

The impact of long-term workers' compensation benefit cessation on welfare and health service use: protocol for a longitudinal controlled data linkage study

Tyler J Lane^{1,*}, Janneke Berecki-Gisolf², Ross Iles¹, Peter M Smith^{1,3,4}, and Alex Collie¹

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¹School of Public Health and Preventive Medicine, Monash University, Melbourne, Victoria, Australia

²Monash University Accident Research Centre (MUARC), Monash University, Clayton, Victoria, Australia

³Institute for Work and Health, Toronto, Ontario, Canada

⁴Dalla Lana School of Public Health, University of Toronto, Toronto, Ontario, Canada

Abstract

Background

In 2012, the Australian state of New South Wales passed legislation that reformed its workers' compensation system. Section 39 introduced a five-year limit on income replacement, with the first affected group having their benefits cease in December 2017. There is limited evidence on how this will affect their healthcare service use and where they will go for financial support.

Methods

Multiple data sources will be linked: administrative workers' compensation claims data from the State Insurance Regulatory Authority (SIRA), universal health insurance data from the Medical Benefits Schedule (MBS) and Pharmaceutical Benefits Scheme (PBS), state hospital and emergency department data, and social welfare data from the Department of Social Services' Data Over Multiple Individual Occurrences (DOMINO). An estimated 4,125 injured workers had their benefits cease due to Section 39. These will form the exposure group who will be compared to 1) a similar group of workers' compensation claimants who have had at least two years of compensated time off work but whose benefits did not cease due to Section 39; and 2) a community comparison group drawn from state hospital and emergency department records.

An accredited third party will link the data, which will be accessible only via secure virtual machine. Initial analyses will compare the prevalence and incidence of service use across groups in both the year before and year after benefit cessation; the community control will be assigned the median benefit cessation date in lieu of an actual date. To estimate the impact of benefit cessation due to Section 39, we will conduct time series analysis of the prevalence and incidence of service use.

Discussion

This study will provide much-needed evidence on the consequences of long-term benefit cessation, particularly on subsequent healthcare and welfare service use.

Keywords

workers' compensation; work disability; data linkage; unemployment benefits; social policy

*Corresponding Author:

Email Address: Tyler.lane@monash.edu (Tyler Lane)



Background

Work-related injury and illness account for an estimated 2.3 million deaths and over 300 million instances of temporary work incapacity annually. Direct and indirect economic costs average 4% of annual global GDP, equivalent to \$2.8 trillion USD in 2012 [1]. Most injured and ill workers who take time off work return to work within days or weeks, though a small proportion remain off work for many months or years. In Australia, only 12% of workers' compensation claims have periods of work disability exceeding six months, yet these claims account for 76% of all compensated time off work [2]. In addition, extended periods of work disability have negative health [3], social and economic consequences [4], which can be exacerbated by overly bureaucratic and poorly-communicated return to work processes [5].

Developed nations including the United States, Canada and Australia have dedicated state or provincial workers' compensation insurance schemes for periods of short-term work disability. These provide injured workers with financial support and funded medical care. Benefits are often time-capped, leading some injured workers to seek access to federally-funded welfare and healthcare systems for ongoing support. However, eligibility criteria for welfare and healthcare systems are often different from workers' compensation schemes [6]. Welfare benefits are typically means-tested and factor in family/spouse income, whereas workers' compensation schemes are typically based on the wages of the injured worker. Those with long periods of work disability may "fall between the cracks" of the social safety net when their workers' compensation benefits end and find themselves without an ongoing means of financial support, or become dependent on alternative systems that are both less generous and more difficult to access [6].

Work-related conditions have broader social costs beyond that which can be measured within workers' compensation datasets alone [7]. For instance, a large share of welfare dependencies are due to work-related conditions [8], and injured workers who are compensated for time off work are more likely to use welfare and healthcare services five years post-injury [9–11]. Beyond this evidence, there is limited research on how disabled workers transition between income support and healthcare systems.

Benefit cessation may result in or exacerbate negative health and social consequences that arise from extended periods of work disability. In the absence of a subsequent return to paid work, direct impacts of benefit cessation include both a reduction in income and reduced access to treatment and rehabilitation services, which may in turn have substantial psychological effects [12, 13]. There are also indirect or unintended consequences. Workers who seek access to other benefit schemes such as disability and unemployment benefits may be subject to stressful eligibility assessment practices [14] that can worsen health [12, 14, 15].

This study aims to quantify the transition of injured workers in the Australian state of New South Wales to alternative income and healthcare services after the cessation of long-duration income replacement payments from workers' compensation. These alternative services include nationally-funded social welfare and healthcare systems, collectively referred to as service use in this protocol. More specifically,

the project seeks to estimate how the incidence and prevalence of service use changed among a cohort of injured workers whose access to workers' compensation benefits ceased following legislative reform in December 2012. Study aims are underpinned by the following research question: *What is the effect of time-capped benefit cessation on future healthcare and welfare service use among long-duration workers' compensation recipients?*

Methods

Study design and setting

This is a retrospective controlled cohort study, using linked administrative claims data from workers' compensation, social welfare, hospital, medical benefits and pharmaceutical benefits datasets. This design will make efficient use of existing administrative data to compare injured workers whose compensation benefits ceased due to the implementation of a policy reform (the exposure) with two comparison groups. These include injured workers with long duration workers' compensation claims (comparison group one) and uninjured community-dwelling people (comparison group two).

