



**The incidence and impact of recurrent workplace injury and disease. A cohort study of WorkSafe Victoria, Australia compensation claims**

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3 **The incidence and impact of recurrent workplace injury and disease. A cohort**  
4 **study of WorkSafe Victoria, Australia compensation claims**  
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## ABSTRACT

**Objective:** To determine the incidence and impact of recurrent workplace injury and disease over the period 1995 to 2008.

**Design:** Population-based cohort study using data from the state workers' compensation system database.

**Setting:** State of Victoria, Australia.

**Participants:** A total of 448,868 workers with an accepted workers' compensation claim between 1 January 1995 and 31 December 2008 were included into this study. Of them, 135,349 had at least one subsequent claim accepted for a recurrent injury or disease during this period.

**Main outcome measures:** Incidence of initial and recurrent injury and disease claims and time lost from work for initial and recurrent injury and disease.

**Results:** Over the study period 448,868 workers lodged 972,281 claims for discrete occurrences of work-related injury or disease. 53.4% of these claims were for recurrent injury or disease. On average, the rates of initial claims dropped by 5.6%, 95% CI [-5.8, -5.7] per annum, while the rates of recurrent injuries decreased by 4.1%, 95% CI [-4.2, -4.0]. In total, workplace injury and disease resulted in 188,978 years of loss in full time work, with 104,556 of them being for the recurrent injury.

**Conclusions:** Recurrent work-related injury and disease is associated with a substantial social and economic impact. There is an opportunity to reduce the social, health and economic burden of workplace injury by enacting secondary prevention programs targeted at workers who have incurred an initial occupational injury or disease.

## ARTICLE SUMMARY

### Article focus

- To determine the incidence and impact of recurrent workplace injury and disease in Victoria, Australia over the period 1995 to 2008.

### Key messages

- A recurrent workplace injury and disease is frequent and associated with a substantial work disability. We established that over the 14 year study period in the state of Victoria, Australia more than 50 % of claims were filed for a recurrent injury or disease. In addition, we found that the majority (104,556 years) of time lost from work was from the recurrent claims.
- There is an opportunity to reduce the social, health and economic burden of workplace injury by enacting secondary prevention programs targeted at workers who have incurred an initial occupational injury or disease.

### Strengths and limitations of this study

- The principal strength is that this is the first study to summarize the overall impact of work disability and annual trends of subsequent work-related injury and disease, as most of the past studies treated claims as single and discrete events.
- The main weakness of this study is that it is Victoria only specific study, and the database does not cover the entire population, certain injuries maybe underreported and, therefore results published here maybe underrepresented. i.e. workers may not claim for mental health related issues, they possibly have claimed in other institutions in the past or they are self-covered.

## INTRODUCTION

Work is now generally acknowledged as being good for health<sup>1</sup>. There is a growing trend internationally to encourage early return-to-work after injury or illness as a means of facilitating recovery, wellbeing and social inclusion. Conversely, periods of unemployment can lead to poor health or exacerbate existing health issues<sup>1</sup>. Disability arising from workplace injury and illness is also now the subject of substantial public policy and academic interest<sup>2</sup>.

Workers' compensation claims data has been an important source of information to describe the incidence and impact of work-related injury and disease within and across jurisdictions internationally<sup>3-5</sup>. Studies in this area reveal the substantial health and economic costs of workplace injury and illness<sup>6,7</sup>. For example, the total cost of health care of officially recognized injured workers in Mexico in 2005 was \$753,420,222 USD<sup>8</sup>. Similarly, workers' compensation insurance for US workers in 2007 cost \$85 billion USD<sup>9</sup>. Over the past two decades the concept of 'work disability', usually measured as the number of days lost from work, has emerged as a means of estimating the burden of workplace injury and disease<sup>2</sup>.

More recently, we and others have utilised workers' compensation system data to focus on recurrent workplace injury or disease<sup>10-12</sup>. These studies in discrete populations or over discrete time periods have demonstrated that injury and disease recurrences contribute substantially to the overall burden of workplace injury and disease. There are numerous examples of population based estimates of the overall burden of workplace injury and disease, including detailed epidemiological analysis of time series<sup>13-15</sup>. However, these studies do not differentiate between initial and

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2  
3 recurrent episodes of injury or disease. Examining annual trends of the initial and  
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5 recurrent occupational injury may provide us a better understanding of the relative  
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7 effectiveness of primary and secondary prevention initiatives<sup>16 17</sup>.  
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10 The current study sought to determine the incidence and impact of a recurrent  
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12 workplace injury and disease in the state of Victoria, Australia over a 14 year period  
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14 using the data from the state workers' compensation system. This study has two  
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16 aims: 1) to describe the annual incidence of initial and recurrent workplace injury and  
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18 disease, and 2) to summarize the disability associated with initial and recurrent  
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20 workplace injury and disease.  
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## 23 **METHODS**

### 24 **Setting**

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29 Victoria is a state of approximately 5.5 million people with an approximate full-  
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31 time working population of 2.4 million (year 2010 data obtained from  
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33 www.abs.gov.au). The Victorian WorkCover Authority (VWA) is the state government  
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35 occupational health and safety and workers' compensation authority. To be eligible  
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37 for workers' compensation benefits, the worker must be able to demonstrate a  
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39 causal link between the injury or disease and their work. Employers are responsible  
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41 for income replacement for the first 10 days away from work, beyond which the VWA  
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43 provides income replacement benefits. Reasonable healthcare and rehabilitation  
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45 benefits are also provided by the VWA. 85% to 90% of workers in the state have  
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47 their workers' compensation insurance provided by the VWA. Exceptions are federal  
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49 government employees, sole traders and employees of some large self-insured  
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51 employers.  
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### 55 **Compensation database**

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3 A de-identified workers' compensation administrative database for the period  
4 from 1986 was obtained from the VWA for the purpose of this study. The database  
5 contains information regarding the claimant, injury or disease, and benefits paid in  
6 relation to the claim. A detailed description of the compensation database can be  
7 found elsewhere<sup>11</sup>.  
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### 13 **Data analysis**

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17 All accepted workers' compensation claims occurring between 1 January  
18 1995 and 31 December 2008 were included in this study. Descriptive statistics were  
19 used to provide an overview of initial (first claim of a worker) and recurrent (second  
20 or subsequent claim of a worker) claims by gender, nature of affliction (injury or  
21 disease) and type of benefits paid (income replacement and medical expenses). Two  
22 outcomes were considered in this study: the rates of initial and recurrent injury and  
23 disease over the 14 year period; and the number of compensated days away from  
24 work, which was used as the indicator of 'work disability'<sup>18</sup>.  
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35 The incidence of initial and recurrent claims per annum was calculated as a  
36 rate per 1,000 workers, for males and females. Denominator data was drawn from  
37 the Australian Bureau of Statistics (ABS) labour force survey for the state of Victoria.  
38 Poisson count regression was used to determine annual changes in rates between  
39 initial and recurrent injury and disease. SPSS version 20.0 was used for all analyses.  
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## 47 **RESULTS**

### 48 **Initial and recurrent workplace injury and disease**

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50 Over the study period of 14 years a total of 448,868 workers lodged  
51 compensation claims for 972,281 discrete occurrences of work-related injury or  
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disease (Table 1). Recurrent injury and disease accounted for 53.4% of all claims. These were attributable to only 26.2% of all claimants.

Males were more likely to have a recurrent injury or disease than females. A majority of claims were for occupational injuries. Occupational diseases were more likely to result in subsequent workers' compensation claims (24.2% vs. 28.2%). The majority of claims were lodged for income replacement and/or medical expenses.

[Insert Table 1 here]

### **Incidence of initial and recurrent workplace injury and disease**

The rates of initial and recurrent workplace injury and disease per 1,000 working population are displayed in Figure 1. Figure 1A illustrates incidence per annum of initial and recurrent claims per 1,000 working population. The rates of initial injury reduced from 26.4/1,000 in 1995 to 12.7/1,000 in 2008 (or by 5.6% per annum,  $p < 0.0001$ , 95% CIs -5.8 to -5.7). The rates of recurrent injury decreased from 24.9/1,000 in 1995 to 14.5/1,000 in 2008 (or by 4.1% per annum,  $p < 0.0001$ , 95% CIs -4.2 to -4.0).

Figure 1B illustrates annual incidence rates per 1,000 working population of initial and recurrent injury and disease, in males and females separately. The rates of initial injury and disease in males were lower by 6.5% ( $p < 0.0001$ , 95% CIs -6.7 to -6.2) than in females. Similarly, the rates of the recurrent injury and disease in males were also lower than if females, but by 4.5%, ( $p < 0.0001$ , 95% CIs -4.8 to -4.2). The incidence rates of recurrent injuries and diseases were higher than in the initial claims by 6.5% ( $p < 0.0001$ , 95% CIs 6.3 to 6.5) in males, and by 4.2%, ( $p < 0.0001$ , 95% CIs 3.9 to 4.5) in females.



[Insert Figure 1 here]

## Work disability

Table 2 summarizes work disability associated with the initial and recurrent injury and disease. In total, over the study period of 14 years, workplace injury and disease resulted in 188,978 years of full-time work loss. More than half (55.3%) of this burden was caused by recurrent injury and disease.

Males incurred for 45,570 (38.7%) years of full time work loss due to the initial injury, and 72,211 (61.3%) years - due to the recurrent injury and disease. Females incurred 38,130 (54.8%) years of full time work loss during their initial claims. This amount of time decreased to 31,404 (45.2%) years in recurrent injury and disease. Occupational injuries accounted for 53,713 (44.8%) years of work disability in all initial claims and 66,026 (55.2%) in recurrent injury. Work disability incurred for a recurrent disease, relatively to the initial claims, was similar: 38,530 (55.6%) and 30,709 (44.4%) years of full time work loss respectively. The average duration of time lost due to workplace injury and disease was 89.8 (267.6) days; however it was higher for recurrent claims.

