness are quantified. The resulting coefficients from the fitted survival model form a basis for standardisation, adjusting for differences across claimants so progress to stable recovery is more readily compared. Claims data will be provided by the Heads of WC Authorities (HWCA).

The focus of this paper is to describe the background to the problem and argue for a standard TTSH measure. Past approaches are reviewed for their suitability in overcoming the current problem. Modelling and data analysis are described in general terms, as no data has as yet been provided.

The further sections of this paper are structured as follows. The next section outlines the Australian institutional framework for delivering WC. Section 3 discusses the reasons for measuring health stability and the associated complications. Section 4 reviews the developments to date in measuring RTW and identifies areas that need further refinement. Section 5 presents our proposed approach to defining and measuring health stability. Section 6 discusses the sources of data to be used in our project. Section 7 outlines the model structure and the steps we plan to take in the analysis stage. Section 8 reviews the challenges that the project faces and how they may hinder the project.

2 Workers' Compensation in Australia

Each Australian state and territory operates its own WC scheme. In addition, the Australian Federal government has a WC scheme for its public servants (Comcare) while large private sector companies (such as Telstra) are self-insured. HWCA oversees and coordinates activities across all the schemes and comprises of the managing directors of each scheme but all schemes operate under their own regulations, have their own premium rates, levels of benefits, exclusion conditions and other rules.

All 10.3 million Australian employees (Australian Bureau of Statistics 2006) are covered by a WC scheme. The business is huge – the cost of claims exceeds \$6bn per annum, a significant component of the Australian GDP.

The myriad of schemes with their individual rules and regulations hampers comparability across schemes. Effective practices employed by one scheme cannot be identified clearly, preventing it from being applied into another scheme. Schemes have different approaches to collecting, presenting and summarising WC data. This creates further difficulties as non-comparable data can lead to misleading interpretations and unwarranted conclusions. The motivation of this project is to circumvent these difficulties to develop standardised measures not bound by scheme design, rules or regulations, or data collection issues.

3 Measuring TTSH and its complications

Getting an injured worker fully recovered and back to work is beneficial to both the claimant and those paying WC benefits. The sooner the claimant is back at stable employment the sooner the WC benefits cease. RTW is also financially beneficial for claimants because they are often paid a reduced level of payment while out of work. There are also social and psychological benefits – most claimants dislike at least long absences from work. The TTSH measure aims to capture the claimant working under stable arrangements and incorporates physical, emotional and social well-being.

We wish to emphasise the difference between defining RTW and stable recovery. The former focuses on the financial and employment aspect; the claimant being back at work and not receiving injury benefits.

In an ideal world, RTW or health stability do not need to be measured as no workplace injuries exist. The next best thing is where injured employees are off work for a limited time and then return to permanent full time employment in their pre-injury occupation at their original level of performance. While off work they receive an agreed amount of compensation. In this environment RTW is directly related to paid worker compensation and given the rate of payment, it is a simple matter to infer the duration to RTW once the worker has in fact returned to work.

TTSH focuses on a stable outcome. Such outcome is not known till the injured worker actually returns to work on a sustainable basis and has regained their physical, social and emotional well-being. At any point of time only those who have achieved stable recovery contribute to the TTSH measure. This argues for "waiting" a suitably long time for all to have achieved a stable recovery (or be classified as unable to achieve stable recovery) and then measuring TTSH. However, the longer the wait, the less relevant and timely are the resulting conclusions. Hence, a "snap-shot" approach where all those still making a recovery at a particular point of time may be suitable. But this also suffers from disadvantages because the resulting sample is heavily biased towards the longer term work disabled and discards recent other "snapshots." Thus in an idealised world complications exist in the measurement of TTSH.

In practice further complications arise:

1. At any point of time a claimant's length of time to return to work is not known. Hence their TTSH is unknown. The claimant may never recover. For example, a claimant may retire while receiving benefits. In this situation it cannot be inferred the scheme is ineffective in assisting them achieve a stable recovery outcome.
2. The health of the claimant and their observed RTW outcome is not an all-or-nothing event. For example, previous claimants may experience injury relapses and resume receiving injury benefits. Similarly, returned workers can experience further gradual health improvements.
3. Returning workers do not always recover to the extent where they can work at their pre-injury capacity. Less than ideal outcomes can occur. For example, claimants may depart to another employer with their previous employer incurring recruitment and training expenses.
4. Each WC scheme has its own specialized data collection system. These systems are often related to financial control relating to WC payments. They are generally not set up to capture non-financial information relevant to a proper appreciation of TTSH. For example, in South Australia claims remain "open" even if a claimant makes a stable medical recovery. Data gathering systems imperfectly measure partial RTW or recovery and do not measure psychosocial aspects of the recovery process.
5. WC schemes record information differently and in a non-uniform manner. Reasonable TTSH proxies for one scheme may be inadequate for another.
6. WC schemes have distinct rules for paying different rates of payments and setting the benefit periods. Studies show claimants in schemes paying more generous benefits take longer, on average, to achieve RTW (Meyer,

Kip Viscusi, and Durbin 1995; Galizzi and Boden 1996; Fox, Borba, and Liu 2005; Campbell Research and Consulting 2006). Scheme design thus influences claimant behaviour, complicating comparisons across schemes.

4 History of measuring time to RTW

This section describes the developments in measuring DOWD, DRTW. The role of surveys in supplementing research studies in this area are also investigated. The section concludes with a review of the Australian and New Zealand National Return-to-Work Monitor (the RTW Monitor), published by Campbell Research & Consulting.