Workers' compensation in Australia is regulated by state, territory, and Commonwealth governments. Each system is cause-based, meaning injuries are only compensated if they are determined to be work-related [16], and operates an insurance model where employers pay premiums for no-fault coverage of employees [17]. Some employers manage workplace injuries and compensation in-house through licensed self-insurer arrangements, though they remain subject to regulatory oversight. Australia's eleven major workers' compensation systems provide insurance coverage or regulate compensation arrangements for approximately 94% of the labour force [18]. The remainder are self-employed or independent contractors and labour hire workers who are only covered under some circumstances [19].

Each of Australia's workers' compensation systems provide direct financial assistance to injured workers in the form of income replacement payments and fund treatment and rehabilitation related to the compensable injury or illness [6]. Income replacement benefits vary by jurisdiction but typically provide 80% to 100% of pre-injury earnings for the initial 3 to 6 month period post injury, contingent on nominal caps, stepping down to 65% to 90% for the remaining duration [20]. While the stated objective of these step-downs is to encourage return to work, evidence suggests that the effect is negligible [20]. Most jurisdictions impose a time limit of two to five years on income replacement benefits, with longer benefits only available to a small proportion who demonstrate serious continuing disability arising from the workplace injury. Medical costs are paid directly to privately-employed healthcare providers or public and private hospitals on behalf of the injured worker. Healthcare payments are generally limited to treatments judged as 'reasonable and necessary' for the purpose of worker rehabilitation. Depending on the jurisdiction, these may be time-limited. In New South Wales, most workers are entitled to two years of medical coverage from the date of claim or end of income replacement payments [19]. Most jurisdictions have employer excess policies

that require employers to pay initial income replacement or healthcare costs below a certain threshold [21].

Another major source of financial support for working-age Australians with work disability is the national social welfare system, colloquially referred to as Centrelink. Unlike workers' compensation, Centrelink benefits are disability-based, meaning they are contingent on having a condition that impairs ability to work, regardless of cause [6, 16]. During the period of this study, the Australian welfare system provided a range of different benefit payments to working age people, including some that are specific to work disability. The Disability Support Pension (DSP) provides financial support to people with permanent physical, intellectual or psychiatric impairments that prevent them from engaging in employment. Approximately 750,000 Australians, or 4.5% of the working age population, receive the DSP [22]. The NewStart Allowance (NSA) is the main national unemployment benefit for people aged between 25 and 65 years. Following changes to eligibility process for the DSP program during the 2000's and 2010's that restricted access to the DSP [23], there are now over 300,000 Australians receiving the NSA who have been assessed as having medical conditions that restrict their work capacity [24]. The Youth Allowance (YA) is an approximately equivalent benefit to the NSA but is available to people aged between 18 and 24 years. Sickness Allowance was a short-term payment of up to 12 months for people aged between 22 and 65 years with temporary work disability due to illness or injury and who have a job or are studying to return to upon recovery. From March 2020 the YA and SA benefits were rolled into a more broadly defined version of the NSA and re-titled the JobSeeker Payment, which includes access for people with temporary work incapacity due to ill health or injury, though this is outside the study time period. The financial support provided through the Australian social security system is considerably less generous than that available through workers' compensation, replacing 19-38% of pre-injury wages for a worker at national average weekly earnings, compared to the 65-100% offered under workers' compensation [6].

Australia maintains a universal health insurance scheme known as Medicare, which pays private providers through the Medical Benefits Schedule (MBS) for medical services, and the Pharmaceutical Benefits Scheme (PBS) for prescription drugs. The "schedule" part of MBS refers to set rates for services with a gap payment of 15% that patients are expected to cover. Providers are free to set their own rates and may charge only the 85% or "bulk billing," which entails no cost to the patient, or may charge more than the schedule and raise the cost of the gap payment that the patient must cover [25]. Consultations with specialist medical practitioners and allied healthcare practitioners such as physical therapy or psychology can be accessed on a privately-funded basis, or at no cost through the public healthcare system but often with long waiting periods. The PBS fixes prescription prices and sets a maximum co-payment of around \$40, or \$7 for concession patients, with the government funding the rest [26]. Public hospitals are financed by state and territory governments and most services incur no cost at the point of care [25]. Half of Australia's hospitals are privately owned and operated (630/1325 in 2016/17) and are accessible through private health insurance or out-of-pocket payments [27].

