

# Impact of legislative reform on benefit access and disability duration in workers' compensation: an interrupted time series study

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## ABSTRACT

**Objectives** To determine the impact of legislative changes to the New South Wales (NSW) workers' compensation scheme on injured workers access to benefits, insurer claim processing and work disability duration.

**Methods** Population-based interrupted time series study of workers' compensation claims made in NSW 2 years before and after legislative amendment in June 2012. Outcomes included incidence of accepted claims per 100 000 workers, the median and 75th percentile insurer decision time in days, and the median and 75th percentile of work disability duration in weeks. Effects were assessed relative to a comparator of seven other Australian workers' compensation jurisdictions.

**Results** n=1 069 231 accepted workers' compensation claims were analysed. Claiming in NSW fell 15.3% following legislative reform, equivalent to 46.6 fewer claims per 100 000 covered workers per month. This effect was greater in time loss claims (17.3%) than medical-only claims (10.3%). Across models, there were consistent trend increases in insurer decision time. Median work disability duration increased following the legislative reform.

**Conclusions** The observed reduction in access to benefits was consistent with the policy objective of improving the financial sustainability of the compensation scheme. However, this was accompanied by changes in other markers of performance that were unintended, and are suggestive of adverse health consequences of the reform. This study demonstrates the need for care in reform of workers' compensation scheme policy.

## BACKGROUND

Employment injury insurance systems support people during the periods of temporary work disability. While approaches vary dramatically between and within nations,<sup>1–3</sup> these systems provide some level of income support for people experiencing an episode of work disability. They may also provide or fund services intended to return the disabled worker to employment or to aid recovery.

Engagement with these systems can have a significant impact on the health and employment outcomes of injured and ill workers. Workers can experience interactions with these systems as stressful and this can contribute to poor mental health, loss of work function and increased disability.<sup>4–5</sup> Claiming

## Key messages

### What is already known about this subject?

- Most nations have employment injury insurance systems to support people during periods of work disability.
- High-quality evaluations of policy reform are important to inform system design and support worker and employer outcomes, but remain rare.

### What are the new findings?

- Changes to the workers' compensation scheme in the Australian state of New South Wales designed to improve financial sustainability produced a significant 15.3% reduction in benefit access, slowed insurer decision making and increased median disability duration.
- Interrupted time series analysis attributes the observed changes to policy reform.

### How might this impact on policy or clinical practice in the foreseeable future?

- This study provides new evidence of the intended and unintended consequences of policy reform that impacted on many thousands of injured workers.
- Findings demonstrate the need for substantial care in future reform of such systems.

workers' compensation increases the probability of later welfare benefit receipt.<sup>6</sup> System administrative processes can impede return to work in some people<sup>7</sup> and may affect others involved in worker rehabilitation such as healthcare providers,<sup>8</sup> potentially limiting access to care.<sup>9</sup>

Spending on social insurance, such as workers' compensation and disability insurance, has been growing. In nations such as the USA, Australia, Denmark and Sweden, the share of the population receiving disability insurance benefits has grown in recent decades.<sup>10–12</sup> Governments have responded by tightening eligibility criteria or reducing benefit generosity.<sup>13–14</sup> Such reforms can have significant and unanticipated health consequences. Analysis of a Dutch disability reform identified that reductions in benefit generosity were associated with adverse effects on life expectancy, particularly for women with low predisability earnings.<sup>13</sup> In England,



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eligibility reassessment has been linked with an increase in self-reported mental health problems and suicide.<sup>14</sup>

In Australia, workers' compensation systems provide insurance coverage for temporary disability and medical care for approximately 94% of the labour force<sup>15</sup> yet there is a sparse evidence base to support system design.<sup>1</sup> Time-bound policy changes, such as legislative reform, provide an opportunity for 'natural experiments' that can produce strong evidence of policy impacts.<sup>16</sup>

This study examines the consequences of a substantial legislative reform to the workers' compensation scheme in the Australian state of New South Wales (NSW) that sought to ensure the long-term financial sustainability of the scheme by restricting eligibility, introducing time limits on income support and implementing more stringent work capacity assessment. Aspects of the reform targeted workers with occupational diseases and mental health conditions. Consistent with the policy objectives of the reforms, we hypothesise a reduction in the number of workers accessing the NSW workers' compensation scheme in the period after reform. Based on prior studies that have demonstrated increases in the time taken by insurers to adjudicate claims following legislative reform,<sup>17</sup> and the adverse impacts of slower decision making on return to work,<sup>4,5</sup> we hypothesise that the reforms increased insurer decision time and the duration of disability among workers with accepted claims. Finally, we hypothesise that workers with occupational disease and mental health conditions will be disproportionately affected by the reforms.