[Insert Table 2 here]

## DISCUSSION

### Principal findings

This large-scale administrative data study, designed to provide a population-based overview of workers' compensation claims, showed that a recurrent workplace injury and disease is frequent and associated with a substantial work disability. We established that over the 14 year study period, 448,868 workers in the state of

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3 Victoria, Australia, lodged 972,281 compensation claims, 53.4 % of them were filed  
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5 for a recurrent injury or disease (Table 1). In agreement with the previously reported  
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7 findings we observed that rates of work-related injury and disease were declining,  
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9 which is probably associated with legislative changes, unemployment rates or  
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11 seasonal affects, and, most importantly, with better strategies and increased  
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13 effectiveness of injury prevention<sup>14 15 19 20</sup>. In addition, we found that the majority  
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15 (104,556 years) of time lost from work was from the recurrent claims (Table 2). This  
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17 is equivalent to ~10.4 days for each working person in Victoria. Despite that  
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19 sickness absence as a proportion of working time is decreasing, these figures are  
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21 still substantial and represent a significant cost to the economy<sup>21</sup>.  
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### 26 **Strengths and weaknesses of the study**

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28 The first strength of this study is the large and exclusive compensation  
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30 research data source, containing detailed and objective information on workers, their  
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32 injuries and diseases. Entries of the dataset are unique and no duplicate information  
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34 is recorded. The second and principal strength is that, to our knowledge, this is the  
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36 first study to summarize the overall impact of work disability and annual trends of  
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38 subsequent work-related injury and disease, as most of the past studies treated  
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40 claims as single and discrete events<sup>14 15 22-24</sup>. Earlier published scientific papers  
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42 focused on the first return-to-work and time lost on temporary disability benefits as  
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44 outcomes of the workplace related injury. These studies concluded that work-related  
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46 injury and illness affects not only injured workers, but also employers, society and  
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48 government<sup>7 22 25-30</sup>. Alternatively, only a few recent studies emphasized the burden  
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50 of subsequent workers' compensation claims; however these studies analysed only  
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52 the initial and second claims, but did not consider any further work-related injuries or  
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3 illnesses<sup>10-12 31</sup>. Lack of understanding of the overall impact of a recurrent workplace  
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5 injury and disease instigates a significant dilemma associated with employment rates  
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7 and earnings of injured workers, adverse effects on productivity and costs, including  
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9 those associated with compensation<sup>9 26 32</sup>.

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12 The main weakness of this study is that it is Victoria only specific study, and  
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14 the database does not cover the entire population, certain injuries maybe  
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16 underreported and, therefore results published here maybe underrepresented. i.e.  
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18 workers may not claim for mental health related issues, they possibly have claimed  
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20 in other institutions in the past or they are self-covered<sup>33 34</sup>. In addition, legislative  
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22 changes and organizational policies might have affected claim rates reported here<sup>35</sup>.  
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24 It is also important to acknowledge that the present study does not report trends in  
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26 claim costs or cost effectiveness analysis over the years; however it is already  
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28 known that repeat workers' compensation claims are associated with increased  
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30 costs of medical and like services and weekly compensation paid<sup>11</sup>.

### 31 32 33 34 35 36 37 38 **Conclusions and policy implications**

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40 The most effective strategy for preventing work-related disability is a primary  
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42 prevention approach, that is, preventing the initial work related injury and disease<sup>36</sup>.  
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44 Findings of the current study highlight a steady decline in the number of initial work-  
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46 related injury and disease (Figure 1), indicating that primary injury prevention  
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48 strategies at workplace are becoming more and more efficient over the years<sup>14</sup>. An  
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50 accelerating reduction of recurrent injuries and diseases suggests that secondary  
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52 prevention initiatives were possibly reviewed and addressed more carefully after  
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54 1999. Despite the current return-to-work efforts and decreasing rates of the initial  
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3 and recurrent injury and disease, there is probably still more room for improvement.  
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5 Current injury prevention policies and procedures need to be regularly revised,  
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7 focussing on more efficient secondary prevention<sup>37-39</sup>. A key to a successful  
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9 secondary prevention is not only appropriately trained staff, but also clearly identified  
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11 risk factors at workplace and a combination of early predictors for poor long-term  
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13 outcomes in workers<sup>16 17</sup>. Both the injured worker and their employer are known to  
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15 the compensation authorities, and therefore can be targeted by OH&S regulators  
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17 and policy makers. It is essential to consider other factors such as precarious  
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19 working conditions, worker's age, gender and comorbidities<sup>40-42</sup>.  
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24 Return-to-work coordinators, clinicians and care management support also  
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26 play an important role in workers' return-to-work and re-injury prevention. Their  
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28 efforts may need to be revisited with incentives provided so reduced costs for  
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30 workers' compensation healthcare and increased safety practises are  
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32 implemented<sup>32</sup>. Education of workers to be more aware of hazards associated with  
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34 their job may be an important step forward. Introducing work wellness and  
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36 rehabilitation programs, providing counselling and job training for returning-to-work  
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38 staff members may also assist in a further reduction of re-injury<sup>2 32 43 44</sup>.  
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Table 1. Profile of initial and recurrent workers' compensation claims by category in Victoria, 1995 to 2008.

Category	Initial claims			Recurrent claims			Total claims			p	
	N	Row %	Col %	N	Row %	Col %	N	Row %	Col %	Row	Col
<b>Total claims</b>	448,868	46.2	-	523,413	53.4	-	972,281	100	-	0.000	-
<b>Total claimants</b>	448,868	76.8	-	135,349	26.2	-	584,217	100	-	0.000	-
<b>Claims per claimant</b>	1	-	-	3.86	-	-	1.66	-	-	-	-
<b>Gender</b>											
<b>Males</b>	274,915	75.1	61.2	91,072	24.9	67.3	365,987	100	62.6	0.000	0.000
<b>Females</b>	163,059	79.8	36.3	41,111	20.2	30.4	204,170	100	34.9	0.000	0.000
<b>Missing</b>	10,894	77.5	2.4	3,166	22.5	2.3	14,060	100	2.5	0.003	NS
<b>Nature of affliction</b>											
<b>Injury</b>	340,203	47.4	75.8	376,033	52.6	71.8	716,236	100	73.6	0.000	0.000
<b>Disease</b>	108,665	42.4	24.2	147,380	57.6	28.2	256,045	100	26.4	0.000	0.000
<b>Compensation benefits paid</b>											
<b>Income replacement +/- medical expenses</b>	257,082	46.8	57.3	292,340	53.2	55.8	549,422	100	56.5	0.000	0.000
<b>Medical expenses only</b>	191,786	45.4	42.7	231,073	54.6	44.2	422,859	100	43.5	0.000	0.000

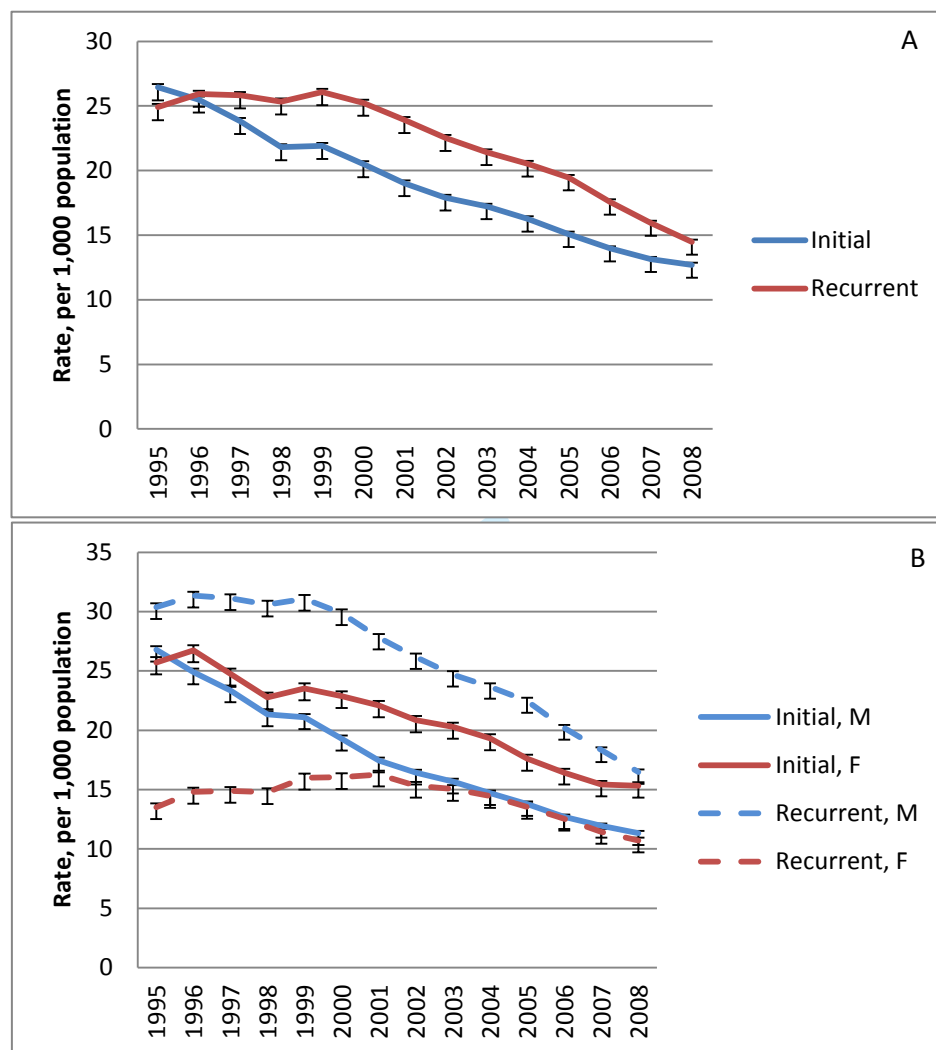
Table 2. Work disability arising from initial and recurrent workers compensation claims in Victoria, 1995 to 2008.