The past 30 years has seen extensive research into the duration of work disability (DOWD) and the effects of scheme benefits on claimants. DOWD measures the length of time the claimant spends off work before returning to work. The traditional definitions of RTW refer mainly to the financial outcomes such as the amount of injury benefits being paid to the claimant and whether they are currently working. Over time, more stakeholders emerged and many voiced concerns about the measurements being biased towards financial outcomes. Research studies have pointed to social and emotional costs being a significant, but neglected, component of the total claims cost (Galizzi and Boden 1996; Evanoff, Abelin, Grayson, Dale, Wolf, and Bohr 2002; Pricewaterhouse Coopers and N.S.W. WorkCover Authority 2003; Wasiak, Kim, and Pransky 2006). Over time, success was rated as the claimant achieving full recovery rather than returning to paid employment. Recent studies incorporate into their analysis, the claimant's perceptions, durability of RTW and motivation to their work and social life in addition to the financial measures.

Existing studies into RTW and its impact on WC schemes are mainly based in USA and Canada, while some studies were based in the Netherlands (Joling, Janssen, and Groot 2004; Lotters, Hogg-Johnson, and Burdorf 2005; Faber, Burdorf, Bierma-Zeinstra, Miedema, and Koes 2006). Only recently has Australia begun research into RTW, with notable studies including the RTW Monitor by Campbell Research & Consulting (Campbell Research and Consulting 2006) and the joint study by PWC and WorkCover NSW in 2003 (Pricewaterhouse Coopers and N.S.W. WorkCover Authority 2003). The RTW Monitor allows schemes to assess their effectiveness in claims management and providing appropriate rehabilitation to their claimants. In addition, the RTW Monitor provides a rough guide for schemes to compare their performance against other schemes.

4.1 Duration of work disability (DOWD)

Studies in Johnson, Cullinan, and Curington (1979), Fenn (1981) and Johnson and Ondrich (1990) focused on the impact of different factors and disincentives originating from scheme design on DOWD. These studies measured the duration as the length of time between the onset of injury or first day of work absence due to work injury to the time when the claimant first returns to paid work.

However, (Butler, Johnson, and Baldwin 1995) performed a study on a large sample of Canadian workers who suffered permanent partial work injuries

over a 13 year period. The study concluded when the first RTW is considered a successful RTW outcome, the true length of time taken to achieve recovery is underestimated by at least 25%. This study was recognised as a milestone paper and many studies subsequently considered **durable** RTW (DRTW) as an indicator of stable recovery. DRTW is defined as a continuous form of RTW but variations exist in different studies. For example, Galizzi and Boden (1996) defined DRTW as the claimant being continuously at work for at least 3 months since their initial RTW; Pricewaterhouse Coopers and N.S.W. Work-Cover Authority (2003) defined DRTW as the claimant reporting themselves to be at work all of the time or most of the time, while Fox, Borba, and Liu (2005) defined DRTW as the claimant being continuously at work for at least 1 month since their initial return to paid work. However, Evanoff, Abelin, Grayson, Dale, Wolf, and Bohr (2002), Pransky et al (2002b), Gillen, Jewell, Faucett, and Yelin (2004) and Joling, Janssen, and Groot (2004) made no accommodation for DRTW, preferring to measure duration to first RTW.

Krause, Dasinger, Deegan, Brand, and Rudolph (1999) classified different DOWD measures into calendar time-to-event, cumulative and point prevalence measures. Comparisons were made between the different approaches of estimating DOWD. Prior to this composite study, researchers used different types of measures without referring to the inherent differences, merits or limitations. Krause, Dasinger, Deegan, Brand, and Rudolph (1999) found the differences between each approach to be significant, in particular the underestimation of DOWD using the calendar time-to-event measure. The paper recommended the use of the cumulative time measure as it incorporates recurrences of injuries leading to absence from work. Furthermore, a claimant working part-time while suffering from residual work disability contributes to their DOWD in proportion to their work capacity. Hence, the measure accounts for a number of the intricate features of the recovery process.

Despite the extensive research into defining and measuring DOWD, no agreement has yet been reached on the standard definition for DOWD. To date, DOWD is liberally defined so results from studies into scheme performance cannot be reliably interpreted. Krause et al (2001a) identified the need for a standard definition for DOWD in order to improve the quality of research in workers' compensation performance measurement and claimant rehabilitation.

4.2 Measuring DOWD using survey data

Until 1999, claims data was the most common data source employed in estimating DOWD. Few studies used survey data to verify the accuracy of the estimates. Recently, researchers began to question the appropriateness of measuring DOWD using only claims data. The role of survey data was recognised and used in enhancing the measurement of DOWD and other aspects of recovery after the study by Krause, Dasinger, Deegan, Brand, and Rudolph (1999).

Dasinger, Krause, Deegan, Brand, and Rudolph (1999) and Krause, Dasinger, Deegan, Brand, and Rudolph (1999) used telephone surveys and found claims data underestimated the true DOWD. Evanoff, Abelin, Grayson, Dale, Wolf, and Bohr (2002) found that the claims database is accurate in measuring the initial DOWD, but underreports the total DOWD as stated in the claimant's medical record. The reason is because the true extent of the post-injury quality

of life cannot be found in the claims database. Over time the definition of RTW has steered towards recovery in terms of health, social well-being and functional capacity so using surveys to extract information regarding the claimant's health, functional limitations and perceptions on life is crucial for measuring DOWD accurately.