Policy reform - Section 39 legislative amendment in New South Wales

This study focuses on the Australian state of New South Wales (NSW). In 2018/19 the workers' compensation system in NSW provided insurance coverage for 4.1 million workers, accepted approximately 100,000 new claims and managed 104,000 open claims. Most workers are insured by the state government nominal insurer, though there are also six specialised insurers for specific industries and 61 employers are licensed self-insurers [28].

In 2012, the New South Wales government introduced the *Workers Compensation Legislation Amendment Act 2012* (the Act), which was a major reform of the state's compensation system [29]. This was primarily a response to the deteriorating financial position which included a projected unfunded liability of \$4.1 billion and an estimated 28% increase in employer premiums [30]. Major features of the reforms were restricting eligibility and limiting maximum duration of income replacement benefits. Our recent evaluation of these reforms concluded that they had their intended effect: the number of accepted claims fell by 15%. However the reforms also had unintended effects as insurer claim processing time increased by 20% and the median disability duration by 29% [31].

Under Section 39 of the Act, income replacement benefits were capped at five years from December 2012. Injured workers with Whole Person Impairment greater than 20% were exempted. Injured workers with active claims prior to the reforms were eligible for a maximum of five further years of income replacement. Beginning December 2017, the first group of injured workers lost their income replacement benefits under Section 39.

Selection of study groups

As the focus of this study is the effect of cap-induced benefit cessation among injured workers with long-duration workers' compensation claims, isolating the effects of benefit cessation from other factors is critical. A major confounder will be extended exposure to the compensation system, which has a host of negative consequences [12, 32]. We define three study groups, described below and summarised in Figure 1 and Table 1.

Exposure: transitions group

Injured workers aged 18 to 65 years at 31 December 2017 with an accepted workers' compensation claim lodged between July 1989 and December 2012, who received at least 260 weeks/five years of income replacement benefits that ceased as a result of Section 39. The New South Wales workers' compensation regulatory authority identified and extracted data on this group from their claims records and estimates a population of 4,125.

Comparison group 1: injured worker with long duration claims

The purpose of this control group is to compare service use in the transitions group to other injured workers with long-duration claims but were not exposed to benefit cessation due

Figure 1: Schematic representation of Exposure and Comparison groups; each (mutually exclusive) nested group reflects its position of a subset of the larger group, from the New South Wales population to injured workers with a long-duration income-replacement claim (≥ 104 weeks/two years), to injured workers with a long-duration income-replacement claim (≥ 260 /five years) that ceased under Section 39