Category	Initial claims			Recurrent claims			Total claims			p	
	N	Row %	Col %	N	Row %	Col %	N	Row %	Col %	Row	Col
<b>Work- loss, years</b>											
<b>All time-loss claims</b>	84,422	44.7	-	104,556	55.3	-	188,978	100	-	0.000	-
<b>Males</b>	45,570	38.7	53.4	72,211	61.3	69.1	117,781	100	62.3	0.000	0.000
<b>Females</b>	38,130	54.8	45.2	31,404	45.2	30.1	69,534	100	36.8	0.000	0.000
<b>Injury</b>	53,713	44.8	63.6	66,026	55.2	63.1	119,739	100	63.4	0.000	0.000
<b>Disease</b>	30,709	44.4	36.4	38,530	55.6	36.9	69,239	100	36.6	0.000	NS
<b>Average (SD) work- loss, days</b>											
<b>All time-loss claims</b>	85.6 (257.1)	-	-	93.4 (276.5)	-	-	89.8 (267.6)	-	-	0.000	
<b>Males</b>	76.2 (241.3)	-	-	86.4 (267.2)	-	-	82.2 (256.7)	-	-	0.000	
<b>Females</b>	102.9 (284.2)	-	-	118.5 (309.6)	-	-	109.4 (295.1)	-	-	0.000	
<b>Injury</b>	71.1 (293.0)	-	-	86.1 (275.9)	-	-	80.7 (261.2)	-	-	0.000	
<b>Disease</b>	113.9 (286.5)	-	-	109.3 (277.1)	-	-	111.3 (281.3)	-	-	0.000	

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Figure 1. Incidence of initial (1A) and recurrent (1B) workplace injury and disease per 1,000 workers in Victoria, 1995 to 2008





**The incidence and impact of recurrent workplace injury and disease. A cohort study of WorkSafe Victoria, Australia compensation claims**

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3 **The incidence and impact of recurrent workplace injury and disease. A cohort**  
4 **study of WorkSafe Victoria, Australia compensation claims**  
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## ABSTRACT

**Objective:** To determine the incidence and impact of recurrent workplace injury and disease over the period 1995 to 2008.

**Design:** Population-based cohort study using data from the state workers' compensation system database.

**Setting:** State of Victoria, Australia.

**Participants:** A total of 448,868 workers with an accepted workers' compensation claim between 1 January 1995 and 31 December 2008 were included into this study. Of them, 135,349 had at least one subsequent claim accepted for a recurrent injury or disease during this period.

**Main outcome measures:** Incidence of initial and recurrent injury and disease claims and time lost from work for initial and recurrent injury and disease.

**Results:** Over the study period 448,868 workers lodged 972,281 claims for discrete occurrences of work-related injury or disease. 53.4% of these claims were for recurrent injury or disease. On average, the rates of initial claims dropped by 5.6%, 95% CI [-5.8, -5.7] per annum, while the rates of recurrent injuries decreased by 4.1%, 95% CI [-4.2, -4.0]. In total, workplace injury and disease resulted in 188,978 years of loss in full time work, with 104,556 of them being for the recurrent injury.

**Conclusions:** Recurrent work-related injury and disease is associated with a substantial social and economic impact. There is an opportunity to reduce the social, health and economic burden of workplace injury by enacting secondary prevention programs targeted at workers who have incurred an initial occupational injury or disease.



## ARTICLE SUMMARY

### Article focus

- To determine the incidence and impact of recurrent workplace injury and disease in Victoria, Australia over the period 1995 to 2008.

### Key messages

- A recurrent workplace injury and disease is frequent and associated with a substantial work disability. We established that over the 14 year study period in the state of Victoria, Australia more than 50 % of claims were filed for a recurrent injury or disease. In addition, we found that the majority (104,556 years) of time lost from work was from the recurrent claims.
- There is an opportunity to reduce the social, health and economic burden of workplace injury by enacting secondary prevention programs targeted at workers who have incurred an initial occupational injury or disease.

### Strengths and limitations of this study

- The principal strength is that this is the first study to summarize the overall impact of work disability and annual trends of subsequent work-related injury and disease, as most of the past studies treated claims as single and discrete events.
- The main weakness of this study is that it is Victoria only specific study, and the database does not cover the entire population, certain injuries maybe underreported and, therefore results published here maybe underrepresented. i.e. workers may not claim for mental health related issues, they possibly have claimed in other institutions in the past or they are self-covered.

## INTRODUCTION

Work is now generally acknowledged as being good for health<sup>1</sup>. There is a growing trend internationally to encourage early return-to-work after injury or illness as a means of facilitating recovery, wellbeing and social inclusion. Conversely, periods of unemployment can lead to poor health or exacerbate existing health issues<sup>1</sup>. Disability arising from workplace injury and illness is also now the subject of substantial public policy and academic interest<sup>2</sup>.

Workers' compensation claims data has been an important source of information to describe the incidence and impact of work-related injury and disease within and across jurisdictions internationally<sup>3-5</sup>. Studies in this area reveal the substantial health and economic costs of workplace injury and illness<sup>6,7</sup>. For example, the total cost of health care of officially recognized injured workers in Mexico in 2005 was \$753,420,222 USD<sup>8</sup>. Similarly, workers' compensation insurance for US workers in 2007 cost \$85 billion USD<sup>9</sup>. Over the past two decades the concept of 'work disability', usually measured as the number of days lost from work, has emerged as a means of estimating the burden of workplace injury and disease<sup>2</sup>.

More recently, we and others have utilised workers' compensation system data to focus on recurrent workplace injury or disease<sup>10-12</sup>. These studies in discrete populations or over discrete time periods have demonstrated that injury and disease recurrences contribute substantially to the overall burden of workplace injury and disease. There are numerous examples of population based estimates of the overall burden of workplace injury and disease, including detailed epidemiological analysis of time series<sup>13-15</sup>. However, these studies do not differentiate between initial and

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2  
3 recurrent episodes of injury or disease. Examining annual trends of the initial and  
4  
5 recurrent occupational injury may provide us a better understanding of the relative  
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7 effectiveness of primary and secondary prevention initiatives<sup>16 17</sup>.  
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10 The current study sought to determine the incidence and impact of a recurrent  
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12 workplace injury and disease in the state of Victoria, Australia over a 14 year period  
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14 using the data from the state workers' compensation system. This study has two  
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16 aims: 1) to describe the annual incidence of initial and recurrent workplace injury and  
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18 disease, and 2) to summarize the disability associated with initial and recurrent  
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20 workplace injury and disease.  
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## 23 24 **METHODS**

### 25 26 **Setting**

27  
28 Victoria is a state of approximately 5.5 million people with an approximate full-  
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30 time working population of 2.4 million (year 2010 data obtained from  
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32 www.abs.gov.au). The Victorian WorkCover Authority (VWA) is the state government  
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34 occupational health and safety and workers' compensation authority. To be eligible  
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36 for workers' compensation benefits, the worker must be able to demonstrate a  
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38 causal link between the injury or disease and their work. Employers are responsible  
39  
40 for income replacement for the first 10 days away from work, beyond which the VWA  
41  
42 provides income replacement benefits. Reasonable healthcare and rehabilitation  
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44 benefits are also provided by the VWA. 85% to 90% of workers in the state have  
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46 their workers' compensation insurance provided by the VWA. Exceptions are federal  
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48 government employees, sole traders and employees of some large self-insured  
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50 employers.  
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### 55 56 **Compensation database**

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3 A de-identified workers' compensation administrative database for the period  
4 from 1986 was obtained from the VWA for the purpose of this study. The database  
5 contains information regarding the claimant, injury or disease, and benefits paid in  
6 relation to the claim. Records include information on the claimant and benefits paid.  
7  
8 The Australian Standard Type of Occurrence Classification System (TOOCS v3)<sup>18</sup>  
9  
10 was used to code the nature/mechanism of affliction. Occupation data were coded  
11 using Australian and New Zealand Standard Classification of Occupation  
12 (ANZSCO)<sup>19</sup>. The Australian New Zealand Standard Industry Classification (ANZSIC  
13 2006) was used to code industry data<sup>20</sup>. A detailed description of the compensation  
14 database can be found elsewhere<sup>11</sup>.  
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## 25 **Data analysis**

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28 All accepted workers' compensation claims occurring between 1 January  
29 1995 and 31 December 2008 were included in this study. Descriptive statistics were  
30 used to provide an overview of initial (first claim of a worker) and recurrent claims by  
31 gender, age, nature of affliction (injury or disease) and type of benefits paid (income  
32 replacement and medical expenses). A recurrent claim in this study was defined as a  
33 second or any subsequent claim of a worker during the study period, and it could  
34 have occurred for the same as initial or a completely different reason. Two outcomes  
35 were considered in this study: the rates of initial and recurrent injury and disease  
36 over the 14 year period; and the number of compensated days away from work  
37 (extracted from the database), which was used as the indicator of 'work disability'<sup>21</sup>.  
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51 The incidence of initial and recurrent claims per annum was calculated as a  
52 rate per 1,000 workers, for males and females. Denominator data was drawn from  
53 the Australian Bureau of Statistics (ABS) labour force survey for the state of Victoria  
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(www.abs.gov.au). A fully adjusted for age and gender Poisson count regression model was used to determine annual changes in rates between initial and recurrent injury and disease. SPSS version 20.0 was used for all analyses.