4.3 Developments in defining recovery

Melles, McIntosh, and Hall (1995) first proposed the importance of defining successful RTW which captures different stakeholders' "key benefits" (quoted from Krause et al, 2001a). This is difficult because their interests conflict. This issue was also raised by the representatives of the different state WC schemes in Australia during an annual meeting hosted by Campbell Research and Consulting on reviewing the RTW Monitor. Social costs, which includes the emotional cost for the claimant and their immediate family, the costs borne by the employer for recruitment and retraining purposes and the economic cost of lost productivity often exceed the financial costs as recorded in the claims data, as evidenced in past studies (Galizzi and Boden 1996; Evanoff, Abelin, Grayson, Dale, Wolf, and Bohr 2002; Pricewaterhouse Coopers and N.S.W. WorkCover Authority 2003; Wasiak, Kim, and Pransky 2006). The implication of the significant social costs has led to the need to measure the claimant's recovery rather than the RTW outcome.

Galizzi and Boden (1996), Krause et al (2001b) and Evanoff, Abelin, Grayson, Dale, Wolf, and Bohr (2002) suggest traditional RTW measures focused predominantly on DOWD and the claims cost and are limited in perspective. The result is the underestimation of the true costs associated with the recovery process. More recent studies assessed the extent to which non-financial measures, such as functional capacity evaluations (FCE), psychosocial factors, post-injury health and mental outcomes enhance the outcome determined using traditional RTW measures (Pricewaterhouse Coopers and N.S.W. WorkCover Authority 2003; Pransky, Benjamin, Savageau, Currivan, and Fletcher 2005; Ferguson, Marras, and Burr 2005; Faber, Burdorf, Bierma-Zeinstra, Miedema, and Koes 2006; Lillefjell, Krokstad, and G. 2006). FCE has recently become a main area of interest due to its potential in explaining the stability and level of recovery and it is discussed in the next paragraph. FCE is currently undergoing development and refinement so its application in the project is under consideration.

In the past few years, researchers have suspected the limitations of using RTW as an indicator of health stability for claimants suffering low back injury. FCE was proposed as an alternative indicator. Under the FCE framework, the claimant's ability to perform certain actions after having sustained work injuries is the proxy for their attained level of recovery. Assessment tools have been developed over the past decade to measure the claimant's functional limitation, motivation at work and other lifestyle factors Ren, Selim, and Fincke (1999), Krause et al (2001b), Pricewaterhouse Coopers and N.S.W. WorkCover Authority (2003), Faber, Burdorf, Bierma-Zeinstra, Miedema, and Koes (2006) and Gross and Battie (2006). Extensive work have been performed in developing a more effective FCE but the association between functional limitations and RTW has not been determined (Faber, Burdorf, Bierma-Zeinstra, Miedema, and Koes 2006). It is undecided whether the claimant's functional capacity is the

predominant factor leading to the claimant's recovery. Lifestyle factors have also been identified as a contribution to the claimant's speed and extent of recovery. Hence, there is speculation about defining the claimant's recovery as being dependent on their functional capacity and satisfaction with life.

While functional capacity has a potential to measure the claimant's level of recovery at a given point in time, full recovery depends on their health stability. However, current studies have only started to recognise this issue. Lotters, Hogg-Johnson, and Burdorf (2005) performed a study on claimants from the Dutch work health service register suffering from musculoskeletal disorders (MSDs) to determine how improvements in pain perception and functional disability are associated with the time of RTW and also after they have been working for a period of time. The study found evidence of claimants experiencing significant improvements in their health and functional capacity over time after their return to paid work. The recovery process is observed to not cease upon the claimant returning to paid work. The study also identified crucial medical and psychosocial factors which determine the claimant's recovery. While the study focused on a particular group of claimants, evidence points to the measurement of health status as a preferred approach to observing the claimant's work status in determining the claimant's recovery.

4.4 Assessing performance across schemes and industries

Previous studies, most notably Galizzi and Boden (1996), Krause et al (2001b), Evanoff, Abelin, Grayson, Dale, Wolf, and Bohr (2002), Pricewaterhouse Coopers and N.S.W. WorkCover Authority (2003), Gillen, Jewell, Faucett, and Yelin (2004), Joling, Janssen, and Groot (2004), Krause, Rugulies, Ragland, and Leonard Syme (2004) and Fox, Borba, and Liu (2005) identified a myriad of determinant factors of DOWD and other measures of recovery. The size and direction of the association are also quantified. To date, no studies have attempted to standardise the results based on the inherent differences in the claimants' characteristics. Existing cross-sectional studies include the general claimant population but aggregate results are reported. Direct comparison between claimants from one group with another is hence not appropriate.

The current consensus is claimants suffering from more severe chronic back injury spend longer time on injury benefits than those who suffer minor burns, sprains and abrasions from workplace accidents. For example, Butler, Johnson, and Baldwin (1995) observed claimants suffering from low back pain face the risk of having recurrences of their workplace injuries. Hence, first RTW is not the same as achieving a stable recovery outcome. However, Seland, Cherry, and Beach (2006) did not account for recurrences of injuries in their study on claimants suffering from ankle or wrist injuries, because recurrences among these claimants are rare and hence statistically insignificant. A suitable approach to measuring TTSH across the general population must account for the inherent difference in the pattern of recovery for each injury group.