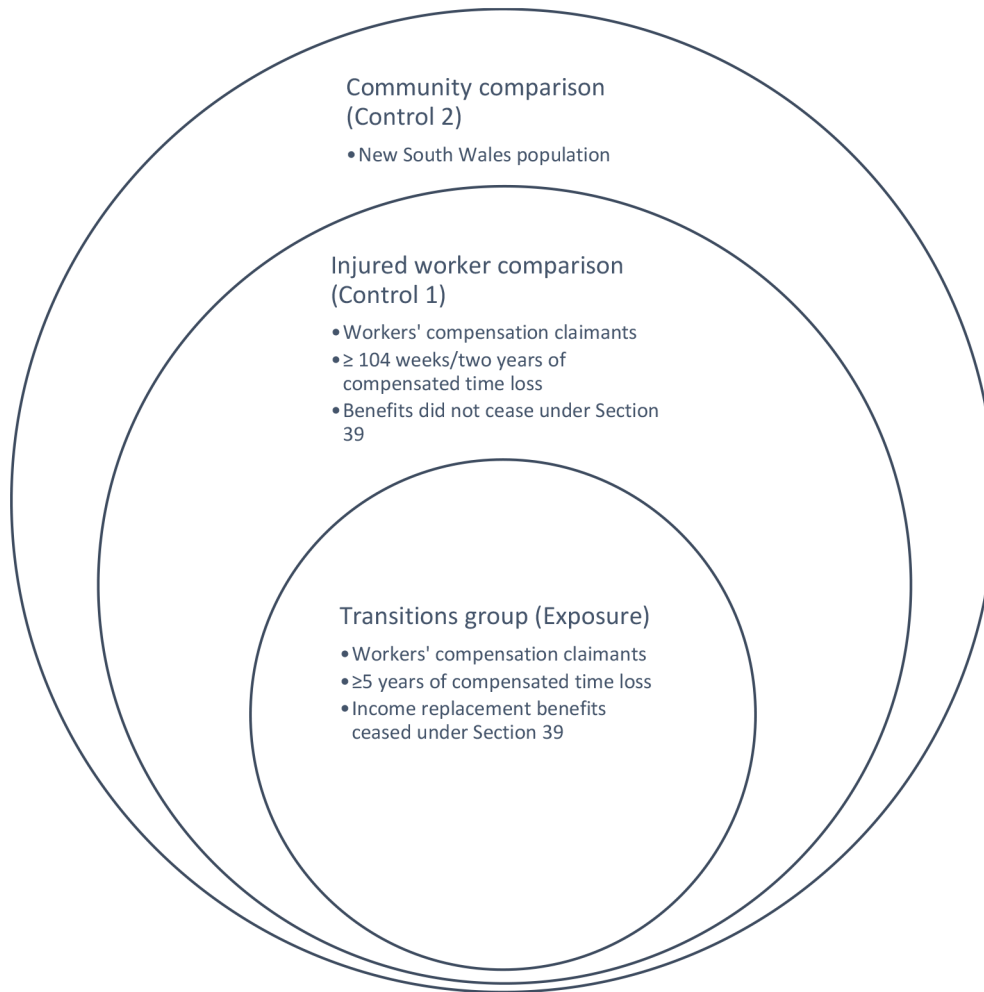


Table 1: Main exposures of interest by study group

Exposure	Transitions group (exposure)	Injured comparison group (control 1)	Community comparison group (control 2)
Injured at work	Yes	Yes	No*
Accepted workers' compensation claim	Yes	Yes	No*
Long duration of workers' compensation benefit receipt	Yes	Yes	No
Section 39 time-capped workers' compensation benefits	Yes	No	No

*Some community comparison group members may have a work injury and accepted workers' compensation claim, though we are unable to identify them.

to implementation of Section 39. It includes injured workers with an accepted workers' compensation claim lodged between July 1989 and June 2018 who received at least 104 weeks or two years of income replacement benefits. While the duration of income replacement in the injured worker control group is substantially shorter than the transitions group, it is still long and this group represent a small proportion of all claims. Setting the duration threshold at 104 weeks was also necessary

to enable selection of controls from a sufficiently large pool of eligible injured workers. Further, injured workers with longer claims that were unaffected by Section 39 would generally be historical claims. Given the substantial effect of the 2012 legislation (of which Section 39 was a part) [31], such historical claims would likely differ systematically from those affected by Section 39. However, we will use sensitivity analyses to estimate the effects of such biases (described in *Sensitivity*

Analysis). The New South Wales workers' compensation regulatory authority identified and extracted data on this group from their administrative claim records.

Comparison group 2: community group

The purpose of this group is to compare service use in the transitions group to the general population. It includes individuals residing in New South Wales who were not members of either the Section 39 cohort or the injured worker control group. As they are drawn from the community at-large using Medicare data (the Medicare Enrolment File or MEF), this group is not limited to workers. Some may have or have had a workers' compensation claim, though it is impractical to identify them. However, the numbers should be small.

Both comparison groups will be sampled at a 3:1 ratio to the exposure group, or $\sim 12,375$ cases for each, to maximise statistical power while minimising resources allocated to study costs for linkage. To be considered eligible, all individuals had to be between 18 to 65 years of age as of 31 December 2017.

Study data

Data from five sources will be linked to assemble the study database.

Workers' compensation claims data

Unit record information from each accepted claim including demographic details, occupation, injury details, delivered income replacement and medical benefits, employer details, and dispute information. These data are collected by insurers during workers' compensation claims management and provided to the State Insurance Regulatory Authority of New South Wales. Data will be accessed from July 1989, the start of the modern workers' compensation scheme in New South Wales, to June 2019 [33].

Hospital data

The New South Wales Department of Health will provide data on hospital admissions (Admitted Patient Data Collection, or APDC) and emergency department presentations (Emergency Department Data Collection, or EDDC). The APDC provides data on all admitted patient services provided by public hospitals, psychiatric hospitals, public multi-purpose services, private hospitals, and private day procedure centres. Data include type of hospital, dates and length of stay, diagnostic codes, discharge destination, health insurance status, referral source, bed days, and geographic information. The EDDC provides information about patient presentations to the emergency departments of public hospitals in New South Wales and includes arrival and departure date and time, principal diagnostic codes based on the International Classification of Disease, compensable status, referral source, triage category, hospital type, mode of arrival, and geographic information. Data will be accessed from the earliest available dates (July 2001 for APDC and January 2005 for EDDC) to June 2019.

Social welfare data

The Australian Department of Social Services will provide the Data Over Multiple Individual Occurrences (DOMINO) dataset, which contains event-based data on individual interactions with Centrelink (the Australian government social security system). These include demographics, benefits history (e.g., benefit status code, income support benefit, partner's income benefit), housing (e.g., household rent amount, ownership status, rent type), location, education, household structure (e.g., number of dependent children) and disability (e.g., primary and secondary medical conditions, blindness indicator, job work capacity assessment). These data cover July 2001 to June 2019.

Healthcare service use

The Australian Department of Human Services will provide the Medicare Benefits Schedule (MBS) dataset, which contains event-based data on health services that qualify for a Medicare Benefit under the Health Insurance Act 1973 and for which a claim has been processed. Data include the types of service funded through the Australian Medicare system using Broad Types of Service (BTOS) codes and specific MBS codes, dates of service, hospital flags, and information on service providers including postcode, location and specialty. These data cover July 1989 to June 2019.