## RESULTS

### Initial and recurrent workplace injury and disease

Over the study period of 14 years a total of 448,868 workers lodged compensation claims for 972,281 discrete occurrences of work-related injury or disease (Table 1). Recurrent injury and disease accounted for 53.4% of all claims. These were attributable to only 26.2% of all claimants.

Males were more likely to have a recurrent injury or disease than females. A majority of claims were for occupational injuries. The vast majority of claimants were 25-44 years old; however the incidence rates of the initial and recurrent injuries or diseases were highest in the youngest workers, 15-19 years of age.

Occupational diseases were more likely to result in subsequent workers' compensation claims (24.2% vs. 28.2%). The majority of claims were lodged for income replacement and/or medical expenses.

[Insert Table 1 here]

### Incidence of initial and recurrent workplace injury and disease

The rates of initial and recurrent workplace injury and disease per 1,000 working population are displayed in Figure 1. Figure 1A illustrates incidence per annum of initial and recurrent claims per 1,000 working population. The rates of initial injury reduced from 26.4/1,000 in 1995 to 12.7/1,000 in 2008 (or by 6.1% per annum,  $p < 0.0001$ , 95% CIs -6.3 to -5.8). The rates of recurrent injury decreased

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3 from 24.9/1,000 in 1995 to 14.5/1,000 in 2008 (or by 3.5% per annum,  $p < 0.0001$ ,  
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5 95% CIs -3.7 to -3).  
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7  
8 Figure 1B illustrates annual incidence rates per 1,000 working population of  
9  
10 initial and recurrent injury and disease, in males and females separately. The rates  
11  
12 of initial injury and disease in males decreased by 6.7% ( $p < 0.0001$ , 95% CIs -7.4 to -  
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14 5.9) than in females. However, the rates of the recurrent injury and disease in males  
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16 every year increased by 3.0%, ( $p < 0.0001$ , 95% CIs 2.4 to 3.7) when compared to  
17  
18 females. The incidence rates of recurrent injuries and diseases were higher than in  
19  
20 the initial claims by 4.5% ( $p < 0.0001$ , 95% CIs 3.9 to 5.3) in males, and by 7.4%,  
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22 ( $p < 0.0001$ , 95% CIs 5.0 to 9.8) in females.  
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25  
26 [Insert Figure 1 here]  
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## 28 29 **Work disability**

30  
31 Table 2A summarizes work disability associated with the initial and recurrent  
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33 injury and disease. In total, over the study period of 14 years, workplace injury and  
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35 disease resulted in 188,978 years of full-time work loss. More than half (55.3%) of  
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37 this burden was caused by recurrent injury and disease.  
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41 Males incurred 45,570 (38.7%) years of full time work loss due to the initial  
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43 injury, and 72,211 (61.3%) years - due to the recurrent injury and disease. Females  
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45 incurred 38,130 (54.8%) years of full time work loss during their initial claims. This  
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47 amount of time decreased to 31,404 (45.2%) years in recurrent injury and disease.  
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49 Occupational injuries accounted for 53,713 (44.8%) years of work disability in all  
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51 initial claims and 66,026 (55.2%) in recurrent injury. Work disability incurred for a  
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53 recurrent disease, relatively to the initial claims, was similar: 38,530 (55.6%) and  
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55 30,709 (44.4%) years of full time work loss respectively. Workers in the 45-54 years  
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3 of age category incurred the highest amount of work loss– 24,973 years in initial and  
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5 36,493 years in recurrent injuries and diseases.  
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8 The average duration of time lost due to workplace injury and disease (Table  
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10 2B) was 85.6 (257.1) days; however it was higher for recurrent claims (93.4(276.5)  
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12 days). The average duration of time lost varied greatly across the age categories of  
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14 injured workers and it increased with workers' age.  
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17 [Insert Table 2 here]  
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## 20 **DISCUSSION**

### 21 **Principal findings**

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25 This large-scale administrative data study, designed to provide a population-  
26  
27 based overview of workers' compensation claims, showed that a recurrent workplace  
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29 injury and disease is frequent and associated with a substantial work disability. We  
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31 established that over the 14 year study period, 448,868 workers in the state of  
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33 Victoria, Australia, lodged 972,281 compensation claims, 53.4 % of them were filed  
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35 for a recurrent injury or disease (Table 1). The incidence rates were highest in the  
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37 youngest workers, possibly due to the denominator accounting for the full-time  
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39 employees. Younger workers usually choose temporary or part-time employment,  
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41 they are less experienced and are less aware of hazardous working conditions;  
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43 therefore are at a higher risk of occupational injuries<sup>22</sup>. Different patterns for men  
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45 and women for recurrent injuries and diseases (Figure 1B) are associated with the  
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47 lower number of women returning to work after the initial injury, which might occur to  
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49 the mental stress, depressive symptoms and vulnerability at work<sup>23</sup>. In agreement  
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51 with the previously reported findings we observed that rates of work-related injury  
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53 and disease were declining, which is probably associated with legislative changes,  
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3 unemployment rates or seasonal affects, and, most importantly, with better  
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5 strategies and increased effectiveness of injury prevention<sup>14 15 24 25</sup>.  
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9 In both initial and recurrent injuries/diseases the work disability increased with  
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11 claimants' age, which possibly was related to claimants' comorbidities, changes in  
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13 physical and mental capacity or attitudes to return to work<sup>26 27</sup>. In addition, we found  
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15 that the majority (104,556 years) of time lost from work was from the recurrent claims  
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17 (Table 2A). This is equivalent to ~10.4 days for each working person in Victoria.  
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19 Despite that sickness absence as a proportion of working time is decreasing, these  
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21 figures are still substantial and represent a significant cost to the economy<sup>28</sup>.  
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#### 24 **Strengths and weaknesses of the study**

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27 The first strength of this study is the large and exclusive compensation  
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29 research data source, containing detailed and objective information on workers, their  
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31 injuries and diseases. Entries of the dataset are unique and no duplicate information  
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33 is recorded. The second and principal strength is that, to our knowledge, this is the  
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35 first study to summarize the overall impact of work disability and annual trends of  
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37 subsequent work-related injury and disease, as most of the past studies treated  
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39 claims as single and discrete events<sup>14 15 29-31</sup>. Earlier published scientific papers  
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41 focused on the first return-to-work and time lost on temporary disability benefits as  
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43 outcomes of the workplace related injury. These studies concluded that work-related  
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45 injury and illness affects not only injured workers, but also employers, society and  
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47 government<sup>7 29 32-37</sup>. Alternatively, only a few recent studies emphasized the burden  
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49 of subsequent workers' compensation claims; however these studies analysed only  
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51 the initial and second claims, but did not consider any further work-related injuries or  
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53 illnesses<sup>10-12 38</sup>. Lack of understanding of the overall impact of a recurrent workplace  
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3 injury and disease instigates a significant dilemma associated with employment rates  
4 and earnings of injured workers, adverse effects on productivity and costs, including  
5 those associated with compensation<sup>9 33 39</sup>.  
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10 The first weakness of this study is that it is Victoria only specific study, and the  
11 database does not cover the entire population, certain injuries maybe underreported  
12 and, therefore results published here maybe underrepresented. i.e. workers may not  
13 claim for mental health related issues, they possibly have claimed in other  
14 institutions in the past or they are self-covered<sup>40 41</sup>. Secondly, we do not have  
15 information on claimants return to work as these dates are not recorded consistently  
16 by the compensation authority, particularly for periods before the year 2004/5. The  
17 reliability of this data is improving as the VWA gains more experience with collecting  
18 return to work outcomes. It is difficult to estimate the magnitude of these impacts  
19 without undertaking a comprehensive data linkage between jurisdictional workers'  
20 compensation and health datasets<sup>11 42</sup>. Thirdly, administrative data collection errors  
21 might have also occurred, which could have affected the nature and dates of  
22 subsequent injuries or diseases. In addition, legislative changes and organizational  
23 policies might have affected claim rates reported here<sup>43</sup>. It is also important to  
24 acknowledge that the present study does not report trends in claim costs or cost  
25 effectiveness analysis over the years; however it is already known that repeat  
26 workers' compensation claims are associated with increased costs of medical and  
27 like services and weekly compensation paid<sup>11</sup>.  
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## 50 **Conclusions and policy implications**

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53 The most effective strategy for preventing work-related disability is a primary  
54 prevention approach, that is, preventing the initial work related injury and disease<sup>44</sup>.  
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3 Findings of the current study highlight a steady decline in the number of initial work-  
4 related injury and disease (Figure 1), indicating that primary injury prevention  
5 strategies at workplace are becoming more and more efficient over the years<sup>14</sup>. An  
6 accelerating reduction of recurrent injuries and diseases suggests that secondary  
7 prevention initiatives were possibly reviewed and addressed more carefully after  
8 1999. Despite the current return-to-work efforts and decreasing rates of the initial  
9 and recurrent injury and disease, there is probably still more room for improvement.  
10 Current injury prevention policies and procedures need to be regularly revised,  
11 focussing on more efficient secondary prevention<sup>45-47</sup>. A key to a successful  
12 secondary prevention is not only appropriately trained staff, but also clearly identified  
13 risk factors at workplace and a combination of early predictors for poor long-term  
14 outcomes in workers<sup>16 17</sup>. Both the injured worker and their employer are known to  
15 the compensation authorities, and therefore can be targeted by OH&S regulators  
16 and policy makers. It is essential to consider other factors such as precarious  
17 working conditions, worker's age, gender and comorbidities<sup>48-50</sup>. The type of a  
18 recurrent injury and disease is also known to the compensation authorities; therefore  
19 if a subsequent claim was lodged a long after the initial claim, or under completely  
20 different circumstances, alternative prevention measures should be considered.