In past studies, older claimants are observed to take longer to recover than younger claimants. Furthermore, claimants who suffer from chronic injuries (DOWD greater than thirty days) are less likely to make an early recovery compared to those with acute injuries (DOWD less than thirty days). Two recent studies used age and disability phase-specific analysis. These studies found the absence of such analyses distorts the observed association between the de-

terminant factors and the probability of RTW and DOWD (Krause et al, 2001b; Pransky, Benjamin, Savageau, Currivan, and Fletcher (2005)). A direct comparison would have ignored the relative difference in the respective recovery process of older and younger claimants.

The standardisation of claimants across different groups need to be incorporated into the model. A standard risk index model, similar to one applied by Folkard and Lombardi (2006) in modelling the impact of long work hours on the incidence of workplace accidents and injuries, may be used to compare outcomes across claimants with different characteristics. The proposed method is briefly discussed in Section 5.

4.5 The Australian and New Zealand RTW Monitor

Currently, Campbell Research and Consulting publishes the RTW Monitor on behalf of HWCA. This ongoing study attempts to provide a detailed picture of the claimant's experience after they have returned to paid work. Two surveys are carried out each year, in May and November, on a sample of claimants from every state scheme (with the exception of Western Australia). The final sample selected for the study is adjusted based on the estimated population of claimants from each state. Three RTW outcomes are defined – full, partial and no RTW, based on the level of post-injury income and injury benefits received since returning to work. Durable and non-durable RTW are also recorded, based on whether the claimant has remained at work.

A clear merit of the RTW Monitor is the consideration of the claimant's durability of RTW, post-RTW employer, occupation and the claimant's perception of the RTW process. These factors contribute to explaining the claimant's extent of recovery. A second merit is the RTW Monitor demonstrating good practice of data collection and presentation. Results are reported in a table, detailing how the claimants respond to each question (measured as a percentage). In addition, the survey has a high response rate, meaning the data collected is likely to be reliable. The study's limitations, however, include the separation of durability and extent of RTW, not defining different partial RTW outcomes and non-rigorous statistical data analysis framework. A more rigorous statistical framework and the combination of psychosocial and medical factors will yield a more robust measure for health stability.

5 Defining the ideal TTSH measure

This section summarises features of health stability used in past studies, with a view of combining the most desirable features into TTSH. The desirable attributes for defining TTSH and how the TTSH measure is operationalised for data analysis are described. Finally, the section presents the possible data sources and assesses their appropriateness for the project.

5.1 Attributes of an effective TTSH measure

An effective TTSH measure incorporates the following attributes:

1. **Post-RTW capacity.** A pilot study by PWC (2003) on the New South Wales claimants concluded 34% of all claimants return to work at partial capacity since the closure of their claims. This highlights the importance of differentiating between claimants who return at full capacity or partial capacity. Past studies have often treated post-RTW capacity as a separate outcome to the claimant's work status. However, Krause, Dasinger, Deegan, Brand, and Rudolph (1999) explicitly accounted for partial RTW by using a cumulative time measure, which adjusts the claimant's DOWD based on the number of equivalent full days of injury benefits received.
2. **Post-RTW employer and occupation.** Employers report preferences for claimants who return to work with the same employer because the employer does not have to incur training and rehiring costs (Butler, Johnson, and Baldwin 1995; Galizzi and Boden 1996; Pricewaterhouse Coopers and N.S.W. WorkCover Authority 2003; Fox, Borba, and Liu 2005). Pransky et al (2002b) reported half of the claimants surveyed returned to the same employer and duties, despite a high proportion of claimants reporting their return to paid work. Hence, claimants who return to work do not necessarily do so under the same employer nor do they perform the same duties.
3. **Psychosocial factors.** Psychosocial factors include attitude to social life, perceptions of pain and level of job motivation. Past studies show claimants whose lifestyle is still detrimentally affected by residual work injury do not attain full recovery. The study by Pricewaterhouse Coopers and N.S.W. WorkCover Authority (2003) measured the social, financial and health outcomes of claimants in conjunction with RTW outcomes and the results show claimants with lower pre-injury job satisfaction and job ergonomic risk have a longer DOWD. In addition, the lack of medical support, failure of the employer to offer alternative work duties and job ergonomic risk increase the likelihood of reinjuries. The studies by Fox, Borba, and Liu (2005, Ferguson, Marras, and Burr (2005) both concluded claimants who return to work are not necessarily satisfied with their work and social life. The claimants also report lower productivity as a result of their residual pain.
4. **Stability of employment and medical status.** Stable recovery depends on the claimant's long-term health condition rather than employment status. Maximal medical recovery (Galizzi and Boden 1996) should also be considered. The claimant cannot be assumed to have achieved stable recovery because they have returned to paid work. Gross and Battie (2006) found insignificant associations between a claimant's functional capacity after they have returned to paid work and the sustainability of the work spell. Evidence also exists showing the claimant's health continuing to improve after their initial return to paid work, especially in the first month (Lotters, Hogg-Johnson, and Burdorf 2005).
5. **Standardisation for claimant characteristics.** Claimants experience different patterns of recovery depending on their personal characteristics, the type of injury and occupation. In addition, the scheme's rules and regulations play a role in influencing the claimant's TTS. If the measure

is indiscriminately applied across the claimant population, the measure will be weighted towards the claimants who are considered as not having recovered, but have in fact achieved maximal medical recovery. This results in the underestimation of the performance of schemes in assisting the claimants achieve stable recovery.