Pharmaceutical use

The Australian Department of Human Services will provide the Pharmaceutical Benefits Scheme (PBS) dataset, which contains unit record information on processed prescriptions paid by Medicare Australia. Data items include the types of PBS medicines dispensed with Anatomical Therapeutic Chemical (ATC) classification and PBS code, dates of supply, and information on prescribers including postcode and location. These data cover July 2002 to June 2019.

Service use outcomes

We define three types of service use outcomes: welfare, healthcare, and pharmaceuticals.

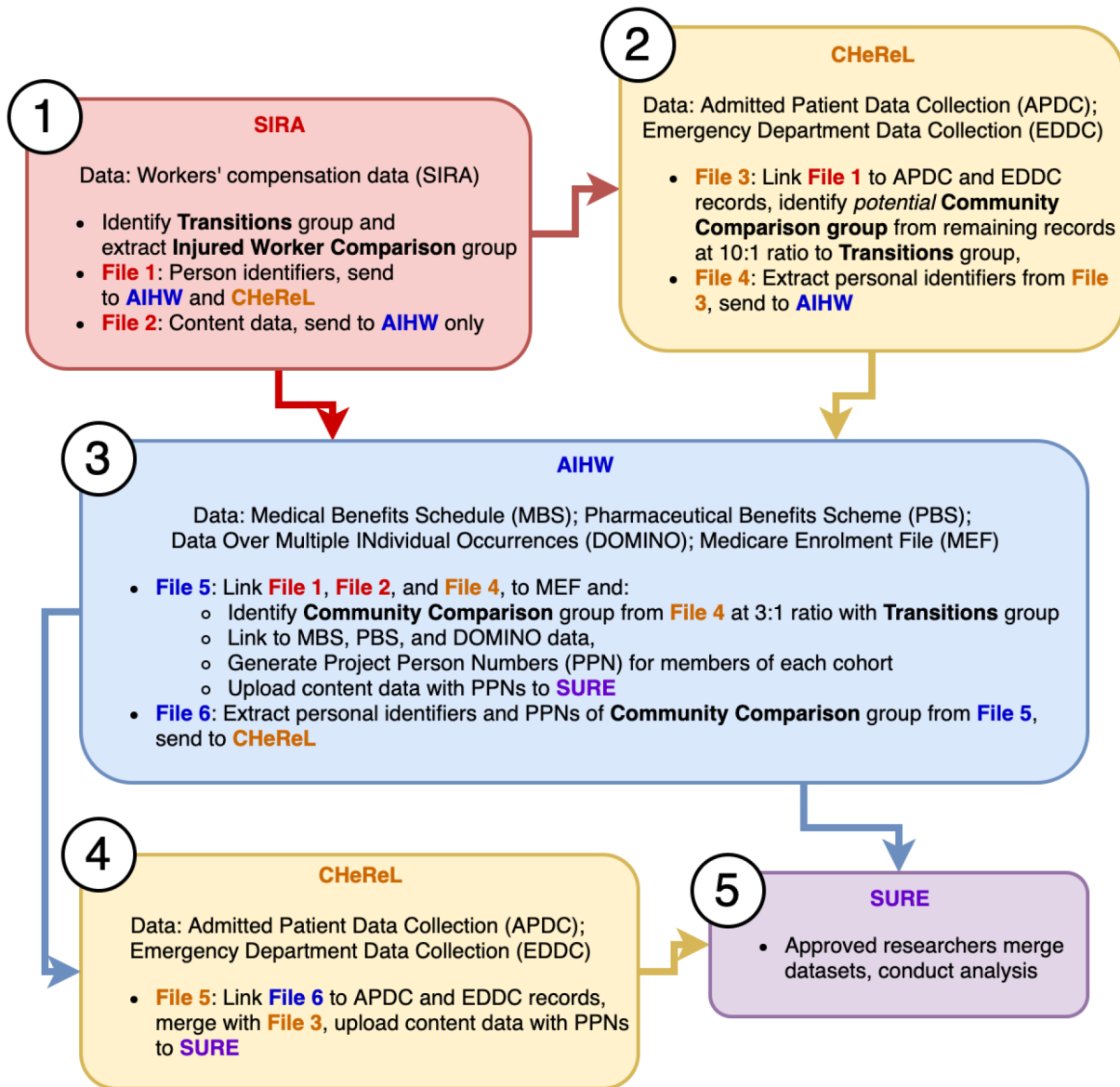
Welfare use

Three categories of welfare use will be identified. The first is work disability benefits including the Disability Support Pension, Newstart Allowance, Youth Allowance and Sickness Allowance. The second is other working age benefits including the Carers Allowance/Payment, Parenting Payment, Special Benefit, Partner Allowance, Bereavement Allowance, and Widow Allowance/Pension. The third is other adult payments including Aged Pension, Veterans Payments, and educational payments such as Austudy or Abstudy.