## METHODS

### Study design

This is a retrospective population-based interrupted time series (ITS) study.

### Setting

Australia has a resident population of approximately 25 million people, a working age population of 16.2 million, and a labour force of 12.3 million.<sup>18</sup>

Australian workers' compensation schemes are principally organised on a geographical basis, with each state and territory having a single compulsory scheme. Commonwealth (national) schemes also operate for federal government employees, some large employers, maritime workers and defence force personnel. Insurance claims management is performed either by private sector insurers or directly by the government authorities.

### State of NSW legislative reform

In June 2012, the NSW Workers' Compensation Legislation Amendment Act (2012) ('The Act') came into effect. The Act made multiple changes to the scheme's structure and operation, which are summarised in [table 1](#).

The primary policy objective of this legislative reform was to improve the long-term financial sustainability of the scheme. This was intended to be achieved by reducing the generosity of benefits and services and restricting access to the scheme for certain groups of workers, thus reducing overall expenditure. A second objective was to improve return to work rates of workers with accepted claims, by introducing financial disincentives for not returning to work if the worker was assessed to have some work capacity. A new regimen of work capacity assessments was introduced to implement this objective. The reforms provided the regulator and insurers with additional powers to make claims decisions that affected treatment and income benefits, and limited recourse to appeals by the worker. Most of the reforms came into effect on 19 June 2012.

The reforms had a significant impact on the finances of the scheme. A subsequent statutory review demonstrated a \$AUD5

**Table 1** Summary of the 2012 reforms to New South Wales workers' compensation legislation

Area of reform	Description
Eligibility	Definitions were tightened such that workers with occupational diseases, mental health conditions, heart attack and stroke were only eligible if employment was the main contributing factor to the condition/disease. Workers who were injured on the way to or from work were required to demonstrate a real and substantive connection between employment and the accident/injury.
Income benefits	Weekly income payments were limited to a maximum of 5 years duration except for the most seriously injured workers rather than continuing to retirement age. New time limit on benefits for workers with full work capacity of 13 weeks. Benefits for workers with partial work capacity were time limited to 130 weeks. The maximum weekly benefit increased from \$AUD1775 to \$AUD1838 and was indexed annually. Income benefits were ceased at statutory retirement age (65 years) rather than continuing for up to 12 months postretirement. Removal of entitlements to lump sum payments for pain and suffering. Threshold for lump sum payments for permanent impairment from physical injury changed from 1% whole person impairment to >10%.
Medical treatment	Time limits on payments for medical treatment were introduced, restricting payments to 12 months after compensation claim is made, or 12 months from the date of the last income payment, whichever is the latter.
Suitable employment	Definition of suitable employment was changed to exclude consideration of whether work is available or available close to the workers' place of residence.
Assessment	Restriction to a single assessment to determine whole person impairment.
Powers of regulator and insurers	Provided that work capacity decisions were made by the insurer and were not eligible for review. Provided the regulator with the power to determine the necessity for medical treatment, the nature of medical treatment and the appropriateness of the treatment provider. Workplace inspectors (employed by regulator) provided with the power to issue legally binding improvement notices to employers not meeting obligations, with penalties payable.
Dispute resolution and legal assistance	Establishment of the WorkCover Independent Review Office (WIRO) to deal with complaints about insurers made by workers or employers. Establishment of the Independent Legal Assistance and Review Service under WIRO to facilitate claimant access to free legal advice. Claimants required to fund their own legal costs in most disputes.

AUD, Australian Dollars.

billion improvement in financial position, moving from a \$AUD4 billion unfunded liability to a \$AUD1 billion surplus within two years.<sup>19</sup> The reforms have been the subject of multiple statutory reviews.<sup>19 20</sup> However, the long-term impacts have not been formally evaluated.