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Secondary prevention examples may include activities that promote lifestyle changes and aim at improving the overall health of injured workers, restructuring the current workplace where the injury occurs, providing suitably modified work for injured workers, recommending them regular exams and screening tests or surveillance systems<sup>51</sup>. Return-to-work coordinators, clinicians and care management support also play an important role in workers' return-to-work and re-injury prevention. Their efforts may need to be revisited with incentives provided so

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3 reduced costs for workers' compensation healthcare and increased safety practises  
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5 are implemented<sup>39</sup>. Education of workers to be more aware of hazards associated  
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7 with their job may be an important step forward. Introducing work wellness and  
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9 rehabilitation programs, providing counselling and job training for returning-to-work  
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11 staff members may also assist in a further reduction of re-injury<sup>2 39 51 52</sup>.  
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15  
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17  
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19

20  
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22  
23 Both authors read and approved the final manuscript.  
24

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27  
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29

30  
31 **Competing interests** None.  
32

33  
34 **Ethics approval** Monash University Human Research Ethics Committee,  
35  
36 Melbourne, Australia.

37  
38 **Provenance and peer review** Not commissioned; externally peer reviewed.  
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41 **Data Sharing** Workers compensation data used in this study are collected by the WorkSafe  
42  
43 Victoria and held by the ISCRR who regularly respond to data requests from the public.  
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Table 1. Profile of initial and recurrent workers' compensation claims by category in Victoria, 1995 to 2008.

Category	Initial claims				Recurrent claims				Total claims				p	
	N	Rate, 95%CI	Row %	Col %	N	Rate, 95%CI	Row %	Col %	N	Rate, 95%CI	Row %	Col %	Row	Col
Total claims	448,868	19.1 [15.2-20.1]	46.2	-	523,413	22.3 [21.2-23.4]	53.4	-	972,281	41.5 [39.4-43.5]	100	-	0.000	-
Total claimants	448,868	19.1 [15.2-20.1]	76.8	-	135,349	5.8 [5.5-6.1]	26.2	-	584,217	24.9 [23.7-26.2]	100	-	0.000	-
Claims per claimant	1	-	-	-	3.86	-	-	-	1.66	-	-	-	-	-
Gender*														
Males	274,915	17.7 [16.8-18.5]	75.1	61.2	91,072	5.9 [5.6-6.1]	24.9	67.3	365,987	23.5 [22.3-24.7]	100	62.6	0.000	0.000
Females	163,059	20.7 [19.6-21.7]	79.8	36.3	41,111	5.2 [5.0-5.5]	20.2	30.4	204,170	25.9 [24.6-27.2]	100	34.9	0.000	0.000
Missing	10,894	0.46 [0.44-0.49]	77.5	2.4	3,166	0.13 [0.13-0.14]	22.5	2.3	14,060	0.59 [0.57-0.63]	100	2.5	0.003	NS
Age category*														
15-19	33,393	54.3 [51.6-57.0]	76.0	7.4	10,571	17.2 [16.3-18.0]	24.0	7.8	43,964	71.5 [67.9-75.1]	100	7.5	0.000	NS
20-24	68,421	27.6 [26.2-29.0]	76.6	15.2	20,858	8.4 [8.0-8.8]	23.4	15.4	89,279	36.0 [34.2-37.8]	100	15.3	0.000	NS
25-34	117,817	18.2 [17.3-19.1]	76.5	26.2	36,132	5.6 [5.3-5.9]	23.5	26.7	153,949	23.8 [22.6-25.0]	100	26.4	0.000	NS
35-44	103,799	17.2 [16.4-18.1]	75.3	23.1	33,963	5.6 [5.4-5.9]	24.7	25.1	137,762	22.9 [21.7-24.0]	100	23.6	0.000	0.000
45-54	87,619	16.5 [15.7-17.3]	77.1	19.5	26,057	4.9 [4.7-5.2]	22.9	19.3	113,676	21.4 [20.3-22.5]	100	19.5	0.000	NS
55-59	24,086	15.4 [14.6-16.2]	81.0	5.4	5,667	3.6 [3.4-3.8]	19.0	4.2	29,753	19.0 [18.1-20.0]	100	5.1	0.000	0.000
60-64	10,828	14.8 [14.1-15.6]	85.6	2.4	1,817	2.5 [2.4-2.6]	14.4	1.3	12,645	17.3 [16.5-18.2]	100	2.2	0.000	0.003
65+	2,905	10.4 [9.9-11.0]	91.1	0.6	284	1.0 [1.0-1.1]	8.9	0.2	3,189	11.5 [10.9-12.0]	100	0.5	0.000	NS



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Nature of affliction															
Injury	340,203	14.5	47.4	75.8	376,033	16.0	52.6	71.8	716,236	30.5	100	73.6	0.000	0.000	
		[13.8-15.2]				[15.2-16.8]				[29.0-32.1]					
Disease	108,665	4.6	42.4	24.2	147,380	6.3	57.6	28.2	256,045	10.9	100	26.4	0.000	0.000	
		[4.4-4.9]				[6.0-6.6]				[10.4-11.5]					
Compensation benefits paid															
Income replacement +/- medical expenses^	257,082	11.0	46.8	57.3	292,340	12.5	53.2	55.8	549,422	23.4	100	56.5	0.000	0.000	
		[10.4-11.5]				[11.8-13.1]				[22.3-24.6]					
Medical expenses only	191,786	8.2	45.4	42.7	231,073	9.9	54.6	44.2	422,859	18.0	100	43.5	0.000	0.000	
		[7.8-8.6]				[9.4-10.3]				[17.1-18.9]					

\* The rates are presented for claimants, not claims

^ "Income replacement +/- medical expenses" group represents these claimants, who had time off work and/or required compensation for medical expenses

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Table 2A. A total work disability arising from initial and recurrent workers compensation claims in Victoria, 1995 to 2008.

Category	Initial claims			Recurrent claims			Total claims			p	
	N	Row %	Col %	N	Row %	Col %	N	Row %	Col %	Row	Col
Work- loss, years											
All time-loss claims	84,422	44.7	-	104,556	55.3	-	188,978	100	-	0.000	-
Males	45,570	38.7	53.4	72,211	61.3	69.1	117,781	100	62.3	0.000	0.000
Females	38,130	54.8	45.2	31,404	45.2	30.1	69,534	100	36.8	0.000	0.000
Injury	53,713	44.8	63.6	66,026	55.2	63.1	119,739	100	63.4	0.000	0.000
Disease	30,709	44.4	36.4	38,530	55.6	36.9	69,239	100	36.6	0.000	NS
Age category											
15-19	2,170	84.6	2.6	396	15.4	0.4	2,566	100	1.4	0.000	0.007
20-24	6,050	66.8	7.2	3,010	33.2	2.9	9,060	100	4.8	0.000	0.000
25-34	17,350	50.5	20.6	16,980	49.5	16.2	34,330	100	18.2	NS	0.000
35-44	23,606	44.0	28.0	30,012	56.0	28.7	53,618	100	28.4	0.000	NS
45-54	24,943	40.6	29.5	36,493	59.4	34.9	61,436	100	32.5	0.000	0.000
55-59	7,426	37.0	8.8	12,650	63.0	12.1	20,076	100	10.6	0.000	0.000
60-64	2,468	35.8	2.9	4,418	64.2	4.2	6,886	100	3.6	0.000	0.006

65+	408	40.6	2.6	597	59.4	0.6	1,005	100	0.5	0.000	0.008
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Table 2B. An average and median work disability arising from initial and recurrent workers compensation claims in Victoria, 1995 to 2008.

Category	Initial claims		Recurrent claims		Total claims		p
	Mean (SD), days	Median (IQR), days	Mean (SD), days	Median (IQR), days	Mean (SD), days	Median (IQR), days	Row
All time-loss claims	85.6 (257.1)	10 (10-38)	93.4 (276.5)	10 (10-39)	89.8 (267.6)	10 (10-39)	0.000
Males	76.2 (241.3)	10 (10-34)	86.4 (267.2)	10 (10-34)	82.2 (256.7)	10 (10-34)	0.000
Females	102.9 (284.2)	10 (10-50)	118.5 (309.6)	10 (10-65)	109.4 (295.1)	10 (10-56)	0.000
Injury	75.1 (244.0)	10 (10-30)	86.1 (275.9)	10 (10-30)	80.7 (261.2)	10 (10-30)	0.000
Disease	113.9 (286.5)	14 9 (10-71)	109.3 (277.1)	11 (10-65)	111.3 (281.3)	13 (10-67)	0.000
Age category							
15-19	29.5 (91.6)	10 (10-16)	26.7 (91.6)	10 (10-10)	29.0 (91.6)	10 (10-15)	NS
20-24	40.1 (123.7)	10 (10-21)	40.3 (135.7)	10 (10-15)	40.2 (127.8)	10 (10-20)	NS
25-34	68.5 (207.6)	10 (10-31)	65.5 (205.9)	10 (10-26)	66.9 (206.7)	10 (10-29)	NS
35-44	102.7 (286.6)	10 (10-48)	92.6 (275.6)	10 (10-39)	96.8 (280.3)	10 (10-42)	0.000
45-54	127.2 (349.8)	11 (10-63)	120.7 (340.6)	10 (10-55)	123.2 (344.3)	10 (10-58)	0.034
55-59	139.3 (336.9)	15 (10-70)	136.1 (337.2)	12 (10-67)	137.5 (337.1)	13 (10-68)	NS

60-64	106.9 (213.5)	16 (10-72)	101.6 (204.7)	15 (10-72)	103.5 (207.8)	16 (10-72)	NS
65+	80.6 (122.5)	25 (10-85.75)	76.8 (127.4)	20 (10-70)	78.3 (125.5)	22 (10-77)	NS

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3 **The incidence and impact of recurrent workplace injury and disease. A cohort**  
4 **study of WorkSafe Victoria, Australia compensation claims**  
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## ABSTRACT

**Objective:** To determine the incidence and impact of recurrent workplace injury and disease over the period 1995 to 2008.