Health service use

Two types of health service use will be identified. The first is service provider attendance, which will also be examined in

Figure 2: Data linkage flowchart between the State Insurance Regulatory Authority (SIRA), Centre for Health Record Linkage (CHeReL), Australian Institute of Health and Welfare (AIHW), and the Sax Institute's Secure Unified Research Environment (SURE)



sub-categories by service provider speciality including primary care, physical therapy, psychological therapy and surgical. The second is hospital or emergency department attendance. Subsequent analyses will examine specific procedures like surgery and whether it was covered by workers' compensation or the public system.

Pharmaceutical use

Two types of pharmaceutical service use will be identified. The first includes opioid analgesics, other pain medications, and psychotropic medications including anti-depressants (pain and anti-depressant medicines), as defined per ATC coding (Anatomic Therapeutic Chemical Classification System coding) [34, 35]. The second includes all other prescription medicines (other medicines). Pain and anti-depressant medicines will be examined in sub-categories such as opioid strength [36].

Confounders

Analyses will adjust for confounders that could bias estimates of the impact of benefit cessation on service use. They will be selected for either an empirical or theoretical link between exposures and outcomes and include age [37–40], sex [38–41], prior health service and welfare use [39], and household composition [39]. Injury type [39, 40], occupation [40] and industry [40] will be available for both injured worker groups (Exposure and Comparison group 1).

Data linkage process

Data will be linked using a probabilistic linkage method based on unique person identifiers available in the study data sources. Four organisations are involved in the data linkage process, which is illustrated in Figure 2 and described below.

The **State Insurance Regulatory Authority (SIRA)**, the workers' compensation regulator in NSW, will identify members of the exposure and injured worker comparison groups from their claims data holdings. SIRA will separate personal identifiers from content data and generate a unique SIRA study number for each case in both groups. Unique personal identifiers include first name, surname, sex, date of birth and postcode. Personal identifiers with the SIRA ID number will be transferred to both the Australian Institute of Health and Welfare (AIHW) and the NSW Centre for Health Record Linkage (CHeReL). Content data will be sent as a separate file to AIHW only.

The New South Wales Ministry of Health manages the **Centre for Health Record Linkage (CHeReL)**, which maintains and links public hospital data in New South Wales and the Australian Capital Territory. CHeReL will link cases in the Exposure group and Comparison group 1 to cases contained in the APDC and EDDC (hospital data). CHeReL will link SIRA data to hospital data. It will then identify potential community comparison group members from hospital data and send personal identifiers from all records to AIHW and separately a concordance file of the SIRA and CHeReL ID numbers. Based on CHeReL's recommendation, records will be extracted at a 10:1 ratio to the Exposure group to allow for un-linkable records.

The **Australian Institute of Health and Welfare (AIHW)** is an independent Commonwealth statutory agency that holds the MBS, PBS, and DOMINO data. It also maintains the Medicare Enrolment File (MEF), which contains names and addresses of all people registered with the population-based Medicare public healthcare scheme. AIHW will link SIRA and CHeReL personal identifiers to MEF data, then identify community comparisons from the potential group at a 3:1 ratio with the exposure group. These will be linked to MBA, PBS, and DOMINO data and each case assigned a Project Person Number (PPN), which will become the primary unique study number to differentiate between cases in the final cohort study database. AIHW will then upload linked content data to the Sax Institute's Secure Unified Research Environment (SURE). AIHW will also return to CHeReL personal identifiers for cases it has identified for the community comparison group along with the PPN. CHeReL will extract EDDC and APDC hospital data for all three study groups, remove personal identifiers, and upload the content data to SURE.

The Sax Institute is an independent non-profit organisation that hosts the **Secure Unified Research Environment (SURE)** platform. The research team will access SURE and merge the content datasets provided by the AIHW and CHeReL using the PPN. This will create the final study database including the entire cohort comprising the three study groups.

Data access and security

Study data will be hosted in the SURE platform, a virtual machine designed for the analysis of linked health data, and stored in a secure data centre in Sydney. Only authorised members of the research team who have been listed on ethics forms, approved by data custodians, and received special training will have access the SURE virtual machine. Access

is secured by a three-factor authentication process involving: 1) username and password; 2) one-time access codes provided by a token; and, 3) a personal digital certificate on the local machine [42]. Neither data custodians nor members of the Sax Institute who manage the study space will have access to the linked data. Files may only enter or leave SURE via a curated gateway following review for compliance with approved ethics and data custodian requirements. The Sax Institute maintains and reviews an audit log of all SURE platform activities [42].

Data analysis

Data cleaning and description

The merged database will be cleaned and checked for data validity and quality. This will involve assessing individual data fields for missingness, logical consistency (e.g., injury occurring before claim), correspondence to data dictionaries [43] (e.g., valid categorical values, continuous data ranges), and identification and removal of duplicate records or impossible values (e.g., age >100 years).

Descriptive statistics will be used to characterise and describe each of the study groups by calculating measures of central tendency and variability or frequencies and percentages on demographic, occupational, claim, injury, medical care, pharmaceutical use, welfare, hospitalisation and other characteristics. Data exploration and visualisation will be used to examine the dataset properties such as dispersion and distribution of values, correlation between variables, and time trends, specifically before and after benefit cessation in the Transitions group.