5.2 Operationalising the TTSH measure

In this section, the operationalisation of the TTSH measure is discussed. The attributes are also defined and classified. The section begins with outlining the stability of the claimant's employment and how the medical status can be operationalised. Next, the partial recovery outcomes are defined and approaches incorporating the claimant's post-recovery work capacity, employer and occupation are investigated. Finally, the standardisation procedure is discussed.

5.2.1 Stability of claimant's employment and medical status

In Section 4, past RTW measures were reviewed. DRTW is commonly considered a superior definition of a permanent and stable RTW outcome. However, current definitions are deficient because they do not fully address the long-term stability of the claimant's conditions. DRTW is only a partial component of their recovery because it takes a snapshot approach of the claimant's employment status. An enhanced approach is outlined below.

To account for the stability of the claimant's employment and medical status, the claimant's status is considered "stable" if their proportion of income comprising of injury benefits and their medical status (based on doctor's diagnosis of the claimant's health) has remained the same for some time period, x . Further details concerning the procedures await the arrival of the data.

5.2.2 Accounting for partial recovery

Existing survival regression models often treat recovery as a dichotomous outcome; either the claimant return to paid work or they do not due to censoring or other causes. This is inadequate because claimants return to paid work at different levels depending on their work capacity, income and the compatibility of their duties after their return to paid work with their pre-injury duties. In previous studies, defining return to paid work at full capacity and no return to paid work are straightforward. However, the definition of return to paid work at partial capacity is inconsistent. Some studies defined this as the claimant who is working but still receiving partial benefits (Dasinger et al, 1999), while other studies account for the claimant's employer/duties post-return to paid work (PWC, 2003, Fox et al, 2005). Partial recovery is proposed to replace the existing definition of return to paid work at partial capacity. This definition considers all of the aforementioned attributes and defines a range of outcomes rather than being a single outcome. The new definitions have the added advantage of meeting the different stakeholders' perspectives.

Partial recovery can either be defined as a discrete categorical variable (based on the extent of the claimant's injury benefits and/or employer/occupation after their return to paid work) or a continuous variable (based on some % measure of their current status with the "ideal" definition of stable recovery). For

practicality, partial recovery should be defined as a discrete categorical variable. The claimant's status is observed and when they reach stability over the long-term in their employment status, level of benefits received and post-RTW conditions, they are assumed to have achieved a stable recovery outcome. As a result, partial recovery is based on the following aspects (in order of least successful outcome to most successful outcome) :

- **Proportion of income made up of injury benefits.** The proportion of income can either be a continuous variable (ranging from 1-99%), or a discrete categorical variable (e.g. 1-24%, 25-74% and 75-99%), depending on the sample size of the study. If the sample size is small, the logical choice is to use a discrete categorical variable.
- **Post-recovery employer.** Different employer and same employer.
- **Post-recovery occupation** Totally different (different industry/duties), similar (nature of work comparable) and same occupation. The measurement of the similarities can be based on the level of training required to adjust the claimant to the new job.

The ordinal outcomes from each aspect are assigned a score. The scores for each aspect are added up to give a total. The scores may be as simple as 0 for the lowest and then 1, 2 etc. Alternatively, it may be weighted based on perceived importance of different aspects. For example, if the costs of retraining new employees are greater than the claimant receiving benefits, a higher score is assigned applies to claimants who return to the same employer. The scoring system will be determined with input from survey industry practitioners. The resulting stable recovery outcome is hence an ordinal variable ranging from no stable recovery, several levels of partial stable recovery to full stable recovery.

5.2.3 Psychosocial and lifestyle factors

Psychosocial and lifestyle factors contribute to defining stable recovery outcomes, based on past studies. However, these factors need to be reviewed because of the lack of agreement between the past studies and their questionable study design. Current measures for certain psychosocial and medical factors rely on medical questionnaires, for which no standard exists. Examples of medical questionnaires used included the SF-36 (and its abbreviated versions) survey for general health (Galizzi and Boden 1996; Pricewaterhouse Coopers and N.S.W. WorkCover Authority 2003; Fox, Borba, and Liu 2005; Ferguson, Marras, and Burr 2005), the Kessler-10 or Hospital Anxiety and Depression Scale (HADS) surveys for measuring psychological stress (Pricewaterhouse Coopers and N.S.W. WorkCover Authority 2003; Lillefjell, Krokstad, and G. 2006), Roland-Morris Disability Questionnaire for functional limitations on low back injury sufferers (Lotters, Hogg-Johnson, and Burdorf 2005; Faber, Burdorf, Bierma-Zeinstra, Miedema, and Koes 2006), Job Content Questionnaire (Lotters, Hogg-Johnson, and Burdorf 2005). Other studies opted to employ customised surveys focusing on the restrictions of the claimant's ability to perform activities of daily living, self-efficacy after RTW or post-RTW experience of residual pain, etc. (Gross and Battie 2006; Pransky, Verma, Okurowski, and Webster 2006; Pole, Franche, Hogg-Johnson, Vidmar, and Krause 2006). To

date, functional capacity evaluations have only been applied to low back injury claimants (Gross and Battie 2006). These evaluations require further review to establish their appropriateness in the current project.

The different approaches to collecting, measuring and analysing the psychosocial factors leads to questions regarding their feasibility and practicality. Identifying the factors to include and how they should be collected and measured is expected to be demanding. This aspect will be returned in the future after consultation with medical and psychological experts.