**Design:** Population-based cohort study using data from the state workers' compensation system database.

**Setting:** State of Victoria, Australia.

**Participants:** A total of 448,868 workers with an accepted workers' compensation claim between 1 January 1995 and 31 December 2008 were included into this study. Of them, 135,349 had at least one subsequent claim accepted for a recurrent injury or disease during this period.

**Main outcome measures:** Incidence of initial and recurrent injury and disease claims and time lost from work for initial and recurrent injury and disease.

**Results:** Over the study period 448,868 workers lodged 972,281 claims for discrete occurrences of work-related injury or disease. 53.4% of these claims were for recurrent injury or disease. On average, the rates of initial claims dropped by 5.6%, 95% CI [-5.8, -5.7] per annum, while the rates of recurrent injuries decreased by 4.1%, 95% CI [-4.2, -4.0]. In total, workplace injury and disease resulted in 188,978 years of loss in full time work, with 104,556 of them being for the recurrent injury.

**Conclusions:** Recurrent work-related injury and disease is associated with a substantial social and economic impact. There is an opportunity to reduce the social, health and economic burden of workplace injury by enacting secondary prevention programs targeted at workers who have incurred an initial occupational injury or disease.

## ARTICLE SUMMARY

### Article focus

- To determine the incidence and impact of recurrent workplace injury and disease in Victoria, Australia over the period 1995 to 2008.

### Key messages

- A recurrent workplace injury and disease is frequent and associated with a substantial work disability. We established that over the 14 year study period in the state of Victoria, Australia more than 50 % of claims were filed for a recurrent injury or disease. In addition, we found that the majority (104,556 years) of time lost from work was from the recurrent claims.
- There is an opportunity to reduce the social, health and economic burden of workplace injury by enacting secondary prevention programs targeted at workers who have incurred an initial occupational injury or disease.

### Strengths and limitations of this study

- The principal strength is that this is the first study to summarize the overall impact of work disability and annual trends of subsequent work-related injury and disease, as most of the past studies treated claims as single and discrete events.
- The main weakness of this study is that it is Victoria only specific study, and the database does not cover the entire population, certain injuries maybe underreported and, therefore results published here maybe underrepresented. i.e. workers may not claim for mental health related issues, they possibly have claimed in other institutions in the past or they are self-covered.

## INTRODUCTION

Work is now generally acknowledged as being good for health<sup>1</sup>. There is a growing trend internationally to encourage early return-to-work after injury or illness as a means of facilitating recovery, wellbeing and social inclusion. Conversely, periods of unemployment can lead to poor health or exacerbate existing health issues<sup>1</sup>. Disability arising from workplace injury and illness is also now the subject of substantial public policy and academic interest<sup>2</sup>.

Workers' compensation claims data has been an important source of information to describe the incidence and impact of work-related injury and disease within and across jurisdictions internationally<sup>3-5</sup>. Studies in this area reveal the substantial health and economic costs of workplace injury and illness<sup>6,7</sup>. For example, the total cost of health care of officially recognized injured workers in Mexico in 2005 was \$753,420,222 USD<sup>8</sup>. Similarly, workers' compensation insurance for US workers in 2007 cost \$85 billion USD<sup>9</sup>. Over the past two decades the concept of 'work disability', usually measured as the number of days lost from work, has emerged as a means of estimating the burden of workplace injury and disease<sup>2</sup>.

More recently, we and others have utilised workers' compensation system data to focus on recurrent workplace injury or disease<sup>10-12</sup>. These studies in discrete populations or over discrete time periods have demonstrated that injury and disease recurrences contribute substantially to the overall burden of workplace injury and disease. There are numerous examples of population based estimates of the overall burden of workplace injury and disease, including detailed epidemiological analysis of time series<sup>13-15</sup>. However, these studies do not differentiate between initial and



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3 recurrent episodes of injury or disease. Examining annual trends of the initial and  
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5 recurrent occupational injury may provide us a better understanding of the relative  
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7 effectiveness of primary and secondary prevention initiatives<sup>16 17</sup>.  
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10 The current study sought to determine the incidence and impact of a recurrent  
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12 workplace injury and disease in the state of Victoria, Australia over a 14 year period  
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14 using the data from the state workers' compensation system. This study has two  
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16 aims: 1) to describe the annual incidence of initial and recurrent workplace injury and  
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18 disease, and 2) to summarize the disability associated with initial and recurrent  
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20 workplace injury and disease.  
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## 23 **METHODS**

### 24 **Setting**

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29 Victoria is a state of approximately 5.5 million people with an approximate full-  
30  
31 time working population of 2.4 million (year 2010 data obtained from  
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33 www.abs.gov.au). The Victorian WorkCover Authority (VWA) is the state government  
34  
35 occupational health and safety and workers' compensation authority. To be eligible  
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37 for workers' compensation benefits, the worker must be able to demonstrate a  
38  
39 causal link between the injury or disease and their work. Employers are responsible  
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41 for income replacement for the first 10 days away from work, beyond which the VWA  
42  
43 provides income replacement benefits. Reasonable healthcare and rehabilitation  
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45 benefits are also provided by the VWA. 85% to 90% of workers in the state have  
46  
47 their workers' compensation insurance provided by the VWA. Exceptions are federal  
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49 government employees, sole traders and employees of some large self-insured  
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51 employers.  
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### 55 **Compensation database**

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3 A de-identified workers' compensation administrative database for the period  
4 from 1986 was obtained from the VWA for the purpose of this study. The database  
5 contains information regarding the claimant, injury or disease, and benefits paid in  
6 relation to the claim. Records include information on the claimant and benefits paid.  
7  
8 The Australian Standard Type of Occurrence Classification System (TOOCS v3)<sup>18</sup>  
9 was used to code the nature/mechanism of affliction. Occupation data were coded  
10 using Australian and New Zealand Standard Classification of Occupation  
11 (ANZSCO)<sup>19</sup>. The Australian New Zealand Standard Industry Classification (ANZSIC  
12 2006) was used to code industry data<sup>20</sup>. A detailed description of the compensation  
13 database can be found elsewhere<sup>11</sup>.

## 24 25 26 Data analysis

27  
28 All accepted workers' compensation claims occurring between 1 January  
29 1995 and 31 December 2008 were included in this study. Descriptive statistics were  
30 used to provide an overview of initial (first claim of a worker) and recurrent claims by  
31 gender, age, nature of affliction (injury or disease) and type of benefits paid (income  
32 replacement and medical expenses). A recurrent claim in this study was defined as a  
33 second or any subsequent claim of a worker during the study period, and it could  
34 have occurred for the same as initial or a completely different reason. Two outcomes  
35 were considered in this study: the rates of initial and recurrent injury and disease  
36 over the 14 year period; and the number of compensated days away from work  
37 (extracted from the database), which was used as the indicator of 'work disability'<sup>21</sup>.

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51 The incidence of initial and recurrent claims per annum was calculated as a  
52 rate per 1,000 workers, for males and females. Denominator data was drawn from  
53 the Australian Bureau of Statistics (ABS) labour force survey for the state of Victoria  
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(www.abs.gov.au). A fully adjusted for age and gender Poisson count regression model was used to determine annual changes in rates between initial and recurrent injury and disease. SPSS version 20.0 was used for all analyses.

## RESULTS

### Initial and recurrent workplace injury and disease

Over the study period of 14 years a total of 448,868 workers lodged compensation claims for 972,281 discrete occurrences of work-related injury or disease (Table 1). Recurrent injury and disease accounted for 53.4% of all claims. These were attributable to only 26.2% of all claimants.

Males were more likely to have a recurrent injury or disease than females. A majority of claims were for occupational injuries. The vast majority of claimants were 25-44 years old; however the incidence rates of the initial and recurrent injuries or diseases were highest in the youngest workers, 15-19 years of age.

Occupational diseases were more likely to result in subsequent workers' compensation claims (24.2% vs. 28.2%). The majority of claims were lodged for income replacement and/or medical expenses.