**Data sources**

Data for this study were derived from the National Dataset for Compensation based Statistics. The database includes individual person-level data for every accepted workers' compensation claim since the 2003/2004 financial year and is updated annually. Data fields include information related to the worker and their occupation, the compensation claim, the condition leading to the claim as well as claim outcome. The database includes Australian Bureau of Statistics labour force denominator data suitable for calculating claim rates. National standard occupational,<sup>21</sup> industry<sup>22</sup> and type of condition<sup>23</sup> coding are used. The database has been used previously to examine differences in disability duration between jurisdictions,<sup>1</sup> to characterise high-risk occupational cohorts<sup>24</sup> and to examine the impact of policy change.<sup>17</sup>

**Participants**

Claim-level data were extracted for people with accepted claims for a 2-year period before and after the month of the NSW legislative reform (June 2012). As the Act took effect in the middle of June, this month was excluded from analysis.

Inclusion criteria were: (1) accepted workers' compensation claim; (2) date of injury between 1 June 2010 and 30 May 2012 or between 1 July 2012 and 30 June 2014; and (3) claim lodgement in one of the following eight Australian workers' compensation jurisdictions: NSW, Victoria, Queensland, Western Australia, Tasmania, South Australia, Northern Territory, Australian Capital Territory. Denied and pending claims were excluded. Three Commonwealth schemes for federal government employees, maritime workers and defence services

personnel were not included. Participants were then divided into two groups based on the jurisdiction in which they accessed workers' compensation, being (1) NSW and (2) all other jurisdictions, collectively acting as a comparison group. Review of national legislative changes revealed that some of the comparator jurisdictions had substantial legislative reform before) or after the study period but no equivalent scheme wide reforms occurred during the study period.

To assess reform impact by type of injury/disease, claims were further separated into groups including (1) occupational diseases including heart attack and stroke; (2) mental health conditions and (3) all other injuries.

**Outcomes**

**Access to benefits**

Defined as the monthly incidence of accepted workers' compensation claims per 100 000 workers, as per prior studies.<sup>24 25</sup> Calculated by dividing the number of new accepted claims per calendar month by the number of covered workers. In addition to all accepted claims, rates were calculated for time loss claims (those with at least one day of compensated wage replacement) and medical-only claims (those for which only medical or treatment expenses had been paid but without time loss).

**Insurer claim processing**

Defined as the median number of days between the date of claim lodgement by the employer and the date of claim acceptance by the insurer, for all claims accepted within a calendar month. This metric reflects the amount of time the insurer takes to decide whether to accept, deny or reject a workers' compensation claim. Prior studies demonstrate that insurer claims processing delays are associated with delayed return to work.<sup>26</sup> We also examined the 75th percentile to better enable identification of changes in the higher end of the distribution.<sup>17</sup>

**Table 2** Characteristics of study groups

	Period before reform (June 2010 to May 2012)		Period after reform (July 2012 to June 2014)	
	New South Wales	Comparator jurisdictions	New South Wales	Comparator jurisdictions
Total number of claims	245 385 (100.0)	337 559 (100.0)	183 016 (100.0)	303 271 (100.0)
Gender				
Female	92 150 (37.6)	116 140 (34.4)	64 502 (35.2)	106 624 (35.2)
Male	153 235 (62.5)	221 418 (65.6)	118 514 (64.8)	196 647 (64.8)
Age at claim lodgement				
16–35 years	92 780 (37.8)	129 753 (38.4)	70 163 (38.3)	113 353 (37.4)
36–50 years	86 416 (35.2)	119 590 (35.4)	62 385 (34.1)	104 433 (34.4)
51–100 years	65 737 (26.8)	87 618 (26.0)	50 156 (27.4)	85 087 (28.1)
Injury type				
Musculoskeletal conditions	136 740 (55.7)	188 793 (55.9)	102 732 (56.1)	173 280 (57.1)
Fractures	12 479 (5.1)	23 207 (6.9)	9665 (5.3)	22 018 (7.3)
Other traumatic	72 787 (29.7)	92 912 (27.5)	55 969 (30.6)	79 160 (26.1)
Neurological conditions	6997 (2.9)	9975 (3.0)	3833 (2.1)	9064 (3.0)
Mental health conditions	8674 (3.5)	12 107 (3.6)	5505 (3.0)	10 967 (3.6)
Other diseases	5394 (2.2)	9438 (2.8)	4075 (2.2)	7763 (2.6)
Other claims	2314 (0.9)	1127 (0.3)	1237 (0.7)	1019 (0.3)
Claim type				
Time loss	147 328 (60.0)	221 531 (65.6)	103 982 (56.8)	206 585 (68.1)
Medical only	98 057 (40.0)	116 028 (34.4)	79 033 (43.2)	96 686 (31.9)

All figures are reported as number (column percentage).