5.2.4 Standardising across different factors

Past studies on recovery across a broad spectrum of claimants only reported results from each group, rather than employing standardisation for better comparability. Only one study made an attempt to compare proxies for recovery across a broad range of industries (Paul Leigh, Waehrer, Miller, and McCurdy 2006). However, this study focuses on cost differences, rather than recovery and stable health outcomes. The project outlined in this paper attempts to be the first to standardise the results based on the claimant's different characteristics and scheme design. The TTSH measure is adjusted for the claimant's level of recovery by ranking them against other claimants with the same or similar characteristics. The ranking process does not treat the recovery outcome as an absolute measure so claimants suffering from different injuries are not compared against each other directly. The bias is reduced and the results derived allow for more effective performance measurement and decision-making. The standardisation process will be discussed in more detail when the data arrives and the analysis proceeds.

5.3 Assessment of current data gathering and analysis practice

This section reviews the role of various data sources in past studies into measuring RTW. Aspects of the data appropriate to the analysis are outlined.

Past studies encouraged the combination of claims data with data collected from surveying the claimants. Information regarding the psychosocial aspects of recovery, the emotional cost and the exact date of their recovery cannot be extracted from claims data. Such data is desirable as the nature of the various stable recovery outcomes is considered in broader aspects, providing more reliable results from which decisions can be made. Market consulting firms have been sought for the implementation process, as they have greater experience and access to the participants.

Data collected from surveys on claimants include the claimant's reported date of return to paid work, dates and/or length of recurrences of injuries, attitudes to employer/workplace after their return to paid work and the claimant's perceived functional capacity and pain levels. Setbacks to using such data include recall bias, selective sampling bias, high implementation costs and questionable reliability of the data. These are discussed in greater detail below.

Recall bias is a major issue because claimants are surveyed some time after they have recovered. As is the nature of memory, the claimant's reported dates of return to paid work and any injury recurrences are not likely to be accurate. Where this occurs, a possible approach used by Pole, Franche, Hogg-Johnson, Vidmar, and Krause (2006) involves asking the claimant the approximate time

of the month they achieve stable recovery and then assume an arbitrary day of the month for the claimant.

This project aims to develop TTSH as a measure applicable across different injuries, occupations and state schemes. However, the sample size used needs to be manageable to ensure the study's feasibility. As a result, the study will analyse a selection of claimants from various schemes, occupations, etc. A limitation of this approach is the results represent the characteristics of the representative sample, rather than the general claimant population. Careful selection of the representative sample will overcome the limitation.

Survey data involves collecting data not stored by schemes or insurers. Such data aims to delve into the claimant's attitudes and perceptions, rather than recording objective information. To extract such data reliably, the appropriate questions need to be asked and the range of possible responses need to be carefully considered. Currently, the common practice is to seek external market research firms to implement such surveys. Because surveys involve appropriately trained staff working outside of normal hours to contact the claimants, cost is an issue.

Finally, the reliability of the data collected is often hard to verify. The questions are subjective in nature and the claimant's responses deviate from the range of responses offered. A long-term strategy to seek relevant experts to review the questions' wording. The schemes can also administer regular surveys accompanying the claimant's payment of injury benefits to obtain timely information. This approach calls for a standard for data collection to be in place but this is beyond the scope of the project.

6 The effects of scheme configurations in Australia on measuring TTSH

This section describes the scheme configurations in the Australian WC scheme and how this affects their approach to data collection. The nature of the claims data - its limitations and what steps can be taken to overcome such limitations are also reviewed.

In Australia, each state operates their WC schemes and are in charge of the rules and regulations, level of benefits and exclusions. NSW, Victoria and South Australia operate their schemes using insurers from the private sector as the claims agents. Queensland, New Zealand and Comcare are managed by a government agency while the Australian Capital Territory, Tasmania, the Northern Territory and Western Australia are all privately underwritten by insurers. Other than the structure of the schemes being different, some schemes store their data with the insurers as the Australian system does not have a proper central scheme database. The closest to a central scheme database is the National Dataset, but this is only a combination of the data from each scheme. The National Dataset is recognised as being insufficient as the data is neither complete nor consistent. Further comments about the nature of the data can be made on a closer review of the data, which has not yet arrived. However, this paper raises some of the major data issues in the Australian system to identify the future challenges to be overcome.

Ideally, the study is best implemented using timely and complete claims

data, not subjected to censoring and short-term volatility. However, in reality, this is not possible.

The first issue identified is the noise generated by short term claims. In past studies, short term claims with injury payment terms lasting up to two weeks add noise to the overall sample and are excluded. Low back injury claimants experience longer durations of work disability and if claims of short duration are not excluded, higher censoring rates will result. For example, Butler, Johnson, and Baldwin (1995) excluded any claim where the time between the injury and the interview is less than three years. Dasinger, Krause, Deegan, Brand, and Rudolph (1999) excluded any claim with duration of injury benefit payments less than one day within the first fourteen days since the date of injury.

The second issue is short term claims volatility. This is present in studies utilising recent claims data. The data set is affected by the lack stability over a short period of time due to the dynamics of the recovery process (Pole, Franche, Hogg-Johnson, Vidmar, and Krause 2006). For example, recently recovered claimants are assumed to have achieved a better recovery outcome than expected if a study is implemented without any delay to allow the stabilisation of the claimant's health status. To reduce such a bias, the project will use data subjected to a time lag. Further analysis will be performed to determine the length of the time lag.