[Insert Table 1 here]

### Incidence of initial and recurrent workplace injury and disease

The rates of initial and recurrent workplace injury and disease per 1,000 working population are displayed in Figure 1. Figure 1A illustrates incidence per annum of initial and recurrent claims per 1,000 working population. The rates of initial injury reduced from 26.4/1,000 in 1995 to 12.7/1,000 in 2008 (or by 6.1% per annum,  $p < 0.0001$ , 95% CIs -6.3 to -5.8). The rates of recurrent injury decreased

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3 from 24.9/1,000 in 1995 to 14.5/1,000 in 2008 (or by 3.5% per annum,  $p < 0.0001$ ,  
4  
5 95% CIs -3.7 to -3).  
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7

8 Figure 1B illustrates annual incidence rates per 1,000 working population of  
9  
10 initial and recurrent injury and disease, in males and females separately. The rates  
11  
12 of initial injury and disease in males decreased by 6.7% ( $p < 0.0001$ , 95% CIs -7.4 to -  
13  
14 5.9) than in females. However, the rates of the recurrent injury and disease in males  
15  
16 every year increased by 3.0%, ( $p < 0.0001$ , 95% CIs 2.4 to 3.7) when compared to  
17  
18 females. The incidence rates of recurrent injuries and diseases were higher than in  
19  
20 the initial claims by 4.5% ( $p < 0.0001$ , 95% CIs 3.9 to 5.3) in males, and by 7.4%,  
21  
22 ( $p < 0.0001$ , 95% CIs 5.0 to 9.8) in females.  
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26 [Insert Figure 1 here]  
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### 29 **Work disability**

30  
31 Table 2A summarizes work disability associated with the initial and recurrent  
32  
33 injury and disease. In total, over the study period of 14 years, workplace injury and  
34  
35 disease resulted in 188,978 years of full-time work loss. More than half (55.3%) of  
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37 this burden was caused by recurrent injury and disease.  
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41 Males incurred 45,570 (38.7%) years of full time work loss due to the initial  
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43 injury, and 72,211 (61.3%) years - due to the recurrent injury and disease. Females  
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45 incurred 38,130 (54.8%) years of full time work loss during their initial claims. This  
46  
47 amount of time decreased to 31,404 (45.2%) years in recurrent injury and disease.  
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49 Occupational injuries accounted for 53,713 (44.8%) years of work disability in all  
50  
51 initial claims and 66,026 (55.2%) in recurrent injury. Work disability incurred for a  
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53 recurrent disease, relatively to the initial claims, was similar: 38,530 (55.6%) and  
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55 30,709 (44.4%) years of full time work loss respectively. **Workers in the 45-54 years**  
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3 of age category incurred the highest amount of work loss– 24,973 years in initial and  
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5 36,493 years in recurrent injuries and diseases.  
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8 The average duration of time lost due to workplace injury and disease (Table  
9  
10 2B) was 85.6 (257.1) days; however it was higher for recurrent claims (93.4(276.5)  
11  
12 days). The average duration of time lost varied greatly across the age categories of  
13  
14 injured workers and it increased with workers' age.  
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17 [Insert Table 2 here]  
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## 20 DISCUSSION

### 21 Principal findings

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25 This large-scale administrative data study, designed to provide a population-  
26  
27 based overview of workers' compensation claims, showed that a recurrent workplace  
28  
29 injury and disease is frequent and associated with a substantial work disability. We  
30  
31 established that over the 14 year study period, 448,868 workers in the state of  
32  
33 Victoria, Australia, lodged 972,281 compensation claims, 53.4 % of them were filed  
34  
35 for a recurrent injury or disease (Table 1). The incidence rates were highest in the  
36  
37 youngest workers, possibly due to the denominator accounting for the full-time  
38  
39 employees. Younger workers usually choose temporary or part-time employment,  
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41 they are less experienced and are less aware of hazardous working conditions;  
42  
43 therefore are at a higher risk of occupational injuries<sup>22</sup>. Different patterns for men  
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45 and women for recurrent injuries and diseases (Figure 1B) are associated with the  
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47 lower number of women returning to work after the initial injury, which might occur to  
48  
49 the mental stress, depressive symptoms and vulnerability at work<sup>23</sup>. In agreement  
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51 with the previously reported findings we observed that rates of work-related injury  
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53 and disease were declining, which is probably associated with legislative changes,  
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3 unemployment rates or seasonal affects, and, most importantly, with better  
4 strategies and increased effectiveness of injury prevention<sup>14 15 24 25</sup>.

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8 **In both initial and recurrent injuries/diseases the work disability increased with**  
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10 **claimants' age, which possibly was related to claimants' comorbidities, changes in**  
11 **physical and mental capacity or attitudes to return to work<sup>26 27</sup>.** In addition, we found  
12 that the majority (104,556 years) of time lost from work was from the recurrent claims  
13 (Table 2A). This is equivalent to ~10.4 days for each working person in Victoria.  
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15 Despite that sickness absence as a proportion of working time is decreasing, these  
16 figures are still substantial and represent a significant cost to the economy<sup>28</sup>.

### 23 24 **Strengths and weaknesses of the study**

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27 The first strength of this study is the large and exclusive compensation  
28 research data source, containing detailed and objective information on workers, their  
29 injuries and diseases. Entries of the dataset are unique and no duplicate information  
30 is recorded. The second and principal strength is that, to our knowledge, this is the  
31 first study to summarize the overall impact of work disability and annual trends of  
32 subsequent work-related injury and disease, as most of the past studies treated  
33 claims as single and discrete events<sup>14 15 29-31</sup>. Earlier published scientific papers  
34 focused on the first return-to-work and time lost on temporary disability benefits as  
35 outcomes of the workplace related injury. These studies concluded that work-related  
36 injury and illness affects not only injured workers, but also employers, society and  
37 government<sup>7 29 32-37</sup>. Alternatively, only a few recent studies emphasized the burden  
38 of subsequent workers' compensation claims; however these studies analysed only  
39 the initial and second claims, but did not consider any further work-related injuries or  
40 illnesses<sup>10-12 38</sup>. Lack of understanding of the overall impact of a recurrent workplace  
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3 injury and disease instigates a significant dilemma associated with employment rates  
4 and earnings of injured workers, adverse effects on productivity and costs, including  
5 those associated with compensation<sup>9 33 39</sup>.  
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10 The first weakness of this study is that it is Victoria only specific study, and the  
11 database does not cover the entire population, certain injuries maybe underreported  
12 and, therefore results published here maybe underrepresented. i.e. workers may not  
13 claim for mental health related issues, they possibly have claimed in other  
14 institutions in the past or they are self-covered<sup>40 41</sup>. Secondly, we do not have  
15 information on claimants return to work as these dates are not recorded consistently  
16 by the compensation authority, particularly for periods before the year 2004/5. The  
17 reliability of this data is improving as the VWA gains more experience with collecting  
18 return to work outcomes. It is difficult to estimate the magnitude of these impacts  
19 without undertaking a comprehensive data linkage between jurisdictional workers'  
20 compensation and health datasets<sup>11 42</sup>. Thirdly, administrative data collection errors  
21 might have also occurred, which could have affected the nature and dates of  
22 subsequent injuries or diseases. In addition, legislative changes and organizational  
23 policies might have affected claim rates reported here<sup>43</sup>. It is also important to  
24 acknowledge that the present study does not report trends in claim costs or cost  
25 effectiveness analysis over the years; however it is already known that repeat  
26 workers' compensation claims are associated with increased costs of medical and  
27 like services and weekly compensation paid<sup>11</sup>.  
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## 50 **Conclusions and policy implications**

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53 The most effective strategy for preventing work-related disability is a primary  
54 prevention approach, that is, preventing the initial work related injury and disease<sup>44</sup>.  
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3 Findings of the current study highlight a steady decline in the number of initial work-  
4 related injury and disease (Figure 1), indicating that primary injury prevention  
5 strategies at workplace are becoming more and more efficient over the years<sup>14</sup>. An  
6 accelerating reduction of recurrent injuries and diseases suggests that secondary  
7 prevention initiatives were possibly reviewed and addressed more carefully after  
8 1999. Despite the current return-to-work efforts and decreasing rates of the initial  
9 and recurrent injury and disease, there is probably still more room for improvement.  
10 Current injury prevention policies and procedures need to be regularly revised,  
11 focussing on more efficient secondary prevention<sup>45-47</sup>. A key to a successful  
12 secondary prevention is not only appropriately trained staff, but also clearly identified  
13 risk factors at workplace and a combination of early predictors for poor long-term  
14 outcomes in workers<sup>16 17</sup>. Both the injured worker and their employer are known to  
15 the compensation authorities, and therefore can be targeted by OH&S regulators  
16 and policy makers. It is essential to consider other factors such as precarious  
17 working conditions, worker's age, gender and comorbidities<sup>48-50</sup>. The type of a  
18 recurrent injury and disease is also known to the compensation authorities; therefore  
19 if a subsequent claim was lodged a long after the initial claim, or under completely  
20 different circumstances, alternative prevention measures should be considered.

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Secondary prevention examples may include activities that promote lifestyle changes and aim at improving the overall health of injured workers, restructuring the current workplace where the injury occurs, providing suitably modified work for injured workers, recommending them regular exams and screening tests or surveillance systems<sup>5 51</sup>. Return-to-work coordinators, clinicians and care management support also play an important role in workers' return-to-work and re-injury prevention. Their efforts may need to be revisited with incentives provided so



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3 reduced costs for workers' compensation healthcare and increased safety practises  
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5 are implemented<sup>39</sup>. Education of workers to be more aware of hazards associated  
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7 with their job may be an important step forward. Introducing work wellness and  
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9 rehabilitation programs, providing counselling and job training for returning-to-work  
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11 staff members may also assist in a further reduction of re-injury<sup>2 39 51 52</sup>.  
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15  
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17  
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20  
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22  
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24

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27  
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29

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35  
36 Melbourne, Australia.

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Table 1. Profile of initial and recurrent workers' compensation claims by category in Victoria, 1995 to 2008.