**Table 3** Effects of the 2012 amendments on outcomes, controlled for other Australian jurisdictions

Outcome 1	Before reform (June 2010 to May 2012)		After reform (July 2012 to June 2014)		Median-level change (99% CI)		Median trend change (99% CI)	
	Median monthly claim rate per 100 000 workers (IQR)				Interrupted time series analyses			
All accepted claims								
New South Wales	343.4	(312.9–354.6)	237.8	(221.1–248.9)	–46.6*	(–63.2 to –30.1)	–0.3†	(–1.4 to 0.9)
Comparator Jurisdictions	214.9	(196.3–220)	180.1	(169.6–188.7)	–7.7	(–19.4 to 4.0)	–0.6	(–1.4 to 0.2)
Time loss claims								
New South Wales	205.0	(185–215.3)	135.3	(125.5–140.8)	–31.6*	(–46.1 to –17.1)	–0.4	(–1.6 to 0.8)
Comparator Jurisdictions	141.7	(129.1–145)	122.5	(116.4–127.4)	–4.7	(–15.0 to 5.5)	–0.4	(–1.3 to 0.4)
Medical only claims								
New South Wales	137.0	(126.2–139.2)	103.0	(95.3–107.9)	–12.5 *	(–17.1 to –7.9)	0.1	(–0.2 to 0.4)
Comparator Jurisdictions	72.9	(66.9–75.1)	56.7	(53.3–60.3)	–4.4 *	(–7.6 to –1.2)	–0.1	(–0.3 to 0.1)
IQR, Interquartile Range.								
Outcome 2	Insurer decision time (days)				Interrupted time series analyses			
Median (IQR)								
New South Wales	6	(2–17)	7	(4–22)	1.2*†	(0.5 to 1.8)	0.1*	(0.0 to 0.1)
Comparator Jurisdictions	5	(2–13)	5	(2–12)	–0.8*	(–1.3 to –0.3)	0.0*	(–0.1 to 0.0)
75th percentile								
New South Wales	17		22		2.1	(–2.7 to 6.9)	0.4*	(0.0 to 0.8)
Comparator jurisdictions	13		12		–1.0	(–4.3 to 2.2)	0.0	(–0.2 to 0.2)
IQR, Interquartile Range.								
Outcome 3	Duration of disability (weeks)				Interrupted time series analyses			
Median (IQR)								
New South Wales	1.8	(0.6–7.0)	2.0	(0.7–7.3)	0.5*	(0.2 to 0.8)	0.0	(0.0 to 0.0)
Comparator jurisdictions	3.0	(0.8–12.0)	3.2	(0.8–12.7)	–0.3*	(–0.5 to –0.2)	0.0	(0.0 to 0.0)
75th percentile								
New South Wales	7.0		7.3		1.2*†	(0.7 to 1.7)	0.1*	(0.0 to 0.1)
Comparator jurisdictions	12.0		12.7		–1.2*	(–1.5 to –0.8)	0.0	(0.0 to 0.0)

\*P&lt;0.01.

†Inconsistent results between controlled and uncontrolled analyses.

IQR, Interquartile Range.

### Disability duration

Defined as the median number of weeks for which income benefits have been paid for claims accepted within a given calendar month, censored to a maximum of 104 weeks. This metric has been used to assess disability duration in multiple prior studies.<sup>1 24 27</sup> We also calculated the 75th percentile to enable examination of any changes in the higher end of the distribution.