At this stage, a pilot study has been proposed to determine the feasibility of the project and define its scope. In this pilot study, the sample will be restricted to claims from a limited number of schemes to reduce the scope for variation. Claims from one or two major occupation groups will be analysed for simplicity of implementation. Further details regarding the pilot study will be discussed in a future paper.

Permission to proceed with this project has been granted by the Macquarie University Ethics Committee. Strict confidentiality will be enforced throughout this investigation, given the sensitive nature of the data.

7 Model specifications

In this section, the possible modelling approaches are discussed in broad terms because of the absence of data. Key issues about modelling RTW outcomes, based on reviews of past studies in this field, are assessed. The aim is to develop a standardised index to describe the claimant's recovery.

The aim is to develop a standardised TTSH measure to account for the differences in the claimant's personal characteristics, injury type, and occupation. The incorporation of psychosocial factors depend on the survey instruments employed and the reliability of the results. However, to standardise across the aforementioned factors, a statistical framework needs to be in place to ensure the results are consistent and realistic. The first step in the proposed approach is to use a survival model to quantify the contribution of the factors to the observed stable recovery outcomes. Next, the different factors are standardised using the ranking of the claimant's outcomes by each factor group. Finally, the rankings are summarised into an index by combining the personal, work-related and medical characteristics of the claimant. This index ideally measures the extent of the claimant's recovery relative to full recovery.

Fenn (1981), Fox, Borba, and Liu (2005), Galizzi and Boden (1996), Krause

et al (2001b), Pransky et al (2002a, 2002b), Pransky, Benjamin, Savageau, Cur-
rivan, and Fletcher (2005), Seland, Cherry, and Beach (2006) and Wasiak, Kim,
and Pransky (2006) used different survival regression models to quantify the
contribution of the factors to the recovery outcome or DOWD. This approach
is reasonable because stable recovery outcomes are similar to observing deaths
in a population. The proposed model identifies the key factors affecting the
likelihood of a claimant achieving some form of stable recovery outcome by
attempting to reconstruct the claimant's full history and extracting the infor-
mation from the full history. The claimant's full history should include their
date of injury, the date(s) of return to paid work and the date(s) of recurrences
of the injury. The main difference with the proposed approach is accounting a
temporary recovery outcome in the model as a transition, rather than an exit
from observation. The only modes of exit from our proposed model occurs
when the claimant achieves one of the following outcomes :

- The claimant achieves stable full recovery, meaning they are now work-
ing at full capacity. Their post-RTW employer and duties are the same
as pre-injury and they report satisfaction with all other aspects of their
lives.
- The claimant achieves stable partial recovery This is classified as the claimant
achieving maximal medical recovery. The outcome falls short of full re-
covery due to the extent of their residual symptoms from their injuries or
illness.
- The claimant is no longer under the coverage of the scheme as they have
died, retired or left the scheme for other reasons prior to them being back
at work.

The advantage of the proposed approach is the consideration of the claimant's
status in broader terms, rather than focusing on their current employment sta-
tus. Different levels of recovery are considered, instead of a dichotomous out-
come; the claimant experiencing full recovery or no recovery. The dichotomous
outcome is unrealistic and has little practical use.

The standardisation process is implemented after the survival model is fit-
ted and the significant factors are identified. Our aim is to obtain a standard-
ised TTSH measure by combining the current health outcome measures. To
standardise the individual outcome measures, the claimants will be split into
their age or industry groups and their ranked recovery outcome within that
particular group is determined. Next, the individual standardised outcome
measures are integrated into the final standardised TTSH measure. This ap-
proach has not been applied before in measuring RTW or health stability. Sec-
tion 4 mentioned the use of a standard risk index model in modelling the im-
pact of long hours on workplace injuries and accidents (Folkard and Lombardi
2006). The standard risk index model is an additive model of individual com-
ponents of risk. This may be suitable for the project because the standardised
measure can be expressed as a sum of the claimant's ranked recovery scores
from each factor.

The applications of age-specific and disability phase-specific analysis on the
data need to be considered. Krause et al (2001b) and Pransky, Benjamin, Sav-
ageau, Currivan, and Fletcher (2005) have observed claimants of a different age

and disability phase experience different patterns of recovery from their workplace injuries. Prior to Pransky, Benjamin, Savageau, Currivan, and Fletcher (2005), older claimants were assumed to have a lower likelihood of recovering from their workplace injuries. However, the study suggested claimants above age 55 behaved similarly as did claimants below age 55. In this project, the plan is to split the sample of claims into two groups - the first thirty days of claim payments (acute phase) and the subsequent period (chronic phase). This approach has been used in the past, with results showing the different effects on the claimant's recovery outcome from the same factors (Oleinick, Gluck, and Guire (1996), Krause et al, 2001a, Krause et al, 2001b). The details of applying age-specific and disability phase-specific analyse await the data arrival.

8 Anticipated challenges

To date, research into measuring health status is hampered by many obstacles. In this section, the obstacles encountered in the past studies and the anticipated limitations to this study are discussed. The key challenges are the reliability and accuracy of the data, difficulty in comparing across a broad range of industries and the tradeoff of accuracy and the practicality of including medical and psychosocial factors into the study. While some of the limitations to obtaining an ideal TTS measure may never be fully overcome, increasing the awareness of the shortcomings of current industry practice may spur early reform. The paper aims to open up opportunities for improving the approaches of measuring and monitoring WC schemes.