Comparing service use between groups

Q1: How does service use differ between the injured worker groups (Exposure 1 and Control 1) and the community (Control 2) both before and after the benefit cessation?

This analysis will estimate differences between the three groups in both the 12 months before and after benefit cessation; the community control group cut-off will be centred at the median benefit cessation in the Transitions group. The purpose of this analysis is not to estimate causal effects of benefit cessation or time in the compensation system, but to characterise each group prior to causal research estimates.

Differences between groups in terms of prevalence of service use will be expressed as Odds Ratios derived from logistic multivariable regressions. Differences in incidence of service use will be expressed as either regression coefficients derived from linear multivariable regressions or Incident Rate Ratios using Poisson/negative binomial multivariable regressions. Study groups will be dummy-coded. Each regression analysis will control for age, sex, month, and year of cessation. Sensitivity analyses will test different years of cut-off for the community control; e.g., if the median benefit cessation in the Transitions group is March 2018, we will test March 2017 and March 2016.

Q2: How does benefit cessation due to Section 39 affect service use? Specifically, how do those whose income replacement payments cease under

Section 39 differ from those who exit the scheme for other reasons, in terms of service use?

To estimate the effect of benefit cessation due to Section 39 on service use, we will conduct a time series analysis on cases in the Transitions group and Injured Worker Comparison who have exited the scheme. Comparison group 2 (the community sample) is excluded from this analysis.

The data are time-indexed based on the month of scheme exit. Month-by-month service use after scheme exit will be modelled to determine how post-benefit cessation service use differs between groups. Post-cessation changes to service use in the Exposure group will be measured against a counterfactual generated from Comparison group 1 (i.e., how did service use change in injured workers affected by Section 39 *relative to a similar group of injured workers who were not affected by it?*), adjusted for age, sex, injury type, injury cause, and claim duration. Analyses will use mixed-effects regressions, with logistic for prevalence and linear/Poisson/negative binomial for incidence. Separate models will be constructed for each category of welfare, health service, and pharmaceutical outcome. We hypothesise that for all outcomes, there will be a larger increase in service use among the Transitions group.

Secondary analyses will focus on subgroup differences by age, sex, region, urban/rural location, socioeconomic standings, condition type, and other factors that emerge from analyses as having outsized effects.

Sensitivity analysis

It will be important to distinguish the effects of a long-duration claim from the effects of benefit cessation due to Section 39, which we will do by replicating the analyses described above, with two modifications. In the first sensitivity analysis, we will focus on how benefit cessation due to Section 39 affected health service use when accounting for overall claim duration. There are substantial differences between the two injured worker cohorts (Exposure: Transitions Group and Comparison 1: Injured Worker Comparison Group). This analysis will repeat the time series modelling described above but will restrict Comparison group 1 to those with more than five years of compensated time loss to match the minimum criterion for the Exposure group. Based on sample data provided by SIRA, we estimate with 95% confidence that between 35% and 41% of Comparison group 1 will meet this criterion (395 out of 1,050 records exceed five years, equivalent to 38%). Given that Comparison group 1 will be extracted at a 3:1 ratio with the Exposure group, this means there will be roughly equivalent numbers for both in sensitivity analysis.

In the second sensitivity analysis, we will focus on differences between shorter and longer-duration claims in the Transitions group. Longer-duration claims are older and had been in the system for longer when Section 39 came into effect, thereby having no expectation of the five-year cap. Shorter-duration claims are newer and lodged after Section 39 came into effect and thus could have had an expectation of the five-year cap. This analysis will repeat time series modelling but will only include claims in the Transitions Group. They will be categorised by duration to compare differences between older ($>$ five years) and newer (\sim five years)

claims in terms of Section 39's effects on service use post-cessation.

Discussion

This protocol describes a method for linking and analysing a set of discrete and independent health and welfare datasets to provide new insights into the impact of workers' compensation benefit cessation on a range of healthcare services and social welfare payments. Linking routinely collected administrative data provides a unique opportunity to evaluate the impact of a population-level policy reform within a major social welfare scheme. Our study protocol will enable examination of how policy reform in a welfare and healthcare system designed and operated by a state level government may have flow-on effects to services in systems operated by a national government, and furthering understanding of how injured workers transition between systems.

Potential benefits and importance of the study

In the past three decades, knowledge of the interaction between worker health and receipt of workers' compensation benefits has grown substantially. There is a strong bi-directional causal relationship between work and health. Good and safe work is good for health, and good health can improve work productivity [3]. There is also evidence that return to work supports recovery from injury [44]. Conversely, certain types of work can be detrimental to health [45], and health conditions can impact labour market participation and productivity.

However, there is much less data on injured worker outcomes following time-capped benefit cessation of a long-duration compensation claim. Even when exiting workers' compensation via other means, the limited body of evidence suggests injured workers struggle to return to work due to stigma against claiming and loss of entitlements to rehabilitation services [46]. This study will provide new information regarding the health and social outcomes of people with long-duration workers' compensation claims and also for people whose benefits cease due to the implementation of legislatively-imposed caps.