### Data analysis

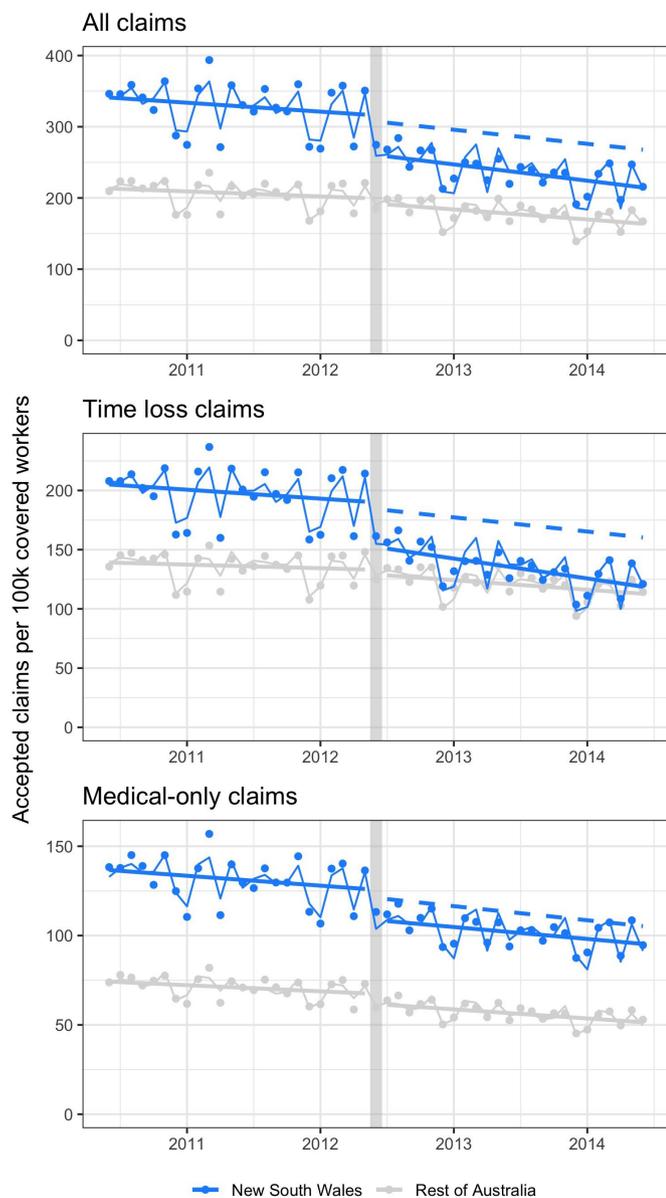
Descriptive statistics including counts, percentages, medians and IQRs were used to examine outcomes before and after legislative reform in both NSW and the comparator jurisdictions.

ITS analysis was used to compare outcomes before and after legislative reform. Aggregate data of monthly outcomes for the NSW and comparator cohorts were compiled. Changes were evaluated by comparing the outcomes between cohorts using a generalised least-squares regression.<sup>28</sup> In total, 96 data points were included in the regression model, including 24 monthly data points before and after the NSW reform for both NSW and the comparator cohorts. To account for seasonality, we tested sets of harmonic terms (six sine and six cosine), retaining those that were statistically significant at  $p \leq 0.05$ .<sup>29</sup> Rather than coerce the model to fit seasonality in both the exposure and comparator group, each group retained its own set of terms. We adjusted for residual autocorrelation by fitting the data to

autoregressive-moving average models based on correlated residuals observed in Autocorrelation Function and Partial Autocorrelation Function plots.<sup>28</sup> For each analysis, all possible models were compared on Akaike information criterion. Due to the multiple comparisons and increased risk of type 1 errors, significance was set at  $p \leq 0.01$ .

ITS results are reported as level changes, affecting the time series' intercept and trend changes, affecting the slope. We conducted each analysis both with (controlled) and without the comparator (uncontrolled). Where results were consistent in terms of significance and direction of effect, we report the results of controlled analyses. Where inconsistent, we report the results with more caution and investigate potential sources of history bias or independent changes within the comparator jurisdictions.<sup>30</sup> In supplementary analysis, we compared median claim incidence, median insurer decision time and median disability duration between injury/disease groups between the NSW and comparator jurisdictions.

Seasonally adjusted ITS trend lines were plotted over monthly data points using code adapted from the ITS tutorial in Bernal *et al.*<sup>16</sup> Analyses were conducted in R<sup>31</sup> using RStudio<sup>32</sup> with the following packages: the tidyverse for data manipulation and plotting, nlme for generalised least squares regression analyses, zoo for date creation, and the see and ggpubr packages for additional plotting.



**Figure 1** Mean monthly claim incidence in New South Wales (blue) and Comparator Jurisdictions (grey), June 2010 to July 2014 for all claims, time loss claims and medical-only claims. Dotted blue lines=counterfactual.