8.1 Data reliability and accuracy

The biggest limitation to developing a desirable TTS measure is the accuracy and reliability of data. Researchers and practitioners both agree on the reliability of claims data but feel the data is limited in its ability to determine the true DOWD (Butler, Johnson, and Baldwin 1995; Dasinger, Krause, Deegan, Brand, and Rudolph 1999; Evanoff, Abelin, Grayson, Dale, Wolf, and Bohr 2002). Claims data do not provide the exact dates of the claimant's return to paid work, as claimants can take unpaid leave after their benefits have ceased. Similarly, the claimants become unemployed and hence receive social security benefits instead. This is an important issue because it represents a shift of the claimants to another form of government support and does not translate to a successful recovery. Survey data has been proven to be a more reliable determinant for DOWD (Dasinger, Krause, Deegan, Brand, and Rudolph 1999; Fox, Borba, and Liu 2005) but it is limited by recall bias and the reliability of the respondent's answers. The wording of the questions is instrumental in determining the data reliability. The same issues limiting the reliability of measuring DOWD is anticipated to be applicable to measuring TTS because the two measures share common characteristics. To reduce the impact of recall bias of the claimants, the use of employer's payroll data has been considered. The payroll data is used to verify the dates of the claimant's return to paid work and sick leave, etc. However, the feasibility of this approach needs to be reviewed.

Time lags between the collection of survey data and the results being made publicly available undermine its reliability. This issue is difficult to overcome because a counterargument for releasing the survey results too early is the risk of the information being affected by short term claims volatility. A possible approach is to adjust the time lag to balance the tradeoff between reliability and short term claims volatility.

8.2 Accounting for differences in scheme structure and rules

Differences in legislations and rehabilitation policies in each scheme affect the level of benefit payment and the claimants' recovery pattern. This in turn can interfere with the measurement of TTSH across different states. Campbell Research & Consulting encountered this difficulty in their National RTW Monitor (Campbell Research and Consulting 2006). Results from this report showed South Australian claimants take the longest time to achieve some form of recovery. The generosity of injury benefits paid to South Australian claimants relative to other state schemes increase their likelihood of remaining off work for longer periods. This result is consistent with results from past studies (Fenn 1981; Butler, Johnson, and Baldwin 1995; Meyer, Kip Viscusi, and Durbin 1995; Galizzi and Boden 1996; Pricewaterhouse Coopers and N.S.W. WorkCover Authority 2003). However, more information is required to ascertain whether the longer duration to recovery is due to South Australian workers suffer more severe injuries or because of higher injury benefit payments.

The standardisation method may be used to account for the differences between schemes. While the concept is logical, the implementation is far from being straightforward. A study by Douphrate, Rosecrance, and Wahl (2006) reviewed the level of claims incidence rates, distribution of sources, causes, types of body locations of injuries and the costs of these injuries across different agribusiness operations. Direct comparison within a single industry is concluded to be difficult because different roles need to be classified into suitable occupational classification codes for analytical purposes. The comparison across a broader range of industries and occupations is expected to pose greater difficulty. Aside from the classification of duties and other factors, the fundamental differences between occupations and industries may not allow for comparisons of the factors. In this case, the standardised TTSH measure risks giving nonsensical output.

Supposing the above approach is feasible and differences between occupations and industries can be compared, data issues need to be overcome for the Australian WC schemes. In the meeting with representatives from the various workers' compensation schemes, the consensus regarding standardising across the schemes is the difficulty of implementation because schemes collect different data and coding is not done uniformly. The data needs to be reviewed in detail to ascertain how the gaps and structural differences limit the development of the TTSH measure.

8.3 Tradeoff between accuracy and practicality

The final limitation of such a study concerns the tradeoff between accuracy and practicality. We mentioned in Section 5.2 that we propose to postpone the incorporation of medical and psychosocial factors into our standardised TTSH

measure until later, when the feasibility of implementing a standardised measure has been recognised. The reason for this postponement is for reasons of practicality, as medical and psychosocial factors have been recognised as being difficult factors to tackle in practice. Pransky et al (2002b) recognised both the DOWD or functional capacity limitations cannot be used on its own to assess the claimant's success in achieving stable recovery. Other outcome measures such as their postinjury satisfaction, motivation and functional capacity need to be considered. Studies making use of these outcome measures have been outlined in Section 4. These studies all acknowledged the complications associated with collecting and verifying the accuracy of the extra data. The extra time and resources employed may well exceed the benefits of including these measures.

9 Conclusion

The paper introduces the time to stable health (TTSH). Past measures for recovery focused on the claimant's return to paid work were insufficient in meeting the needs of different stakeholders in the WC industry. The key deficiency is the inability of the measures to satisfactorily account for the medical and psychosocial aspects of recovery. The proposed measure extends beyond observing whether the claimant is currently at work or not by measuring their health and lifestyle factors. Survey data will be used in conjunction with claims data to increase the reliability of our measures. To account for differences across schemes, industries and occupations, the outcome variables within each group are standardised by taking the ranked outcome before combining it to the final index measure. The final index measure is an indicator of the claimant's level of recovery relative to full recovery. TTSH is calculated based on the time taken for the claimant to reach their optimal level of work, health and psychosocial condition.

The paper aims to discuss the problem in broad terms as well as outlining our planned approaches. However, this is done in the absence of data. The authors appreciate any advice and feedback regarding the proposed methodology, approaches to the data analysis and other practical issues.

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