It is also important to understand the characteristics of individuals with adverse outcomes. Such information can help state and Commonwealth governments develop policy to prevent negative post-claim outcomes such as poor health and un/underemployment, and programs to minimise negative health outcomes and maximise return to work. By linking retrospective claims, healthcare, and welfare data, we will also be able develop a more complete picture of the health and social function of injured workers in the periods during and after they were receiving workers' compensation income benefits.

Project governance

There are multiple parties involved in project governance including the investigator team, data custodians, linkage authorities and funding agency. The investigator team, comprised of the authors on this protocol paper, is responsible

for study design, scientific and ethical conduct of the project, overall study management, data analysis and reporting. Data custodians include the Australian Department of Health, Department of Social Services, the NSW Department of Health and the NSW State Insurance Regulatory Authority, who have agreed to provide access to data for linkage. Data linkage authorities are the AIHW and CHeReL whose roles include securing access to health and welfare datasets in accordance with procedures required by the data custodians, and performing linkage. The funding agency is SIRA, the workers' compensation regulator in New South Wales. There are several steps in place to manage potential conflicts of interest and ensure independence of study findings. Access to linked data is limited to authorised members of the investigator team who will undertake all analyses. The investigator team developed the scientific rationale, study methods and analytical approaches in consultation with data custodians, linkage authorities and the study funder. An independent expert scientific advisor provided input to the study protocol and analytical methods as part of the ethical review process. The content of published output from the study remains solely the responsibility of the investigator team, though data custodians will be provided an opportunity to comment on study outputs before they are made public.

Strengths and limitations

Study strengths include the longitudinal design and the use of multiple groups with differing levels of exposure to workers' compensation processes and means of benefit cessation. This will provide an opportunity to explore causal relationships between long-duration benefit cessation and use of other healthcare and welfare services. Statistical analyses will be adjusted for a range of personal, household, claim, health and benefit factors that have previously been linked with worker health. To our knowledge, this is the first time that population-level state workers' compensation data have been linked with national healthcare service and welfare data in Australia. The data linkage process engages multiple agencies across state and national government, using linkage protocols that have been established in prior studies. Analyses will be conducted on de-identified linked data in a secure environment.

The study also has a number of limitations. The incidence of some study outcomes remains unknown; we expect that transition to working age welfare benefits and Medicare-funded physician attendances will be common, though others will be rare. Statistical methods will be selected to account for such challenges should they arise, and we will express outcomes as relative difference between groups to aid interpretation. We are unable to perfectly isolate the exposure to cap-induced benefit cessation in our study design due to the Transitions Group by definition having much longer durations claims; while we will explore this problem in sensitivity analyses, it may nevertheless result in overestimates of Section 39's impact. Pharmaceutical use as captured in the PBS will be limited to pharmaceuticals that exceed co-payment costs; changes to 2012 PBS data collection will be accommodated in the analysis. However, the following pharmaceuticals will not be captured in our analysis: (1) PBS items without co-payment; (2) private prescriptions (Therapeutic Goods Administration approved pharmaceuticals

that were not obtained through the PBS); and (3) over the counter pharmaceuticals. As a consequence, the consumption of pharmaceuticals such as codeine, which was freely available without prescription in Australia until February 2018, will be under-estimated in our study. However, the data capture of psychotropic medications such as antidepressants is likely to be less impacted by these data limitations.

Conclusions

There is limited evidence regarding the impact of benefit cessation on transition between sources of healthcare and welfare services. This study exploits a population-wide policy reform in the Australian state of New South Wales to conduct a natural experiment of time-capped benefit cessation on healthcare and welfare use among people with long periods of work disability. We anticipate the findings will contribute valuable information that will provide new insights into the interactions between siloed health and disability support systems.

Author's contributions

AC is the Principal Investigator. AC led the development of the research questions and study design and obtained the funding; TL, RI, JBG and PS refined the development of the research questions and study design. AC and TL led obtaining ethical and data access approvals. AC, PS, RI and JBG will have oversight of the analysis and interpretation of data. TL led the writing of this manuscript, though all authors provided critical review and final approval.

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Statement of Conflicts of Interest

The authors receive partial salary support from the State Insurance Regulatory Authority grant, who are also the workers' compensation data custodians.

Ethics statement

The study received ethical approvals from the Monash University Human Research Ethics Committee (#14696), the New South Wales Population and Health Service Research Ethics Committee (2019/ETH00422), and the Australian Institute of Health and Welfare ethics committee (#EO2018/4/480). The project plan was assessed for technical feasibility by the Australian Institute of Health and Welfare and the Centre for Health Record Linkage, a process which included independent peer review. Approval to access the study datasets was provided via Public Interest Certificates

from both the Department of Social Services and Department of Health, and via an information sharing agreement with State Insurance Regulatory Authority.

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