## RESULTS

### Characteristics of workers' compensation claimants

Claims totalled 1 069 231, comprising 428 401 (40.1% of total) claims from NSW and 640 830 (59.9%) claims from comparator jurisdictions (table 2). Nearly two-thirds of cases in both the groups were male, while the age distribution was similar between groups. The most common conditions were musculoskeletal, followed by other traumatic injury. Fractures, mental health conditions, occupational disease and neurological conditions were in the minority. The majority of claims in both groups involved time loss, although these were slightly more common in comparator jurisdictions.

### Access to benefits

Following legislative reform, there was an overall reduction in the rate of accepted workers' compensation claims in NSW. While the median monthly incidence reduced by 106.6 claims per 100 000 workers between pre and postreform periods, ITS

analysis showed a 15.3% reduction in the time series intercept coinciding with reform implementation, equivalent to 46.6 fewer claims per 100 000 covered workers per month (table 3 and figure 1). ITS revealed that the rate of reduction in time loss claims in NSW in the month following reform was higher at 17.3% or an estimated 31.6 fewer claims per 100 000 workers per month. The reduction in medical-only claims was less but still statistically significant at 10.3% or 12.5 fewer claims per 100 000 workers per month. In comparator jurisdictions, there was a significant reduction of 4.4 medical-only claims per 100 000 workers per month, though plotted results suggest that this was a marginal change. No changes in trend were observed in the controlled analyses for either NSW or comparator jurisdictions.

### Insurer claim processing

Median and 75th percentile insurer decision times increased in NSW post-reform and remained static or decreased in comparator jurisdictions. ITS analysis comparing the pre and post-reform time series revealed a statistically significant level increase in the median insurer decision time in NSW of 1.2 days coinciding with legislative reform, equating to a change of 20% from the prereform period. This was accompanied by a significant trend increase of 0.1 days per month (table 3 and figure 2). In uncontrolled models, the level increase in median insurer decision time in NSW was smaller at 0.4 days and was non-significant (online supplementary table 1). In contrast, comparator jurisdictions recorded a statistically significant level decrease of 0.8 days.

A similar pattern was observed in ITS analysis of the 75th percentile of insurer decision time, in which there was a non-significant level increase of 2.1 days in NSW accompanied by a statistically significant 0.8 days per month trend increase. No significant level or trend changes in the 75th percentile were observed in the comparator jurisdictions. Note that for NSW the 2011 data were excluded for non-linear patterns in the data that appeared unrelated to data in the rest of the time series.