Category	Initial claims				Recurrent claims				Total claims				p	
	N	Rate, 95%CI	Row %	Col %	N	Rate, 95%CI	Row %	Col %	N	Rate, 95%CI	Row %	Col %	Row	Col
Total claims	448,868	19.1 [15.2-20.1]	46.2	-	523,413	22.3 [21.2-23.4]	53.4	-	972,281	41.5 [39.4-43.5]	100	-	0.000	-
Total claimants	448,868	19.1 [15.2-20.1]	76.8	-	135,349	5.8 [5.5-6.1]	26.2	-	584,217	24.9 [23.7-26.2]	100	-	0.000	-
Claims per claimant	1	-	-	-	3.86	-	-	-	1.66	-	-	-	-	-
Gender*														
Males	274,915	17.7 [16.8-18.5]	75.1	61.2	91,072	5.9 [5.6-6.1]	24.9	67.3	365,987	23.5 [22.3-24.7]	100	62.6	0.000	0.000
Females	163,059	20.7 [19.6-21.7]	79.8	36.3	41,111	5.2 [5.0-5.5]	20.2	30.4	204,170	25.9 [24.6-27.2]	100	34.9	0.000	0.000
Missing	10,894	0.46 [0.44-0.49]	77.5	2.4	3,166	0.13 [0.13-0.14]	22.5	2.3	14,060	0.59 [0.57-0.63]	100	2.5	0.003	NS
Age category*														
15-19	33,393	54.3 [51.6-57.0]	76.0	7.4	10,571	17.2 [16.3-18.0]	24.0	7.8	43,964	71.5 [67.9-75.1]	100	7.5	0.000	NS
20-24	68,421	27.6 [26.2-29.0]	76.6	15.2	20,858	8.4 [8.0-8.8]	23.4	15.4	89,279	36.0 [34.2-37.8]	100	15.3	0.000	NS
25-34	117,817	18.2 [17.3-19.1]	76.5	26.2	36,132	5.6 [5.3-5.9]	23.5	26.7	153,949	23.8 [22.6-25.0]	100	26.4	0.000	NS
35-44	103,799	17.2 [16.4-18.1]	75.3	23.1	33,963	5.6 [5.4-5.9]	24.7	25.1	137,762	22.9 [21.7-24.0]	100	23.6	0.000	0.000
45-54	87,619	16.5 [15.7-17.3]	77.1	19.5	26,057	4.9 [4.7-5.2]	22.9	19.3	113,676	21.4 [20.3-22.5]	100	19.5	0.000	NS
55-59	24,086	15.4 [14.6-16.2]	81.0	5.4	5,667	3.6 [3.4-3.8]	19.0	4.2	29,753	19.0 [18.1-20.0]	100	5.1	0.000	0.000
60-64	10,828	14.8 [14.1-15.6]	85.6	2.4	1,817	2.5 [2.4-2.6]	14.4	1.3	12,645	17.3 [16.5-18.2]	100	2.2	0.000	0.003
65+	2,905	10.4 [9.9-11.0]	91.1	0.6	284	1.0 [1.0-1.1]	8.9	0.2	3,189	11.5 [10.9-12.0]	100	0.5	0.000	NS

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Nature of affliction															
Injury	340,203	14.5	47.4	75.8	376,033	16.0	52.6	71.8	716,236	30.5	100	73.6	0.000	0.000	
		[13.8-15.2]				[15.2-16.8]				[29.0-32.1]					
Disease	108,665	4.6	42.4	24.2	147,380	6.3	57.6	28.2	256,045	10.9	100	26.4	0.000	0.000	
		[4.4-4.9]				[6.0-6.6]				[10.4-11.5]					
Compensation benefits paid															
Income replacement +/- medical expenses^	257,082	11.0	46.8	57.3	292,340	12.5	53.2	55.8	549,422	23.4	100	56.5	0.000	0.000	
		[10.4-11.5]				[11.8-13.1]				[22.3-24.6]					
Medical expenses only	191,786	8.2	45.4	42.7	231,073	9.9	54.6	44.2	422,859	18.0	100	43.5	0.000	0.000	
		[7.8-8.6]				[9.4-10.3]				[17.1-18.9]					

\* The rates are presented for claimants, not claims

^ "Income replacement +/- medical expenses" group represents these claimants, who had time off work and/or required compensation for medical expenses

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Table 2A. A total work disability arising from initial and recurrent workers compensation claims in Victoria, 1995 to 2008.

Category	Initial claims			Recurrent claims			Total claims			p	
	N	Row %	Col %	N	Row %	Col %	N	Row %	Col %	Row	Col
<b>Work- loss, years</b>											
All time-loss claims	84,422	44.7	-	104,556	55.3	-	188,978	100	-	0.000	-
Males	45,570	38.7	53.4	72,211	61.3	69.1	117,781	100	62.3	0.000	0.000
Females	38,130	54.8	45.2	31,404	45.2	30.1	69,534	100	36.8	0.000	0.000
Injury	53,713	44.8	63.6	66,026	55.2	63.1	119,739	100	63.4	0.000	0.000
Disease	30,709	44.4	36.4	38,530	55.6	36.9	69,239	100	36.6	0.000	NS
<b>Age category</b>											
15-19	2,170	84.6	2.6	396	15.4	0.4	2,566	100	1.4	0.000	0.007
20-24	6,050	66.8	7.2	3,010	33.2	2.9	9,060	100	4.8	0.000	0.000
25-34	17,350	50.5	20.6	16,980	49.5	16.2	34,330	100	18.2	NS	0.000
35-44	23,606	44.0	28.0	30,012	56.0	28.7	53,618	100	28.4	0.000	NS
45-54	24,943	40.6	29.5	36,493	59.4	34.9	61,436	100	32.5	0.000	0.000
55-59	7,426	37.0	8.8	12,650	63.0	12.1	20,076	100	10.6	0.000	0.000
60-64	2,468	35.8	2.9	4,418	64.2	4.2	6,886	100	3.6	0.000	0.006



65+	408	40.6	2.6	597	59.4	0.6	1,005	100	0.5	0.000	0.008
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Table 2B. An average and median work disability arising from initial and recurrent workers compensation claims in Victoria, 1995 to 2008.

Category	Initial claims		Recurrent claims		Total claims		p
	Mean (SD), days	Median (IQR), days	Mean (SD), days	Median (IQR), days	Mean (SD), days	Median (IQR), days	Row
All time-loss claims	85.6 (257.1)	10 (10-38)	93.4 (276.5)	10 (10-39)	89.8 (267.6)	10 (10-39)	0.000
Males	76.2 (241.3)	10 (10-34)	86.4 (267.2)	10 (10-34)	82.2 (256.7)	10 (10-34)	0.000
Females	102.9 (284.2)	10 (10-50)	118.5 (309.6)	10 (10-65)	109.4 (295.1)	10 (10-56)	0.000
Injury	75.1 (244.0)	10 (10-30)	86.1 (275.9)	10 (10-30)	80.7 (261.2)	10 (10-30)	0.000
Disease	113.9 (286.5)	14 9 (10-71)	109.3 (277.1)	11 (10-65)	111.3 (281.3)	13 (10-67)	0.000
Age category							
15-19	29.5 (91.6)	10 (10-16)	26.7 (91.6)	10 (10-10)	29.0 (91.6)	10 (10-15)	NS
20-24	40.1 (123.7)	10 (10-21)	40.3 (135.7)	10 (10-15)	40.2 (127.8)	10 (10-20)	NS
25-34	68.5 (207.6)	10 (10-31)	65.5 (205.9)	10 (10-26)	66.9 (206.7)	10 (10-29)	NS
35-44	102.7 (286.6)	10 (10-48)	92.6 (275.6)	10 (10-39)	96.8 (280.3)	10 (10-42)	0.000
45-54	127.2 (349.8)	11 (10-63)	120.7 (340.6)	10 (10-55)	123.2 (344.3)	10 (10-58)	0.034
55-59	139.3 (336.9)	15 (10-70)	136.1 (337.2)	12 (10-67)	137.5 (337.1)	13 (10-68)	NS

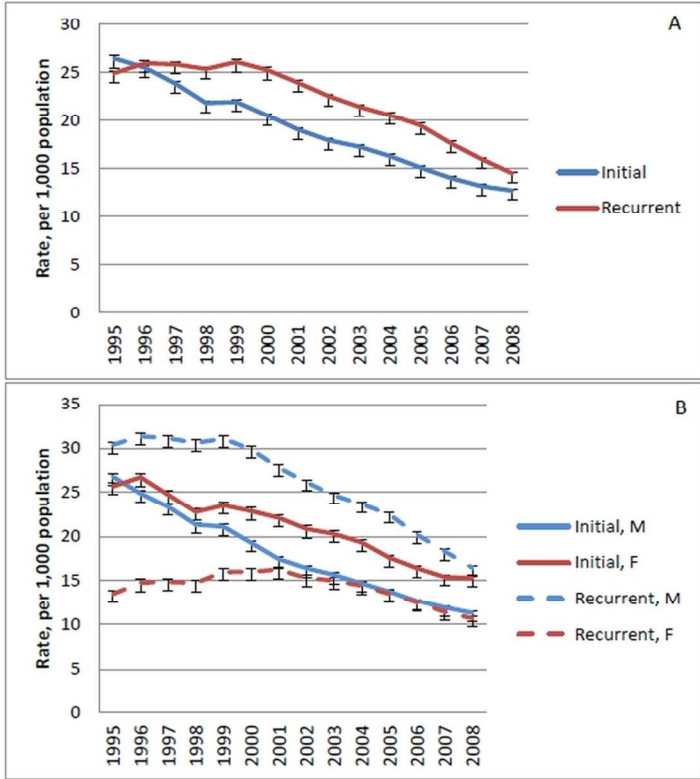
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60-64	106.9 (213.5)	16 (10-72)	101.6 (204.7)	15 (10-72)	103.5 (207.8)	16 (10-72)	NS
65+	80.6 (122.5)	25 (10-85.75)	76.8 (127.4)	20 (10-70)	78.3 (125.5)	22 (10-77)	NS

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Figure 1. Incidence of initial (1A) and recurrent (1B) workplace injury and disease per 1,000 workers in Victoria, 1995 to 2008



103x90mm (300 x 300 DPI)