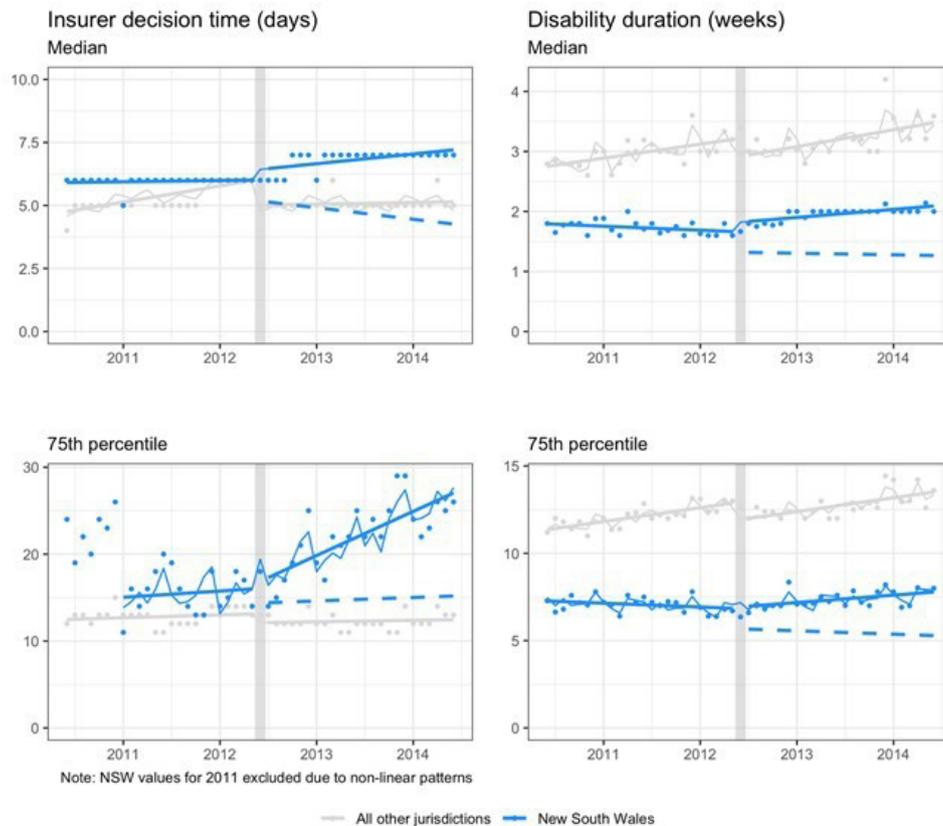
### Disability duration

Median and 75th percentile disability duration increased in both NSW and comparator jurisdictions post-reform. ITS analysis comparing the pre and post-reform time series revealed that there was statistically significant level increase in the median disability duration of 0.5 weeks in NSW following the legislative reform (table 3 and figure 2), equivalent to a 28.6% increase. In contrast, comparator jurisdictions recorded a statistically significant level decrease of 0.3 weeks. Accordingly, there were substantial differences in effect magnitudes between controlled and uncontrolled analyses.

Among the 75th percentile of disability duration, there were significant trend increases of 0.1 weeks per month. Results on level changes were inconsistent between controlled and uncontrolled analysis.

### Outcomes by nature of injury or disease

ITS results by nature of injury/disease group are presented in online supplementary table 2. ITS analysis revealed that median claim incidence decreased by 36.5% in occupational disease, 25.9% in mental health condition and 13.1% in all other injury groups. All of these level changes were statistically significant. For mental health condition claims the median insurer decision time increased by 65.5% and the median disability duration increased by 92.1% immediately following reform. Level changes on insurer decision time and disability duration were



**Figure 2** Median and 75th percentile insurer claim processing and disability duration time in New South Wales (blue) and Comparator Jurisdictions (grey), June 2010 to July 2014. Dotted blue lines=counterfactual.

non-significant for occupational disease and other injury groups, or inconsistent between controlled and uncontrolled analyses.

## DISCUSSION

Legislative reforms to the NSW workers' compensation scheme in 2012 resulted in a large and significant reduction in the number of injured and ill workers having their claims accepted. The magnitude of this policy effect was larger in claims that involved time loss than in claims in which the worker was seeking treatment or medical expenses only. Following the reforms, insurer decisions took longer and the duration of disability for injured workers with accepted claims increased significantly. Reductions in claim acceptance were larger in workers with occupational disease and mental health conditions than workers with other injuries, and there was also a significant increase in disability duration among workers with mental health condition claims. Overall, the findings demonstrate a direct connection between the implementation of the legislative reforms in July 2012 and changes in three outcomes that are important markers of workers' compensation scheme performance. Findings also demonstrate that the impacts of legislative reforms were not evenly distributed and that workers with occupational disease and mental health conditions were disproportionately affected. Despite the pervasive nature of employment injury insurance schemes in developed economies, few studies have examined the impact of legislative reform on worker and scheme relevant outcomes. One Finnish study observed an improvement in return to work and work participation among injured and ill workers following legislative amendments requiring employers to report episodes of extended sickness absence to occupational health services.<sup>33</sup> Another Finnish study noted workers who accessed part-time sick leave in the first 12 weeks after work

disability (enabled by changes in legislation) had improved return to work outcomes and a reduction in full disability retirement compared with workers who accessed full-time sick leave.<sup>34</sup> Studies in Denmark, Sweden and England have described the adverse impacts of restricting access to benefits on people with work disability.<sup>12–14</sup> Significant reductions in access to benefits were reported in two studies following tightening of eligibility in USA workers' compensation schemes during the 1990s.<sup>35 36</sup> There have also been studies of the health impact of legislative reform in other forms of injury compensation such as road traffic crash insurance schemes.<sup>37 38</sup> While the findings of the current study support these prior studies, the unique nature of Australian workers' compensation schemes makes it difficult to generalise to jurisdictions with very different policy settings. Findings are most relevant to jurisdictions with similar workers' compensation arrangements and policy features, including the rest of Australia, Canada, Hong Kong and some southern European nations.

Taken together, these studies suggest that reforms to injury and disability compensation schemes that increase access to benefits are linked with improvements in the health of claimants, whereas reforms that restrict access can have adverse health impacts. Efforts to restrict access require introduction or extension of bureaucratic processes such as medical and functional capacity assessment, which have been associated with negative claimant experience and poor mental health.<sup>4</sup> The introduction of extra processes can delay decision-making and introduce the potential for dispute, which has also been linked with adverse impacts.<sup>39</sup> Additional bureaucracy may increase the 'burden of proof' of the injured person to demonstrate the veracity of their claim,<sup>4</sup> which has been associated with reductions in the perceived fairness of benefit processes, which in turn has been linked with claimant health.<sup>40</sup>

Recent system-level studies extend these specific findings and suggest that the relationship between policy reform, compensation scheme performance and worker health is complex, dynamic and can produce unintended health impacts.<sup>41</sup>

In prior studies, we have attributed increases in insurer decision time to increased insurer administrative burden flowing from legislative amendment,<sup>17</sup> and have observed associations between more complex injuries and longer decision times.<sup>26</sup> We and others have observed that workers with more complex conditions typically have longer disability duration,<sup>1</sup> but increases in duration may also arise from changes in administrative processes that lead to delays in decisions<sup>42</sup> or increased worker stress resulting from tightening of benefit access.<sup>14</sup> These prior studies suggest multiple potential causal mechanisms for the observed increases in insurer decision time and disability duration following the 2012 reforms. While our analysis does not allow us to differentiate between the relative contribution of these mechanisms to the observed change in outcomes, this prior evidence suggests that all may stem from legislative reform of the type undertaken in NSW in 2012.

The NSW legislative reforms took place during a period of economic recovery following the global financial crisis. Prior studies have shown decreases in rates of workers' compensation claims during periods of recession, followed by gradual increases during recovery. This is the opposite pattern to that observed in our study, adding further weight to our conclusion that the change in claim incidence in NSW was due to policy reform to the workers' compensation system.

Strengths of the current study include the use of population-level data and a robust quasi-experimental study design. The ITS method enables attribution of the observed changes in outcomes to the policy intervention. Features of our analysis include use of both historical and contemporaneous comparators, testing effects in both controlled and uncontrolled analyses, and adjustment for seasonality and autocorrelation. These adjustments are not able to control for all co-occurring events, for example, changes in comparator jurisdictions that were not observed by the research team. Although outcome measures have been used as indicators of scheme performance in prior studies, we were not able to examine important indicators of function and disability such as self-rated health, work ability or health service utilisation. We use duration of income benefits as a proxy for disability duration as per prior studies, however, we note that some of the NSW reforms may influence income benefits while not affecting disability duration (eg, inability to review insurer work capacity decisions). Our study design also did not allow us to disaggregate the relative contributions of the many changes introduced by the NSW legislative reforms.

## CONCLUSION

We observed large and significant changes to three important markers of workers' compensation scheme performance linked to a major legislative reform in the Australian state of NSW in 2012. The observed reduction in access to benefits was anticipated and consistent with the policy objective of improving the financial sustainability of the compensation scheme. However, this was accompanied by changes in other markers of performance that were unintended, and are suggestive of adverse consequences of the reform. Workers with occupational disease or mental health conditions were disproportionately affected by the reforms. Legislative change is a tool commonly used by governments to influence the performance of benefit and compensation schemes. This study provides evidence that can

support future reform in Australian workers' compensation schemes, and demonstrates the need for care in legislative reform to other benefit schemes internationally.

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**Contributors** AC and TJL conceived the study. TJL and DB conducted the analyses with input from AC and SEG. AC drafted the manuscript. All authors reviewed the data analysis, read and approved the final manuscript.

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**Competing interests** None declared.

**Patient consent for publication** Not required.

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**Data availability statement** All data relevant to the study, and R analysis code, are available via figshare at [https://monash.figshare.com/projects/Impact\\_of\\_legislative\\_reform\\_on\\_benefit\\_access\\_and\\_disability\\_duration\\_in\\_workers\\_compensation\\_an\\_interrupted\\_time\\_series\\_study/71678](https://monash.figshare.com/projects/Impact_of_legislative_reform_on_benefit_access_and_disability_duration_in_workers_compensation_an_interrupted_time_series_study/71678).

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